

Perspectives in

Hard Red Spring Wheat

Breeding and Marketing

J. F. Carter

The issue today and for the near future on farms, among public breeders in universities and the USDA, and ideally, we assume, with private seed company breeders in the breeding of hard red spring wheat (durum wheat, too, to lesser extent) is "yield versus quality."

"Yield versus quality" probably is an oversimplification of comparing present yield levels of Chris, Waldron and Fortuna having acceptable quality versus such varieties as Era, Red River 68 and Bonanza considered to have unacceptable quality. I wish to discuss the status of quality in hard red spring wheat in some detail later but perhaps the agronomic situation in hard red spring wheat should be discussed briefly.

Public wheat breeding teams have done a remarkably efficient and effective job of constructing a good wheat plant. It resists most plant pests, especially diseases such as stem rust that has caused catastrophic losses in past years. It resists cold soils after seeding in the spring, germinates well, tillers and produces good early growth, heads uniformly, stands well, holds its large vitreous seeds, matures at good harvest time, and threshes easily. Farmers and processors have been well satisfied, although always yearning for higher yields of grain that could be milled to more loaves of bread from a given weight of wheat. The availability first of Gaines miracle wheat in the Pacific

Northwest and later the so-called Mexican semi-dwarf wheats has greatly increased the producers' yearning for higher yielding wheats for the spring wheat region.

Agronomic problems remain to achieve the ideal wheat genotype. We seek other sources of resistance to wheat stem rust, leaf rust, Septoria and the foliage disease complex, and now ergot infection of wheat appears to be of increasing importance. Further improvements in straw strength and standability and in resistance to shattering are desired. We seek a wheat that does not germinate and sprout in the head or swath at maturity while awaiting harvest, but still germinates in the soil when we rush it back from Arizona winter increase to seed in North Dakota.

We are developing wheats with still greater resistance to wheat stem sawfly damage, and searching for those that would be immune to or resist attacks of the devastating cereal leaf beetle should it move west from the Great Lakes area. Spring wheats are being converted to day length insensitivity so that their growth cycle is the same in North Dakota as in Mexico, Uruguay, Colombia or India. Wheat genotypes with unusual tolerance to such environmental stress as drouth are being developed and studied.

More complex researches on wheat include:

1. Attempts to induce favorable mutations in wheats having one or more major faults, or maybe

Dr. Carter is professor and chairman, Department of Agronomy.

only making an otherwise tall wheat shorter, or a disease-susceptible wheat to be resistant.

2. Genetic studies of leaf type, baking quality, or 5B chromosome effect.

3. The use of the so-called "5B effect" to allow hybridization of otherwise highly incompatible species.

4. Studies of wheat physiology and morphology to learn how to construct a better wheat plant for grain production.

5. The study and use of cytoplasmic male sterility and nuclear / cytoplasmic interactions which, at best, should result in production of economic hybrid wheat. As next best, such interactions will provide a great amount of genetic, cytogenetic and cytotoxic information on wheat that should allow parental combinations with highly predictive results. We at North Dakota State University believe the sterility/restoration problem is essentially solved, but the job of synthesizing and testing an economic HRS hybrid wheat remains to be accomplished. Hybrid wheat breeders may have difficulty in producing hybrids that excel conventional varieties in the near future.

6. Producing a hard red winter wheat for the northern plains that has necessary levels of winter hardiness, disease resistance, yielding ability, and milling and baking quality.

Better Wheats in the Future

Wheat breeding teams have or will achieve all necessary desirable agronomic characteristics for wheats of the future. These advances will be by public breeders and perhaps a few private breeders, and involve many varieties. I doubt that ever again will we have a catastrophic loss due to changing races of wheat stem rust because of broad based resistance from many sources and breeders incorporating resistance to newly discovered races into varieties. But we have not, probably never shall, achieve acre-yield levels completely satisfactory to farmer producers. Higher yields of hard red spring wheat equal or better than the best one tried by a farmer or his neighbor, or highest yields reported anywhere, are now the goal and desire of farmer-producers in the countryside. They are also the main issue for discussion among producers, breeders, administrators, and the "grain trade," if the latter allow themselves to be engaged in discussion.

The farmer-producer is interested in feeding his family, making a good living, making a profit, accumulating some capital investment to support his retirement, and enjoying life in the process. He

is interested in high yield for sake of bushels produced multiplied by the price of grain, and high yield history for certificate payments. Wheat certificates paid in addition to cash or loan price for wheat are of importance regarding acre-yield, because established yield history for a three-year period on farms influences amount of certificate payment.

