United States Department of Agriculture

Los Lunas Plant Materials Center

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2023 Report of Activities

USDA NRCS Plant Materials Program operates 25 Plant Materials Centers (PMCs) throughout the country. Each Center is strategically located to support the conservation needs in a specific geographical and ecological region. The Los Lunas Plant Materials Center (NMPMC) serves the southwest arid and semi-arid region, including northeast Arizona, southeast Colorado, New Mexico, southeast Utah, and southwest Texas. The NMPMC focuses on conducting plant materials studies for improving soil health in range and agricultural land, for improving wildlife habitat, and urban conservation, breeder and foundation seed production of conservation plant releases, and technology transfer for supporting NRCS field offices in the effort for helping people help the land.

The history of NMPMC begins with the Albuquerque Soil Conservation Service Nursery (ASCSN) that was established in 1936. The ASCSN was one of the four Soil Conservation Service (SCS) nurseries that served the southwestern United States. The ASCSN quickly released 'Vaughn' sideoats grama and 'Grenville' switchgrass in 1940 but was closed in 1953 following the closure of the SCS nursery program. In 1957, because of dedicated efforts by former ASCSN staff and the superintendent of the Middle Rio Grande Substation of New Mexico State College of Agriculture and Mechanical Arts (NMSCA), the ASCSN program was relocated to the Middle Rio Grande Substation (today known as the Ag. Sci. Center at Los Lunas) and was reborn as the Los Lunas Plant Materials Center. With expanded missions, SCS and NMSAC have grown to become the Natural Resources Conservation Service (NRCS) and New Mexico State University (NMSU) respectively. The partnership between the two entities that began nearly seven decades ago has successfully continued.

Fig. 1. The front gate (top) and office building (bottom) of NMPMC and NMSU Ag. Sci. Center at Los Lunas.

Los Lunas Plant Materials Center Staff

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Studies:

Cover Crop and Tillage Practices for Improving Soil Health and Forage Production

This is the second year of a five-year study designed to compare three forage cover crops commonly grown in New Mexico (forage corn, millet, sorghum-sudangrass) mixed with a legume (cowpea) using three tillage treatments each year after terminating the cover crops. The specific objectives of the study are to measure the effects of tillage practices on forage production and forage quality, and the effects of different cover crops and tillage methods on soil health. The overall goal of this study is to enhance cover crop and tillage recommendations and better inform conservation planners on implementing conservation practices including Conservation Crop Rotation (328), Cover Crop (340), and Pasture and Hay Planting (512).

Preliminary analyses of a few key measures for forage production and soil health recorded in 2023 growing season are presented in this report. Further analyses will be conducted, and conclusions will be reported in later publications.

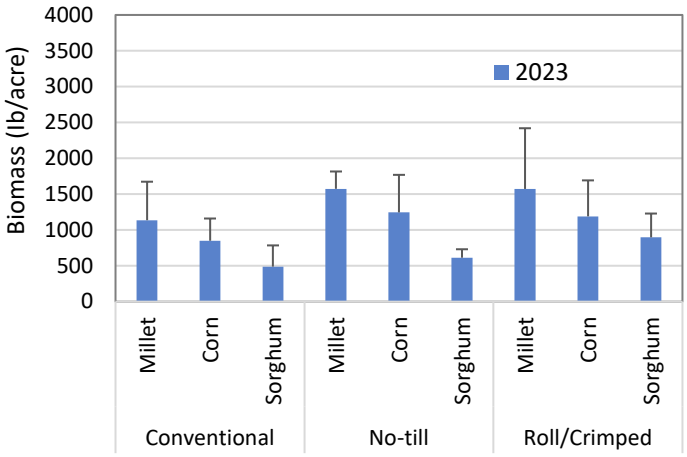

Fig. 2. Biomass yield of millet, forage corn, and sorghum-sudangrasss at 90 days after planting in 2023.

Among the three crops, millet yielded the highest above ground dry biomass (sampled 90 days after planting) and sorghum-sudangrass appears to produce the lowest yield (Fig. 2). Given the high-yielding nature of sorghum-sudangrass, this result was not expected. The crops were planted in the second week of April, and a longer period of cooler than normal temperatures in the early growing season may have contributed to plant injury and slow growth in sorghum-sudangrass.

