

*One man never gave up on his vision.
He sacrificed comfort, the regard
of others, and gave the world...*



In 1897 alone, two thirds of the world's wheat was shipped from Eureka, and wagons rolled in from as far as 75 miles away. In 1902 the railroad moved on, and in 1904 a rust epidemic struck. The wheat bonanza was over.

'HOPE'

Seven years, starting in 1879, stand out as Dakota Territory's greatest "land boom." By 1885, the population had increased from 50,000 to 415,000.

Open land without trees, a long stretch of good weather, and their own private hopes and dreams encouraged settlers to break sod and plant wheat. In the 7 years of the land boom, wheat acreage increased from just over a hundred thousand acres to well over a million acres.

In the middle of this period came a Scottish immigrant to Dakota. The New York State school teacher put up a claim shanty on a piece of land about 7 miles northwest of Webster. In 1891 during a blizzard, a son, Edgar, was born to the McFadden family in that little home which also served as a granary. The baby's bed was a grain bin filled with the next year's seed wheat.

Meanwhile, wheat had been planted at the Agricultural Experiment Station

in spring 1887, the year of the Station's establishment at the agricultural school in Brookings.

Without teams, implements, or money, the farm superintendent apparently borrowed the money to buy the seeds that first year, hoping the crop would pay off the debt. Results from this first crop were sketchy, but rust was reported in seven of the 15 varieties planted.

Out in the countryside, wheat was fast becoming responsible for the state's first "economic boom."

Wheat farmers prospered so much, in fact, that Eureka, up McPherson County just below the North Dakota line, for 15 years (1887 to 1902) was the largest inland wheat market in the world.

In 1892, 3,300 cars of grain were shipped out of Eureka; hooked together they would have been a train 30 miles long. At least 35 elevators and warehouses employed 200 men to handle

almost 4 million bushels of wheat. The harvest that year was exceptional, yielding 20 to 25 bushels per acre and bringing up to 70 cents a bushel.

But Eureka residents were living on borrowed time, and they knew it.

The railroad by 1902 moved on; another end-of-track was built up the line. Overnight, many businesses in town moved, lock, stock, and barrel, to the new terminus.

Time had run out, too, for the wheat farmers. But for a different reason.

They weren't aware of the invisible red rain falling on the filling heads of their wheat. Disease had always been around in some form or other. But they couldn't foresee that 1904 would be an epidemic year for wheat rust, one of the worst stem rust years on record, or that production across the state would be reduced by 50%.

And then, from 1904 on, though acreage stayed high, rusts and scab would take their toll and yields did not match the halcyon years of the late 1800s.

Rust was particularly bad in 1916 and 1917 and wiped out nearly the entire crop in 1920. "Marquis," the leading hard red spring wheat planted, was particularly susceptible to rust.

Back in 1904, when the good wheat years were ending, the boy McFadden turned 13. He was the family farmer that year; his father had been gored by a bull and nearly killed.

Young McFadden put in the crops and later made ready to harvest wheat that was swelling with a promise of 40 bushels per acre. But silently, the red rain fell over the farm. Just days before harvest, stalks broke over and kernels shriveled. Instead of 40 bushels per acre, he harvested 5.

The red rain was spores of the stem rust fungus. The weather was particularly good that year for the disease. From Texas, where the rust overwintered, the spores rode the winds north. It is said that in a bad rust year, as many as 600,000 spores could pour down on a single square foot of Dakota wheatland.

The boy must have brooded long about the failure of his first wheat crop, even while spending 3 teenage years in Texas.

"I returned to South Dakota just in time to witness the big drought of June 1911, followed by an epidemic of stem rust which practically wiped out everything that the drought had not taken. It is little wonder that I acquired a lasting impression of the vital importance of controlling drought and plant diseases."

Again, there would be no wheat crop to speak of from the McFadden home place that year of 1911. But nearby stood a patch of Yaroslav emmer, erect and robust, fairly bursting with health. If the spring wheats in northeastern South Dakota had succumbed to the



Edgar McFadden, memorialized for providing "a bountiful harvest for his fellow farmers while to a hungry world he gave bread."

—Day County farmers

red rain, why hadn't the emmer, another small grain?

Emmer was an enigma, not much better than a weed to some scientists and farmers but a feed grain and capable of producing twice as many bushels per acre as spring wheat. It had been grown continuously at the Highmore Experiment Station since 1903, where it was considered "probably the least valuable of small grains grown in South Dakota." Pigs wouldn't eat it, unless it was first ground or soaked.

But it stood up to rust.

So if it were crossed with a bread wheat, would it impart its rust resistance to the wheat?

