

FACT SHEET

Zone Tillage & GPS-Guided Planting of Shrub Willow Crop Varieties

*Four-shank zone builder***Shrub willow crops can be planted on marginal land**

Fast-growing shrub willow bioenergy crops have been demonstrated to grow well on marginal agricultural land in the Northeast and upper Midwest, including poorly drained fields, rocky soils, and land with low nutrition. Establishment of perennial willow crops on abandoned hay, pasture, or scrub land could potentially return over 1 million acres of underutilized farmland to sustainable agricultural production. However, this land can be difficult to prepare and fit for planting using conventional plowing. The use of conservation tillage is better suited for hard-to-plow sites, reduces erosion, and preserves soil organic matter, carbon, and soil health.

Zone tillage limits soil disturbance

Shrub willow bioenergy crops are typically planted in a double-row spacing arrangement, with rows spaced 30 inches apart separated by a 5 foot alley. Zone builders prepare a narrow planting strip that is 8 to 10 inches wide using a three-component system: a residue-cutting couler in the lead, followed by a deep shank that rips 15 to 17 inches deep breaking compacted plow layers, with trailing angled closing coulters and rolling baskets. A five-shank zone builder with 30 inch spacing was adapted for preparation of willow fields by removing the middle shank.

*Zone builder components***Field trials to evaluate zone tillage**

At the New York State Agricultural Experiment Station in Geneva, yield trials are being planted with three cultivars ('Fabius', 'Millbrook', and 'Fish Creek') to collect data on the relative effectiveness, cost, and yield of shrub willow established using zone tillage compared to conventional plowing. Four fields were prepared in the fall by moldboard plowing half, while the other half was simply sprayed with herbicide to kill the standing vegetation (sod, alfalfa, or wheat). In the spring, the plowed fields were further chisel plowed and disked, while the non-plowed portions were sprayed a second time with herbicide. Finally, zone building was conducted across both halves of each field using GPS guidance.

*Field trial in Geneva to compare zone tillage with conventional plowing*

Mechanical planting of shrub willow

Shrub willow is planted in spring or early summer from dormant stems, called whips, that are typically 6 to 7 feet long. Whips are grown and harvested every year in dedicated nursery beds. The unrooted whips are stored frozen and kept dormant until planting day. The whips are fed into a mechanical planter, which cuts them into 7 to 9 inch (18-23 cm) pieces as it moves across the field, and pushes or drops them into a slit cut in the soil, leaving only 0.5 to 1 inch (1 to 2 cm) aboveground. Once planted, roots emerge and the buds break to form shoots within 7 to 10 days. Mechanical planters have been designed in Europe to plant 2, 4, or 6 rows at once. Commercially available willow planters include the Egedal Energy Planter produced in cooperation with Ny Vraa Bioenergy and the new NB STEP planter produced by Nordic Biomass. Double A Willow is the exclusive U.S. producer of planting stock of improved willow cultivars bred in New York and provides planting services using an Egedal 4-row planter. Ag Development Services has been planting willow in NY using a STEP planter and is licensed to manufacture and market the new STEP planter in North America.



Four-row Egedal Energy Planter

GPS-guided tillage and planting

In order to plant willow in land prepared by zone tillage, the rows of the willow planter must be precisely aligned with the slits ripped by the zone builder. This is best achieved using GPS guidance and auto-steer equipment on the tractor used for zone tillage and subsequent planting. This precision ag equipment provides accuracy to within 1 to 2 inches (2 to 5 cm) in aligning repeated

trips across the field, in precise and consistent row spacing, and in maintaining straight rows across the field. The zone tillage for the trials at the NYS Ag Experiment Station was accomplished using a Leica mojoRTK unit with auto-steer, while planting by Double A Willow was guided by a Raven unit provided and supported by Agrinetix, LLC. Subsequent crop management, such as weed control will also be facilitated by GPS guidance.



GPS-guided auto-steer unit

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