All three crops produced the lowest biomass yield in conventional tillage (CT), while the yields appear to be similar in no-till (NT) and roller crimping (R/C) (Fig. 3). When looking at the biomass yield of individual crop under three different tillage practices, however, sorghum-sudangrass seems to yield noticeably lower compared to millet and forage corn (Fig. 3).

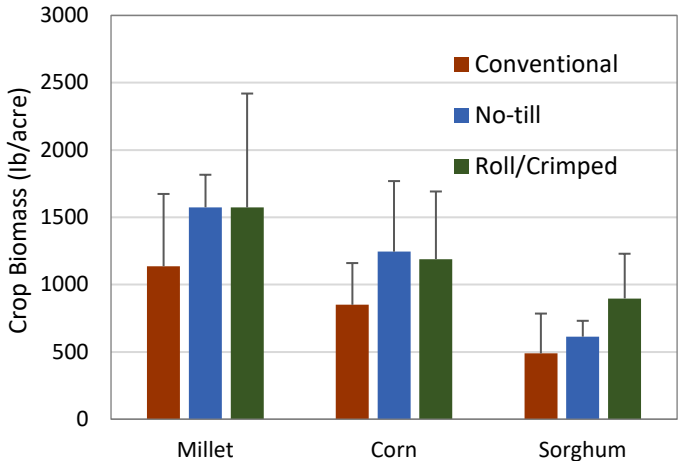

Fig. 3. Biomass yield of millet, forage corn, and sorghum-sudangrass in three tillage practices in 2023.

Weed biomass shows an opposite trend to crop biomass in all three crops and tillage practices; weed biomass increases as crop biomass decreases.

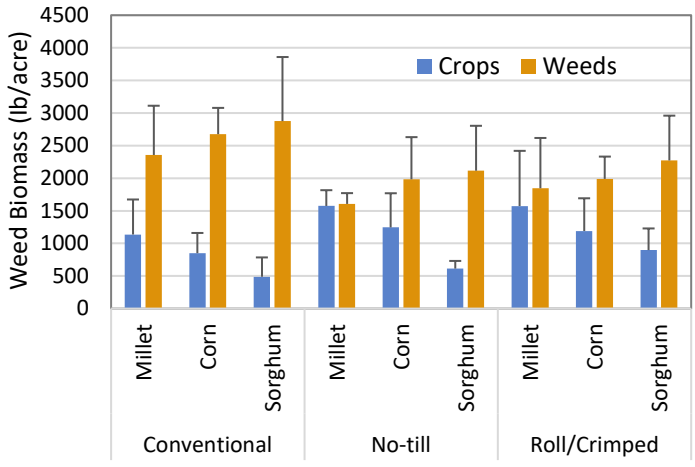

Fig. 4. Weed biomass in comparison to that of crops in three tillage practices in 2023.

The highest weed biomass was found in CT and again NT and R/C show similar results (Fig. 4). It may not be surprising that the highest weed density was found in CT; weed seeds buried/ stored in soils can be exposed to the surface by turning of the soil in CT.

The Relative Forage Quality (RFQ) is a measure of overall forage quality. Results show that the RFQ of the cover crops was similar across all tillage practices in this early year of the study. However, data from NT and R/C tend to suggest a slight increase in RFQ from millet, corn, to sorghum-sudangrass (Fig.5-