"This idea filled my mind in the fall of 1911 when I started for State College to learn something about botany, field crops, and diseases," McFadden later reminisced.

His professor surely already knew that emmer and bread wheats were only distantly related, that emmer had 28 chromosomes and wheat 42, and that scientists of the day said such a mating would never take. Was it to finally silence this young man already earning his lifelong reputation as an aggressive,

tenacious, bulldog personality that the professor gave the go-ahead to such an experiment?

McFadden was boarding at a rooming house on the southwest corner of 8th Avenue and 9th Street in Brookings. He coaxed his landlady to give up a corner of her garden, and there he planted a row of emmer and a row of Marquis wheat.

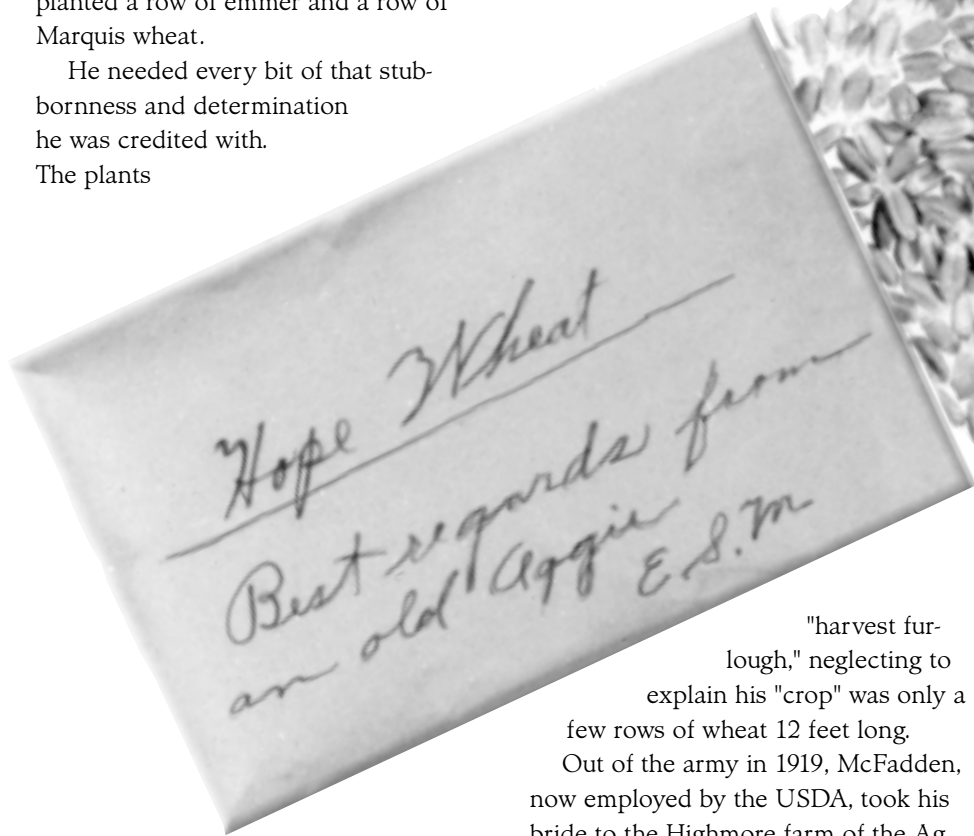
He needed every bit of that stubbornness and determination he was credited with. The plants

never exist, grew, pollinated itself, and produced 100 seeds McFadden planted in spring 1918.

But now, after graduation in 1918, he was called into the army. The story goes that he persuaded his commanding officer to give him a

plots, convinced his new wheat/emmer plants were rust resistant.

Meanwhile, the farm and the finances were failing. In 1921, his fields were burned out by drought. In 1922,



came up nicely.

But they normally self pollinated, even before the florets opened. They didn't bloom at the same time; Marquis was early, emmer was late.

For a few days that year, blooming overlapped. McFadden teased out the emmer anthers and brushed the pollen from Marquis onto the emmer stigma. He had to work at speed; scientists have now pinpointed the length of time in hot July weather such as in Brookings that wheat pollen will stay viable. After the anther opens, it is less than 5 minutes.

That fall he harvested a few shriveled seeds and planted them in the spring of 1917. One—just one—came up. This one plant, that scientists had said would

"harvest furlough," neglecting to explain his "crop" was only a few rows of wheat 12 feet long.

Out of the army in 1919, McFadden, now employed by the USDA, took his bride to the Highmore farm of the Ag Experiment Station, where they lived in the seed house while he continued his breeding work. When federal funds dried up in 1921, he never gave a second thought to desk work at another USDA location or to the offer of teaching at State College. He moved his family back to the Day County farm.

