JIAK YO'ORA TIKOM

Technical Report

Experimental parcel for cultivation of organic White Sonora wheat in Yaqui Tribe Territory: Sonora, Mexico

Cycle 2016-2017

Southwest Folklife Alliance

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Cornelio Molina Valencia

M.S./Agronomy and Social Science

SOUTHWEST FOLKLIFE ALLIANCE

an affiliate of the University of Arizona

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THE UNIVERSITY OF ARIZONA
Agnese Nelms Haury
Program in Environment and Social Justice

Location:
This work was carried out on a parcel of land that belongs to the Agricultural Technology Baccalaureate Center #26 (CBTA 26, Spanish acronym), a technical school with high enrollment of Yaqui students. The CBTA 26 is situated in Vicam Station, Guaymas municipality, in the State of Sonora. As claimed by the traditional Yaqui authorities, Vicam Station belongs to the area demarcated by the traditional Pueblo of Vicam and the CBTA 26 agricultural lands are within the jurisdiction of the Town of San Ignacio de Tórim. The parcel of land used in this project is located in Irrigation Distric #18, also known as "Las Colonias Yaquis". A total of 2.5 acres of land were designated for the project.

Significance:
This project is significant because it takes place in an indigenous cultural context in Mexico, with the goal of advancing a sense of efficacy, sovereignty, and economic development led by and for the benefit of the Yaqui Tribe in Sonora. The project was designed to advance technological contributions and transference of knowledge in wheat planting and harvesting from the Tucson basin to the Yaqui Tribe in Sonora. This transfer would reinforce the holistic relationship between environment, soil, and water that is of intrinsic value to the Yaqui people. The project employed a Yaqui agronomist as lead technical coordinator in Vicam. In addition to the agricultural and technical aspects, the project also involved the exchange and demonstrations of traditional Yaqui foodways, stories, and recipes across the U.S.-Mexico border, from Vicam to Yoem Pueblo in Marana and to New Pascua in Tucson.

PROJECT OBJECTIVES

The project encompassed 4 steps:

1. Establish a 5-acre experimental plot for heritage wheat planting on land of CBTA 26. Half of the 5 acres were dedicated to cultivate ancestral organic wheat, White Sonora variety. The other half was used to cultivate four commercial organic wheat varieties (Topahui, Norman, Borlaug, and Cirno). The control varieties were selected in consultation with INIFAP (Mexican National Institute for Agricultural Research).

Cornelio Molina, project coordinator in Sonora, inspects stalks of Sonora White wheat during visit to BKW Farms in Marana, AZ in 2016.

2. Establish an organic crop management system, with assistance from INIFAP and from the Plant Health division of the Secretariat of Agriculture and Livestock (SAGARPA, Spanish acronym) to monitor the crop growth.

3. Grant to the partner school CBTA 26 20% of the total harvested White Sonora wheat to use it in its academic and technology transferring programs.

4. Establish a pilot demonstration project for storage, management, baking applications using flour from the harvested heritage wheat, and design of a business plan for potential Yaqui-owned, heritage-based social enterprises.

The title of this report in Yoeme language translates in English to “the wheat of our elders.” This report was translated from Spanish to English by Patricia Espinosa-Artiles, M.Sc.

IMPLEMENTATION

The following 24 actions describe the technological progression of the project from start to finish. Dates and agronomic details are included in order to facilitate replication of similar projects in the future and to establish a record of the learning process.

1. Soil Preparation
Basic tasks of soil tilling began at the end of November 2016. Activities included lifting off the wet layer from the soil and groove tracing.

Mechanical soil preparation at CBTA 26 lands in November 2016, Vicam, Sonora MX

2. Pre-planting Irrigation
Pre-planting irrigation was accomplished on December 4 and 6, 2016. Irrigation on soil consisting predominantly of clay texture required profound application.

3. Planting
The soil moisture conditions were almost at field capacity and ready for sowing by December 18th. Due to rain, the planting was delayed until December 28th. We identified lack of moisture uniformity in the seedbed at the time of planting.

4. Seed Selection

White Sonora wheat was chosen due to its ancestral connection with Sonora, a landrace variety that preceded the wheat varieties that emerged from the scientific efforts of the Green Revolution (1940-1960). Sometimes called "Father Kino's wheat," of the family also known as "sacramental varieties," White Sonora has been successfully reintroduced to market in the United States in the last 20 years. The seeds were obtained from BKW Farms in Marana, Arizona, a certified grower of organic White Sonora. BKF Farms links the provenance of their White Sonora seeds to NATIVE SEEDS/SEARCH in Tucson, AZ which includes accessions from 3 distinct sources: a seed collected by USDA in Durango, Mexico in 1907 labelled "Flor de Sonora;" a seed collected by USDA in Santa Ana, Sonora in 1916 labelled "Sonora;" and a seed collected by Gary Paul Nabhan in the Gila River, Arizona in 1988 labelled "White Sonora." The project benefited from advice and collaboration with Dr. Maribel Alvarez, from University of Arizona/Southwest Center/Southwest Folklife Alliance, who has conducted research on the genealogy, revival, and social dimensions of wheat and White Sonora in Northern Mexico.