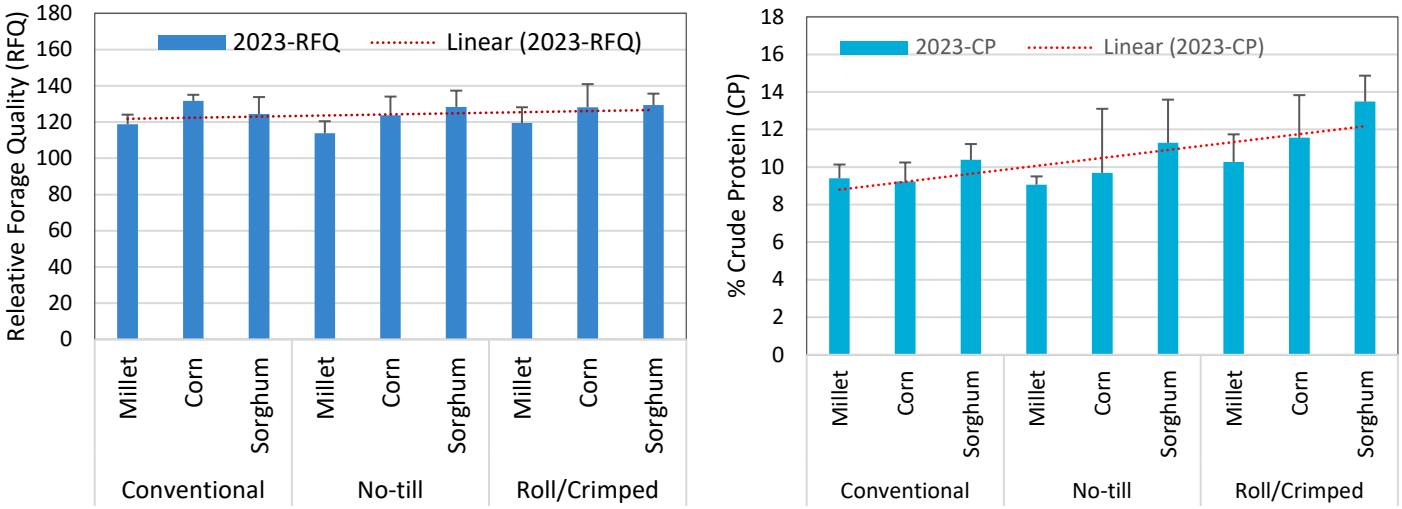

Fig. 5. Relative forage quality (left) and percent crude protein content (right) of millet, forage corn, and sorghum-sudangrass under three tillage practices in 2023. Dotted line is the linear regression.

left). Similarly, crude protein content, an important indicator of forage quality, appears to be increasing from CT, NT, to R/C (Fig. 5-right).

Soil samples were taken at three depths (0-20, 20-40, 40-60 cm) approximately 30 days after plant emergence. Presumably, soil bulk density (BD) is one of the less sensitive and microbial biomass carbon (MBC) is one of the most sensitive to management practices. At 0-20 cm, soil surface BD are similar among the crops grown under the same tillage practice, but BD values show a slightly lower trend from CT to R/C, to NT (Fig. 6). At deeper than 20 cm, BD values are similar across all the crops and tillage.

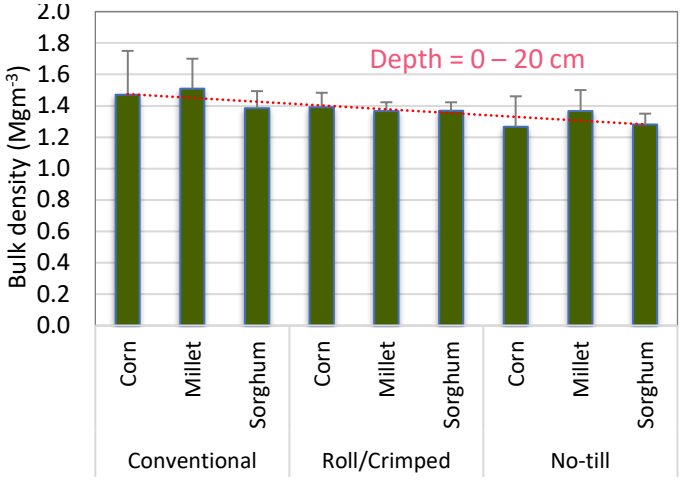

Figure 6. Soil bulk density under three different crops and tillage practices in 2023. Dotted line is the linear

