# WHITE MOUNTAIN FARM

*Thirty Years of Quinoa Development*
*in the San Luis Valley of Colorado*
*At 7,500 Feet Altitude*

# White Mtn. Farm Quinoa Farmers


***Ernie & Virginia New*** ***Paul & Cindy New*** ***John McCamant***

# Colorado Quinoa in the early 80's

- Dr. David Cusack first grew quinoa in Colorado in 1982 with seed provided by Dr. Steve Gorad.
- In 1983, Cusack joined with Gorad and Don McKinley to form the Quinoa Corporation in order to market imported quinoa. At the same time, Cusack continued working to grow quinoa in Colorado with Dr. Duane Johnson, the New Crops Agronomist at Colorado State University in Ft. Collins.
- Quinoa has been grown in Colorado every year since 1982. (continued…)

# Colorado Quinoa in the early 80's
## (Continued)

- My commitment was to continue Dave Cusack's quinoa work after he was murdered in Bolivia in 1984.
- Initially our quinoa research was done under the auspices of the nonprofit Sierra Blanca Associates from 1982-1987.

- But later, when funding for Sierra Blanca Associates ceased, we decided to continue our quinoa research with White Mountain Farm, our new "for-profit" corporation.

# White Mtn. Farm - The Setting

At White Mountain Farm we grow organic quinoa and organic seed potatoes. We are located in the dry and expansive San Luis Valley of southern Colorado, in the town of Mosca.

This topographic map of Colorado shows the mountains (green) in the west and the plains (white) in the east.

# White Mtn. Farm - The Setting

- In 1987, we began White Mountain Farm in Mosca, Colorado, on the property of the existing New family farm.
- Ernie New of Mosca, in the middle, partnered with John McCamant of Denver, on the left. And on the right is Paul New, Ernie's son.

- They are examining quinoa seed from the research field.

# White Mountain Farm - The Setting

The peak of Sierra Blanca -- about 30 miles due east of the Farm.  Sierra Blanca is Spanish for White Mountain.

# White Mountain Farm - The Setting

At the base of the mountains you can make out Great Sand Dunes National Park, 20 miles east of the Farm. Sand blowing eastward across our fields has been a serious challenge for quinoa growth.

# White Mountain Farm - The Setting

The San Luis Valley is a sunny ancient lake bed at 7,500 feet elevation, with low precipitation and intense spring winds. It's the highest elevation farming area in the United States. Temperatures are marginal for quinoa, being too hot for many lines, but our newer varieties seem to be more heat tolerant. Cooling monsoon rains usually arrive in mid-July, just as the quinoa begins to bloom, making it possible for the plants to set seed.

# Seed Evolution

David Cusack collected many quinoa varieties and ecotypes from several regions of South America. Often these were too heat-sensitive, required a longer growing season, bloomed too late to mature seed, and never produced seed. I continued growing out those that produced. In 1987 there were still 37 different varieties , but now we're working with only about ten lines, and the ones we currently grow have radically changed from their predecessors. The large variety of quinoa combines with our native Chenopodium weeds and mutations, providing a good basis for genetic changes.

# Seed Evolution (continued)

- In our research field, we plant 100-200 selections of seeds every year, in 25’ x 10’ plots.
- At harvest time, we select individual plants, whole plots, or best plants in a plot, for possible replanting the next year.
- We harvest the research field by hand with a knife or pruners, and put the heads through a bundle thresher.

- A manually cranked 1920’s Clipper Cleaner further separates seed from chaff. I save the larger-sized seeds for replanting.

# Seed Evolution (continued)

Young Paul New helps harvest quinoa. About this time, we organized the Quinoa Producers Association with members drawn from Colorado, Washington state, and Canada. Paul was elected the first and then the last president.

# Seed Evolution

**407**

One seed collection which originated in southern Chile was designated by Cusack as CO407. It proved to be the most adaptable.

Ernie New took excellent photos from the beginning. These capture what 407 looked like in the late 1980's. This one shows the yellow and orange colors typical of 407.

# Seed Evolution

**407**

This single plant of 407 grew outside the spray irrigated area, but still matured. Rainfall in the San Luis Valley was greater in the 1980's than it is today.

Cusack wrote in his 1983 field notes, "This variety matured before all the others. It had large compact heads of a brilliant orange-gold color. May be the most promising variety planted this year."

# 407

407 seed provided our first large field production and was the source for two of the four new varieties we've identified. While 407 grew better than other lines, its seed was small and dark. It had excellent flavor but was sticky when cooked.

We noticed from the beginning that some 407 plants grew a couple feet taller and had purple heads. When the seeds of the tall purples were grown out the following year, they segregated into every type imaginable: tall and short, red, yellow, brown- or black-seeded, early- and late-maturing, etc. The next year the brown- and black-seeded plants with purple heads stabilized, so we grew out single plant selections again. Then we evaluated the results for texture and flavor -- the flavor is great and the plants are beautiful!