5. Planting Density

A total of 277 pounds of seeds of White Sonora wheat were available for planting. The White Sonora seeds are smaller than other commercial wheat seeds commonly known in Sonora. The seeds are semi-rounded in shape and of light tan/whitish color. Because of their size, there are more seeds in 2.2 pounds of seeds than are usually the norm in varieties of the region. The planting density was of 119 pounds per acre. The seeds were planted in double rows in grooves of 100 meters in length.

6. Pre-planting Treatment

The seeds were treated with organic fungicidal to protect them from harmful microorganisms. The brand Bio Thork was applied.

7. Soil Fertilization

A total of 15 tons of "gallinaza" (a fertilizer made from hen's excrement) was uniformly applied in the validation plot. The "gallinaza" was obtained from the Yaqui Valley region. The amount of applied "gallinaza" was determined based on results of soil

fertilization analysis conducted by the INIFAP. The “Gallinaza” was applied as an organic source of nitrogen and phosphorous to the crop.

8. Germination

Within ten days of planting, by January 7, 2017, the planted White Sonora showed high levels of germination.

Germination stage of White Sonora wheat planted in Yaqui territory in Sonora, Mexico, January, 2017. In the background can be seen Omteme Hill, a Yaqui ancestral site.

9. Weather Conditions

Climatic conditions during the time of germination and growth of the White Sonora wheat were very unstable. In general there were plenty of days with sunshine, little rain, and the region did not experience any days of freezing temperatures.

10. Plant Cluster Formation

Within 30 days of planting, White Sonora wheat plants were visibly growing. By the end of January 2017 cluster proliferation of 9 and 12 sprouts were evident. These formations were consistent with the normal growth parameters observed in Sonora in wheat cultivation in general.

White Sonora wheat 25 days after planting. Notice the lumpiness of the seedbed due to the clay texture of the soil.

11. Auxiliary Irrigations

Two applications of gravity irrigation were administered to the White Sonora crops after planting. The first one was done 45 days after planting (on February 10, 2017). A second irrigation was deemed necessary and applied on March 20, 2017.

12. Crop Development

Fifty days after planting (by February 15, 2017), the Sonora White wheat crop showed more than 55% vegetation cover on the soil. The control group of commercial varieties showed 40% vegetation cover. Sonora White showed variability in patterns of growth, evidenced by patches of wheat mats of different colorations on the soil. Some seedlings grew faster and taller than the others, measuring about 45 cm in length from the basal part of the stem to the tips of the leaves.

Widespread vegetation of the Sonora White crop 53 days after planting.

13. Wind

Periodic gusty winds (common in the Lent season in Yaqui lands), between 15 and 20 miles per hour, were recorded during the growth period.

14. General Appearance of the Crop

Sonora White wheat plants exhibited hues of green less intense than we are used to seeing in commercial varieties in Sonora. Without additional lab tests it is hard to conclude whether this variation is the result of nutrient deficiencies in this variety. Seventy days after planting (in the first week in March), vegetation cover in the White Sonora experimental plot was of 100%. Plant height was approximately 60 to 65 cm.

15. Plant Flowering Stage

Plant flowering started by March 16th, 84 days after planting, and coincided with the second auxiliary irrigation. Pollination and fertilization were well underway at this point.

16. Flower Spike Stage

By the first day of April, 95 days after planting, the flower spike was fully formed and the grains could be seen in aqueous stage (high humidity in the forming grains). Flower spikes varied in size from 8 to 12 cm in length.

17. Temperature

During the flowering days of the crop cycle, temperatures rose significantly in the region. Strong winds were also experienced. It is hard to say whether these climatic conditions had any impact in the formation and optimal filling of the White Sonora wheat grains.

18. Grain Filling

The size of the flower spikes was mostly uniform by the end of the crop cycle (116 days after sowing). There was some variability in the size of the wheat grain and the amount of grains per ear of wheat.[1] Variability could be attributed to several factors registered at the

[1] The amount of grains per ear of wheat was variable. A total of 28 grains were counted in an 8 cm-spike, while 57 grains were recorded in 10 cm-spikes. About 90% of the grains had normal and uniformed sizes.

Size and grains per ear variability of the White Sonora wheat cultivated in Yaqui territory in Sonora Mexico, April 2017.

end of the crop cycle, such as high temperatures and strong winds. The late planting date due to rainy weather and the absence of cold hours during the stage development of the crop could also have impacted the filling.