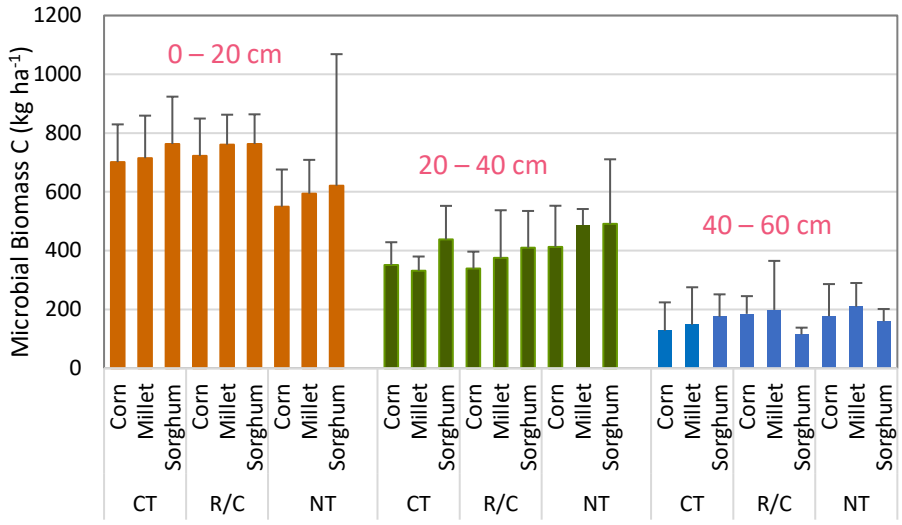

Fig. 7. Microbial biomass carbon measured at different depths under different crops and tillage practices in 2023.

Microbial biomass carbon varied with depth, and the highest values, indicating the highest microbial activities, are seen at 0-20 cm (Fig. 7). In addition, MBC appear to be higher in CT and RC than in NT. The higher MBC may be due to a rapid surge in microbial activities generally occurring due to soil surface disturbance. It would be worth investigating if the trend holds throughout the growing season. Data indicate that MBC may be varied among the crops (Fig. 7).

Cowpea Planting Date Observation

Fig, 8. Sampling for cowpea and weed biomass.

Cowpea was planted as a smother crop in two fields that had been retired from seed production. The purpose of this observation planting was twofold: to keep the ground covered and suppress weeds, and to collect preliminary data for exploring an optimum planting date and potential use of cowpea as a successful smother crop in the middle Rio Grande area. This observation planting was initially started in one field (F-1) in 2022 and expanded to add another field (F-2) in 2023. In other words, it was the second-year planting in F-1 and the first-year planting in F-2. Each field is about one acre in size, and both fields share the same soil type and received comparable management schedules. Cowpea was planted on three different dates: 1st week of April, May, and June in 2023, and biomass samples were taken in the second week of July (Fig. 8), approximately the peak of growing season (Note: biomass was not collected in 2022). Results from April and May planting show that cowpea biomass yield was considerably higher in F-1 compared to that of F-2 (Fig. 9). A repeated planting of cowpea in F-2 may have contributed to a higher yield. Moreover, compared to weed biomass, cowpea planted in May in F1 produced about 50% less (Fig. 9-left), while cowpea in F-2 appears to be catching up with the weeds (Fig. 9-right). In summary, data from this observation planting show a notable trend that may warrant further studies.