He was no farmer. He was a scientist obsessed with the idea of saving other farmers from the ravages of stem rust.

The family was described as "poor as church mice." But McFadden ignored his scoffing neighbors, neglected his growing family, and let the farm run itself while he worked day and night in his makeshift back-porch lab and his

they were hailed out. In 1923, they were rusted out; the red rain had struck again in the worst epidemic Day County had ever seen.

But only his fields withered. His test plots flourished. This terrible year was a turning point in the McFadden story.

To make relations with his neighbors worse, McFadden had tried to tell them the epidemic was coming. He had trapped the red spores of the rust on microscopic slides coated with petroleum jelly. Since he knew how long it would take for them to infect and destroy the wheat plants, he could predict failure almost to the day.

Success in the midst of devastation: his test rows of emmer/ Marquis escaped the plague totally. By the next year the new variety was reliable enough to receive a name.

'Hope.'

It was still a puny little Hope—low yielding, light weight, susceptible to spring frosts and black chaff, dark floured.

But it was resistant to stem and leaf rusts. And it had wheat's set of 42 chromosomes, meaning it could be easily crossed with high yielding wheats. He sent packets of Hope to other breeders; the germplasm that had combined in

one single seed in a Brookings backyard garden began to spread throughout the world.

Until the semidwarf wheats appeared about 20 years ago, Hope genes were in virtually all wheats the world over.

- During the war years of 1939-1945, over 15 million acres of Hope derivatives were planted in the U.S. and Canada. It was estimated that farmers in the Dakotas and Minnesota saved \$135 million in 1944 alone. Total savings during the war years: perhaps \$400 million.

- Six varieties of Texas wheats, developed from Hope by McFadden after he moved there in 1935, provided a barrier of rust-resistant wheats that would break the northward spread of the fungus spores.

- In the "Green Revolution" in less developed countries, the breeders added the rust resistance of Hope and its derivatives to local wheats.

- Popular magazines of the 1940s reported that possibly 25 million people from other countries had escaped death by starvation because they had bread derived from McFadden's Hope.

Mcfadden's personal fortunes did not profit hugely from his pioneering work. He took no royalties from his discoveries, although the family was able to live comfortably in Texas on his USDA salary.

He lived 43 years in South Dakota and 25 in Texas. His life work is perhaps best captured on a granite memorial erected by the farmers of Day County. It reads, partially, "He Provided a Bountiful Harvest For His Fellow Farmers While To A Hungry World He Gave Bread." ♦

Material for his article was gleaned from interviews with Ray Moore, former director of the Agricultural Experiment Station and with Mrs. Wanda Rufer, niece of Edgar McFadden, and from numerous Experiment Station bulletins, History of the Plant Science Department by Lyle Derscheid, and magazine and newspaper articles of the 1940s.

The Minneapolis Tribune photographer caught Edgar McFadden, left, and Gov. George Mickelson at the memorial dedicated to McFadden in 1947 in Webster. The plaque reads, in part: The farmers and farm organizations of Day County herewith seek to perpetuate the memory of and appreciation for one of Day County's farmers, agronomist and plant pathologist Edgar S. McFadden. A story describing McFadden's exploits, accompanied by several photos, appeared in the Sunday, October 26 issue of the Tribune.



His yellowed September 1946 copy...

...of the *Farm Journal* is a treasured possession for Ray Moore, plant scientist emeritus and former director of the South Dakota Agricultural Experiment Station.

"Five cents a copy. Fifty cents a year, a dollar for 5 years." To prove those prices, he shows the cover: a little girl, her teacher, an apple.

And a teaser strip running across the bottom: "The Man Who Gave Us Bread, the story of a miracle—Hope wheat—page 28"

"I never met Edgar McFadden," Moore says, "but I have talked to several who did know him. I gather he was an aggressive individual—persistent, tenacious, and someone who didn't quit until the job was done."

Moore admires McFadden's character and drive and is impressed by his output, but says that another person also contributed to Hope wheat. "We overlook his professor, the man who said, 'Go ahead.' He didn't quash McFadden's dreams, as he could have so easily."

Are men like McFadden and that professor around today?

"Yes, they are," Moore says, "and they will likely be found in states like South Dakota where there is a deliberate effort to buck the national trend of not listening to the determined dreamers and to go for short-term, foreseeable improvements.

"We allow our scientists a lot of freedom to pursue their own vision. We've always encouraged our folks to get out and about, to learn the needs of our ranchers and farmers, and then to design their own projects to answer those needs.

"Another McFadden will come along. Or is here now. I hope we recognize his or her talents and offer the resources to do work that, like McFadden's, will ultimately make a lasting contribution to the world's welfare."