19. Physiological Maturity of Wheat Grain

Analysis on the moisture content of the Sonora White wheat grain revealed that the grain reached its physiological maturity by May 9, 2017 (127 days after sowing). At this stage the grain was ready for harvesting.

Sonora White wheat cultivated in Yaqui territory, Sonora, Mexico in full physiological maturity, May, 2017 (127 days after sowing).

20. Weed Control

The wheat crop was able to grow and develop well even though no system of weed control was implemented. The presence of Convolvulus arvensis (bindweed) and other invasive herbaceous plants did not have a negative effect on the growth of the wheat plants. The presence of wheat blight was noticed during the peak of physiological maturity of the crop but did not affect the grain filling stage. Nevertheless, Dr. Juan Manuel Cortez from INIFAP classified the White Sonora wheat as a wheat-blight susceptible variety.

Beginning of the White Sonora wheat harvest in Yaqui territory, May 21, 2017. There is color difference between the BORLAUG wheat variety, which is whitish and yellowish, and the White Sonora wheat which displays a golden color. The green plants are unwanted weeds in the White Sonora wheat crop.

21. Harvesting

The harvesting of the organic White Sonora wheat and other wheat varieties selected by the INIFAP for this project was conducted on May 21, 2017. The degree of humidity was reduced to 8% at the time of harvest. Harvesting took place uneventfully. The harvested grain was unloaded on a floor covered with black plastic tarp previous to the filling of sacks. The straw or crop residue of the White Sonora wheat does not break up like other varieties; instead, it tended to compress on the soil surface.

22. Production

A total of 64 sacks, 98 pounds each approximately, were filled with the White Sonora wheat grain. The total amount of harvested wheat was of 6,249 pounds. INIFAP received 20% of the harvested wheat as proof of technology transfer.

The process of wheat grain sack filling by the shade of a "guamúchil" (Pithecellobium dulce) tree.

The completed harvest awaiting transportation to storage.

Work team of CBTA 26 and collaborators from the Yaqui tribe. Project leader Cornelio Molina is the 4th from the left.

23. Storage

A storage facility was fabricated in Vicam Pueblo to collect the harvest. With a dimension of 26 x 19 feet, the facility has capacity to store up to 16,000 pounds of grain. Features such as galvanized aluminum walls, 110 and 220 electrical connections, anti-rodent perimeter protection, lighting, and air vents were installed to facilitate future operations, including a small mill.

Fabrication stages for storage facility to collect harvested White Sonora wheat, Vicam, Sonora MX.

24. Milling, Cooking and Tasting

Several cultural demonstrations were organized following the harvest to test the elasticity and taste of White Sonora wheat in typical Yaqui products for domestic consumption.

The acquisition of two small, mobile mills of the brand Wonder Mill facilitated the immediate transformation of the grains into flour. We are grateful to BKW Farms' owner Ron Wong, in Marana, AZ, for introducing and demonstrating the use of the Wonder Mill to the project.

With the assistance of master Yaqui home cook, Chuyita Valenzuela, in Potam Pueblo, Sonora, a workshop held in October 2017 produced "coyotas" (brown-sugar filled pastry) and "pan semita" (bread rolls). Both bakers and consumers remarked on the fine texture and distinct taste of the baked goods.

The Wonder Mill in use in Potam, Sonora, 2017. This portable mill allows for fine or coarse flour production at a moderate temperature that helps preserve the nutrients in the grains

Typical Sonoran gastronomic offerings produced with White Sonora wheat grown in Yaqui lands, Sonora.

Chuyita Valenzuela, in Potam Pueblo, Sonora, leads other local Yaqui women in a tasting workshop with White Sonora wheat.

ASPIRATIONS/NEXT STEPS

The successful small-scale planting and harvesting of White Sonora wheat in Vicam established proof-of-concept for imagining larger enterprises in the near future that could connect the social, cultural, and economic sovereignty goals of the Yaqui Tribe in Sonora and link such efforts to similar aspirations among Yaquis in Southern Arizona.

Some of the ideas under consideration include:

- Expanding the planting area for White Sonora wheat in Yaqui-owned lands;
- Expanding research and collaboration around White Sonora as a landrace variety between Yaqui agronomists and agricultural/technical entities in Sonora;
- Forming a small cooperative of Yaqui farmers who will agree to plant and harvest organic White Sonora as an economic initiative.
- Create a line of premium, organic heritage-wheat products that can be commercialized through a Yaqui-owned social enterprise.
- Open new markets cross-border for Yaqui heritage food products and food traditions.

Timeline:

From planting (December) to harvest (May): 6 Months

Irrigation: 3 water treatments *(Pre-planting early December; early February; late March)*

150-day planting to harvesting benchmarks: White Sonora wheat in Yaqui lands, Sonora, MX 2016-17.

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