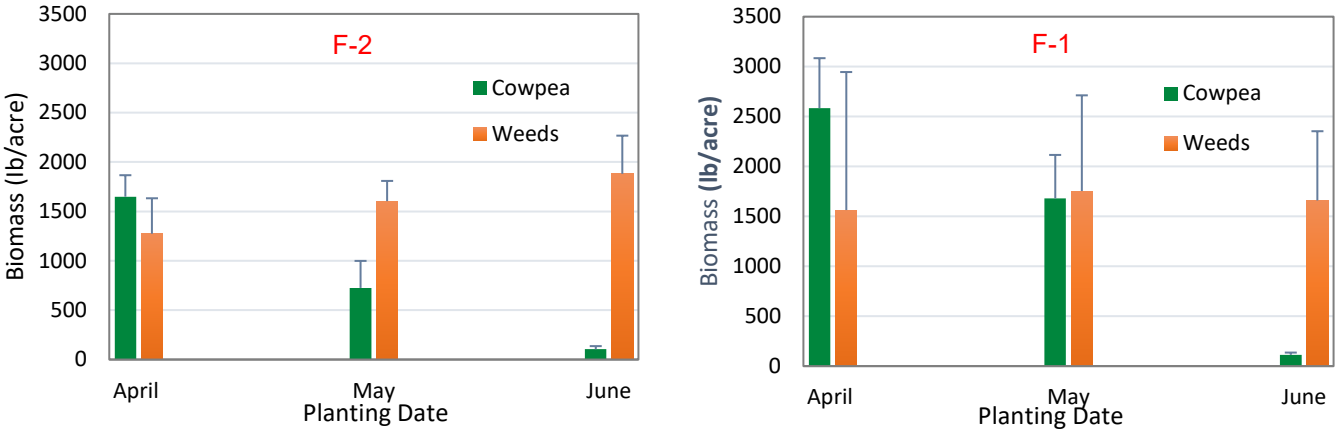

Fig. 9. Cowpea and weed biomass yield from planting conducted in Field 2 (left) and Field 1(right) at NMPMC in 2023.

Release Maintenance and Foundation Seed Production:

Fig. 10. A flower head of 'Alma', an improved blue grama selected for large seed size. NMPMC, 2023.

A key mission of NRCS Plant Materials Program is to develop improved conservation plants and release them for uses in addressing resource concerns. PMCs around the country, including NMPMC, have released hundreds of improved cultivars and pre-varietal germplasms. PMCs continue to maintain their respective releases and provided stock seeds or foundation materials to commercial seed producers who make improved conservation plant seed available to the market. Subsequently, the commercially produced seed is used in conservation programs including EQIP and CRP.

NMPMC has released 41 grasses, forbs, trees, and shrubs for conservation needs in New Mexico and neighboring states. Some of the major releases include: 'Alma', 'Hachita' and 'Lovington' blue grama, 'Arriba' western wheatgrass, ‘Largo’ and 'Jose' tall wheatgrass, 'Luna' pubescent wheatgrass, 'Pastura' little bluestem, 'Elida' sand bluestem, Grant Germplasm Cane bluestem, ‘El Vado’ spike muhly, 'Bandera' Rocky Mountain penstemon, San Juan Germplasm narrow leaf penstemon, ‘Cedar’ Palmer’s penstemon, 'Jemez' New Mexico forestiera ‘Grenville’ switchgrass, 'Llano' Indiangrass, 'Paloma' Indian ricegrass, 'Redondo' Arizona fescue, 'Nogal' black grama, 'Salado' alkali sacaton. Tusas Germplasm bottlebrush squirreltail, 'Niner' sideoats grama, 'Vaughn' sideoats grama,Westwater Germplasm alkali muhly, 'Windbreaker' big sacaton.

Fig. 11. Ready to be harvested 'Niner' sideoats grama in a seed production field, NMPMC, September 2023.

Grasses

Presently, NMPMC maintains foundation seed production of 13 grasses: Alma, Hachita, Arriba, Jose, Grenville, Niner, Vaughn, Nogal, Paloma, Redondo, Salado, Viva, & Windbreaker.

Fig. 12. 'Salado' alkali sacaton (left) and 'Alma' blue grama at peak flowering, NMPMC, September 2023

Fig. 13. ‘Redondo’ (left) and ‘Paloma’ (middle), cool season native grasses at seed maturity, and ‘Grenville’ (right), a warm season native grass prior to flowering. NMPMC, June 2023.

As it is crucial to produce sufficient viable seed for meeting foundation seed demand, NMPMC plans to reestablish breeder and foundation blocks and maintain seed production of all active grass releases in coming years.

Our recent experience regarding ‘Lovington’ blue grama seed demand is a good example for maintaining sufficient stock seed of all active releases.

NMPMC ceased Lovington seed production many years ago after improved cultivars Hachita’ and ‘Alma’ blue grama were released in 1980 and 1992, respectively. However, in recent years, more seed growers have requested Lovington foundation seed.

We obtained Lovington stock seed maintained at the National Germplasm System and planted a seed increase plot in August 2023. Seed harvested from this seed increase plot will be used to establish a breeder block.

Fig. 14. 'Lovington' blue grama seed increase plot right after field planting, NMPMC, August 2023.

Trees, Shrubs, and Forbs

In addition to improved cultivars and selected native and introduced grasses, NMPMC continues to maintain selected forbs, and shrubs released for various conservation uses, including ‘Jemez’ New Mexico olive, ‘Pink Lady’ winterberry euonymus, ‘Bandera’ Rocky Mtn. penstemon, ‘Cedar’ Palmer’s penstemon, and San Juan Germplasm narrowleaf penstemon. In December 2022, ‘Bighorn’ & ‘Autumn Amber’ skunk-bush sumac, ‘Montane’ mountain mahogany, ‘Barranco’, ‘Hope’, & ‘Regal’ desert willow, and ‘Bonita’ soap yucca were discontinued due to limited commercial demand for stock materials.