Need Higher Yields and Income

The farmer is interested in and needs higher wheat yields and income because of the changing farm production situation which includes wheat production in surplus of demand, lower cash prices, dock strikes restricting wheat exports, increased mechanization, higher labor and operating costs, and higher taxes, along with opportunities to increase acre-yields with better weed control, application of fertilizers and use of improved wheat varieties.

The ultimate and best solution to the cost-price squeeze of the farmer is development of a variety having acceptable quality for milling and baking while equalling or exceeding all other available varieties for yield. We at NDSU are making progress towards such a variety, but have discarded more than 140 advanced hard red spring wheat experimentals since Waldron because of unacceptable quality or other reasons. **Our concern is that, in the meantime,** the production and sale of hard red spring wheats having lower than acceptable quality (by North Dakota standards at least) do not cause loss of our foreign markets to aggressive competitors with a good product, and loss of some of our domestic markets to hard red winter wheat.

Yield Versus Quality Issue

On the issue of "yield versus quality" as I understand it now in North Dakota, the principal producer of hard red spring wheat in the United States, several assumptions may be made as valid:

1. Characteristics of grain, flour, dough and loaf have been defined, generally understood, and accepted in past years as communicated from "grain trade" by people, conferences, companies, formerly the Northwest Crop Improvement Association and more recently by the Crop Quality Council.
2. Wheat breeders have produced varieties having acceptable quality and agronomic characteristics.
3. Farmers of northern plains have produced these varieties and processors have bought the wheat to manufacture baked goods for the consumer.

4. Hard red spring wheat of variably sized crops has been sold mainly for cash in domestic and export markets.
5. Increased farm operating costs have stimulated increased interest in higher yielding crops. Knowledge and availability of high yielding but unacceptable quality, *semidwarf* hard red spring wheats have led to their composing approximately 10 percent of the 1971 crop in North Dakota.
6. Decreasing motivation of hard red spring wheat producers to "hold the quality line" (alone, they think along with NDSU and some commodity organizations) could result in 30 percent wheats of unacceptable quality in our 1972 crop and perhaps more than that in eastern North and South Dakota and western Minnesota.

Wheats of unacceptable milling and baking quality composed about 10 percent of 1971 hard red spring wheat production in North Dakota. We estimate that such wheats of unacceptable quality could compose 30 percent or more of our 1972 hard red spring wheat crop. How will, should or can the "grain trade" react to this 1972 crop prospect? I believe now in 1972 is the time for the **"grain trade" to share more visible responsibility** that at least 90 percent or more wheats of acceptable quality are produced in North Dakota in 1972. **Producers, grain merchants and processors** of HRS wheat **have a joint stake** in the domestic and export markets.

"Grain Trade Response"

We recognize some indirect evidence of "grain trade response" in upholding this quality principle in the past and perhaps some direct evidence in 1972. Some apparent examples of recognizing acceptable quality hard red spring wheat by the "grain trade" in the market place include:

1. Payment of protein premiums for hard red spring wheat (\$0.24/bu. for 16% over 13% protein, February 18, 1972 in Fargo cash market).
2. Discounts for Northern Spring and Red Spring (some experimental *semidwarfs* of 1971 crop graded Northern Spring or Red Spring, and at least one experimental line had a **zero percentage of vitreous kernels**).
3. Harvest surveys of grain buyers determine their buying points.
4. The Minneapolis cash market lists 2-5¢/bu. discount for Red River 68 and World Seeds 1812 wheat.
5. Some purchase contracts allegedly exclude de-

livery of wheat varieties having unacceptable quality.

6. In meetings in Stutsman county, North Dakota, in early February, 1972, it was stated that
 - a. some companies now specify normal or acceptable mixing times or farinograph curves in their hard red spring wheat purchase contracts;
 - b. elevators have indicated that some commission firms have instructed they want **no semidwarfs** in 1972 crop; and
 - c. some elevators have been instructed that *semidwarf* wheat of 1972 harvest must be binned separately. (Parenthetically, it is unfortunate that *semidwarf* or short wheats get a "bad" label because shortness is presently associated with poor quality. Height is just one plant character, and we assume that short wheats of acceptable quality will be developed soon. It will be unfortunate if the "*semidwarf* = unacceptable quality" label were perpetuated.)

More Visible Input

But, to continue with "yield versus quality," more visible input by the "grain trade" upholding the HRS wheat quality principle as desirable and indispensable is needed to **help the wheat producer** hold the line on quality. For example:

1. Educational programs by grain buyers at all levels (in addition to NDSU educational programs) are needed to emphasize need for quality wheat for domestic and export markets. A few key TV spot statements by some large grain merchandizers would convince the producer that the wheat buyer and processor also believed and practiced the HRS quality principle.
2. If the producer knew that certain unacceptable wheats are not bought for milling, he will believe that the need for wheat quality is fact, not fiction.
3. Wheat buyers should emphasize that wheats of acceptable or superior quality bring premium prices for domestic and export markets.