***407 Black***

Not all black-seeded 407 plants are purple. In this photo, to the right of the purple head is a green head with black seeds.

## *407 Black*

We've grown out the good 407 Blacks in larger production fields for 25 years. There is still considerable variation and selection continues.

The Farm continued to grow out large fields of the original 407 for a few years, but we discontinued them in favor of other larger seeded selections.

After two years of growing 407 only in small research plots, the Farm once again grew out 30 acres of 407. Some individual specimens from that 30-acre field had larger seeds, heads that displayed the old yellow color, and the strong 407 plant conformation.

We saved the seed from those promising individual plants for seed increase in the research field the following year.

***407 White***

A large number of research plots have been devoted to these larger seeded 407s, with selection and re-selection continuing year after year.  Now we regularly plant large fields of 407.

***407 White***

# *Lipez*

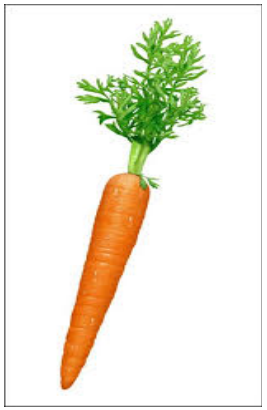
- In January, 1984, David Cusack attended the quinoa festival in Lipez, Bolivia, where the highest quality, large white-seeded quinoa was grown. He brought several hundred pounds of the large Lipez seed back to the United States.
- Cusack found growers in the San Luis Valley who agreed to plant 160 acres of it in 1984, however, none of it produced.
- We took some Lipez seed to small fields at higher elevations in Colorado, such as Telluride. Lipez did successfully produce seed in those high mountain fields. The plants were large, with green heads that turned yellow at maturity.

# *Lipez*

Lipez maturing from green to yellow. These 3 photos demonstrate the strength and vigor of this premium plant from southern Bolivia.

# *Lipez lost*

- Unfortunately, Lipez didn't continue to adapt in the San Luis Valley as the 1990's grew warmer. Finally, one year no Lipez produced any seed whatsoever in the fields.



- Fortunately, Ernie had planted some Lipez seed in the Farm's vegetable-growing area at a later date, where there is more overhead irrigation. In that slightly cooler location nine Lipez plants set seed.
- In the research field we repeatedly grew out the Lipez seed originating from Ernie's nine plants.
- Out of these successive tries, the Farm has developed a shorter plant with good seed size for large field production.
- We call it Short Blanca. We've been able to grow the Short Blanca in large fields for the last seven years.

# *Short Blanca*

These Short Blanca plants in the research field are significantly shorter than Lipez.

# *Cahuil*

- In 1986, Steve Gorad, President of the Quinoa Corporation at the time, brought back from southern Chile a variety of quinoa called "Cahuil".
- When grown out, it proved to be as good as the 407. Cahuil exhibited green plants and purple plants in equal proportion, and it produced small white seeds with a clean pleasant flavor. In both the large fields and the research field it was quite stable with neither crosses nor mutations until the early 2000's when some larger-seeded plants appeared.

# *Cahuil*

- When the larger-seeded Cahuil plants were grown out, they segregated into a large number of types, indicating they had been crosses.
- Many single plant selections were taken from these crosses and grown out in the research field.
- We're still sorting out the Cahuil lines, while using the Cahuil Cross as one of our major lines.

# *Cahuil*

These plants are not only more colorful and stronger than the original Cahuil, but they also have larger seeds.

# *Cahuil*

You can discern the flat yellow roof of my trusty 1983 Volvo Station Wagon beyond the Cahuil seed heads in the right-hand photo. It carried me from Denver to the Farm and back, 202 miles one way, for three decades. When I donated the Volvo to Colorado Public Radio this spring, it had 398,500 miles on its odometer.

***WMF Quinoa Lines:***

- *407 White*
- *407 Black*
- *Short Blanca*
- *Cahuil Cross*

These are the four quinoa lines White Mountain Farm currently grows in larger fields, and they have produced good seed consistently for several years.

Our Farm's most troublesome challenge in quinoa cultivation has been strong spring winds that sand-blast the newly sprouted quinoa – the same winds that deposited all the sand onto the nearby Great Sand Dunes National Park.

- Although our organic fertility has increased tremendously over the years, quinoa is a heavy feeder and could always use more.
- Four years ago we identified a shortage of sulfur in the soil, so we are now adding gypsum to correct this deficiency.
- Notes:

1. John is Univ. of Washington alum. – He got his PhD there.
2. John sent quinoa seeds with Steve Gorad to Tibet. Got back this beautiful and interesting vacuum-packed brick of quinoa.

***Above:*** ***Paula is short. Quinoa is tall.***

***Right:*** ***Art Warner & John McCamant harvest the quinoa research field.***

Our next speaker is ***Paul New***, the popular Manager of White Mountain Farm. He has developed a number of techniques for planting, cultivation, and saponin removal that he will describe to us, along with additional insights and observations from his own experience.