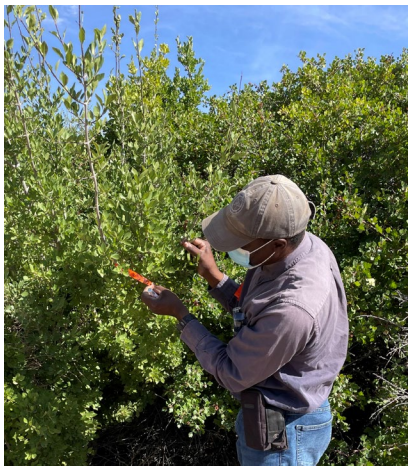

Fig. 15. Keith White, Bio. Sci. Tech., labeling and conducting physical plant inventory (above). 'Jemez' New Mexico olive (left), and 'Pink Lady' winterberry euonymus (right) at NMPMC, September 2023.

Information Transfer:

Release Brochures

- Release Brochure for 'Alma' blue grama (*Bouteloua gracilis*). 2023. USDA-Natural Resources Conservation Service, Los Lunas Plant Materials Center, Los Lunas, NM 87031. Brochure
- Release Brochure for Arriba western wheatgrass (*Pascopyrum smithii*). 2023. USDA-Natural Resources Conservation Service, Los Lunas Plant Materials Center, Los Lunas, NM 87031. Brochure
- Release Brochure for Elida sand bluestem (*Andropogon hallii*). 2023. USDA- Natural Resources Conservation Service, Los Lunas Plant Materials Center, Los Lunas, NM 87031. Brochure
- Release brochure for El Vado Spike muhly (*Muhlenbergia wrightii*). 2023. USDA-Natural Resources Conservation Service Los Lunas Plant Materials Center, Los Lunas, NM 87031. Brochure
- Release Brochure for Bandera Rocky Mountain penstemon (*Penstemon strictus*). 2023. USDA-Natural Resources Conservation Service, Los Lunas Plant Materials Center, Los Lunas, NM 87031. Brochure

North Area Teams Field Day

On June 28, 2023, NMPMC hosted a field day for 65 conservation planners and staff members from NM-NRCS North Area Teams. NMPMC team provided an overview of the Plant Materials Program, plant releases, breeder and foundation seed production, and a soil water infiltration demonstration. This field day provided up to date plant materials information and interactive discussions on the uses of locally adapted native grasses for resource conservation in changing climate environments.

Fig. 16. Rick Strait, NM State Soil Scientist & Plant Materials Program Manager, gives the PMC program overview.

*Fig. 17. State Soil Scientist, Rick Strait, demonstrates infiltration patterns in soil (above), and Jarai Mon, NMPMC Manager, answers questions on foundation seed production and distribution (below). *Photos: Luke Luna, Public Affairs Specialist.*

NMPMC and NMSU Ag. Sci. Center Joint Field Day

On August 8, 2023, NMPMC and NMSU Los Lunas Ag. Sci. Center held an annual joint field day for members of community, local landowners, producers, and customers.

NMPMC was able to highlight and share information on the NRCS-Plant Materials Program, conservation plants released by the NMPMC, plant selection and seed production processes, and the uses of improved native grasses not only in soil and water conservation but in rangeland and forage production in New Mexico and surrounding areas.

The event was a huge success and attended by over 300 community members, local vendors, customers, and stakeholders. The work of NMPMC and NMSU on native and non-native grasses displayed in this field day was published in the Fall volume of NMSU-ACES magazine.

Fig. 18. Seed cleaning demonstration station (left) and an example of breeder block display (right) at the field day.

Fig. 19. A group of field day participants stopped to learn about NMPMC native grass breeder blocks.

**Photos: NMSU, ACES information.*

For more information contact NMPMC: [Los Lunas Plant Materials Center | Natural Resources Conservation Service (usda.gov)]

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Helping People Help The Land