Additional action by USDA is possible to uphold the quality principle for hard red spring wheat. Mr. Pulvermacher, general sales manager, U. S. Export Marketing Service, twice in North Dakota since December 1, 1971, requested that North Dakota farmers produce only high quality wheats. But, the USDA also should seriously consider discounting any HRS wheat of unacceptable quality contributing to undesirable total level of low quality wheats; that is, not wait until a specific variety

having unacceptable quality reaches some arbitrary level ($\approx 10\%$) in commercial grain channels. If unacceptable wheat variety "X" may compose 3 percent of total crop in 1972, as all other unacceptable wheats are composing 30 percent of total crop, variety "X" should be placed on "discount" list now prior to seeding time.

Why Grow Era-type Wheat?

If "Era-type" wheat is unacceptable to wheat processors and their customers, or if it is grown in excess of blending opportunities, or if the baker of breads and his customers will not, can not, or **need not adjust** to Era quality, then why is Era-type wheat purchased? We should ask ourselves some pertinent questions. If there is no significant grain buyer reaction in 1972, **when will it occur? Do we await a "catastrophic percentage" of Era-type production 1973?** It is certain that our foreign customers want high quality HRS wheat. Will high quality HRS be available only from West Coast ports assuming that Montana and western North Dakota will not grow as much Era-type wheat as eastern North Dakota and western Minnesota? Will the Red River Valley produce two crops of HRS in 1972—one of milling and the other of non-milling quality?

I'm sure our competitors for HRS markets are watching the "yield versus quality" reaction of producer-processor-customer in the northern plains with interest. Canada has tightened grade requirements and added protein guarantee in her quest for 25 percent of world wheat export markets. Australia is striving for higher quality wheats. Hard red winter wheat breeders in the United States are improving protein content and general quality of their HRW wheat.

Producers, grain buyers and processors of the "grain trade" along with the wheat breeders and administrators of public and private agencies must adjust and react to the **"yield versus quality" simmering pot** in the HRS wheat production region. We must make the right adjustments while retaining our hard-won markets, if possible.

Pertinent Conclusions

In summary and conclusion, I believe that we should consider carefully what is the **now**, the **1972 crop**, and the **future** of our hard red spring wheat production and markets in the northern plains. Some pertinent points are:

1. We know that our foreign customers want high quality hard red spring wheat.
2. We assume that our domestic customers still want, and will pay for, high quality HRS wheat.

3. We know that our farmer-producers **want, need and may grow** highest yielding wheats available with or without acceptable quality, and with knowledge of possible resultant marketing problems.
4. Wheat breeders, cereal chemists, and administrators of universities and commodity organizations in the heartland of the HRS wheat producing region continue to strive to meet wheat quality goals for domestic and export consumers. These people and organizations recommend high acceptable quality HRS wheat as a necessary prerequisite to **all breeders, all agencies and all private seed companies** who strive to produce high yielding wheats for our traditional HRS markets. We assume that high quality is relevant and credible now and will be five, eight and 10 years from now for the new wheats the breeder has "on the drawing board" today.
5. Our domestic and foreign markets may hang in the balance of continued production of acceptable quality wheats by wheat producers and their purchase in preference to wheats of unacceptable quality by the grain merchant in 1972. The year 1972 may be critical for northern plains quality wheat production and markets. Some important decisions must be made in the one or two months ahead by producers regarding their choice of variety to grow, the USDA on what varieties to place on discount list, and grain buyers on quality level of HRS wheat to buy or reject in 1972.
6. The **ultimate satisfactory solution to our dilemma** of "yield versus quality" is the development of a completely acceptable quality HRS wheat variety equalling or exceeding all others in yield. But this variety is not now available to my knowledge, or if Foundation seed of such a variety were available now, it could not be in commercial production prior to 1974.
7. Until the high yielding variety of acceptable quality is developed, **the HRS wheat producer in partnership with the grain merchant** must take the necessary action to (a) maintain our production of high quality HRS wheat at 90 percent or more of total HRS wheat production, and (b) suppress production of Era-type, unacceptable quality wheats at 10 percent or less of our total HRS wheat production. Or, an increase of HRS wheat of unacceptable quality may so adversely affect our general HRS wheat quality level that our **domestic and foreign markets will be lost to competitors** for many future years.