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Establishment strategies for native warm-season grasses: Organic and conventional approaches

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Native warm-season grasses (NWSG) are valuable for forage and conservation, but their adoption is slow due to challenges in establishment, especially competition from weeds. This study, conducted in Ohio, tested different methods for establishing three NWSG types—switchgrass, eastern gamagrass, and a mix of indiangrass and big bluestem—under conventional (with herbicides) and organic (without herbicides) management.

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1. **Which establishment strategy produced the most consistent native warm-season grass (NWSG) establishment and forage production by 2024?**

a. Organic (cover crops, no herbicide).

b. Conventional + cover crops (rye) with herbicide.

c. Conventional without cover crops, with herbicide.

d. Organic with spring manure application.

2. **Across sites and years, which NWSG treatment generally showed the greatest overall performance (forage mass and nutritive value)?**

a. Indiangrass + big bluestem (IG/BG) mixture.

b. Eastern gamagrass (EG) monoculture.

c. Switchgrass (SG) monoculture.

d. Tall fescue interseeded with clover.

3. **During severe drought at one location, which species achieved the greatest biomass, likely due to deeper rooting?**

a. Switchgrass (SG).

b. Indiangrass (IG).

c. Big bluestem (BG).

d. Eastern gamagrass (EG).

4. **Which herbicide was applied selectively in IG/BG plots to aid establishment?**

a. Atrazine.

b. Imazapic.

c. Mesotrione.

d. Glufosinate.

5. **No fertilization was applied to any plots during the experiment.**

a. True.

b. False.

6. **Which of the following was NOT one of the three study sites?**

a. Jackson Agricultural Research Station (JARS).

b. Eastern Agricultural Research Station (EARS).

c. Greenacres Foundation (GAF).

d. Western Agricultural Research Station (WARS).

7. **In the Organic strategy (no herbicide), which summer cover‑crop mixture was drilled before establishing NWSG?**

a. Cereal rye + crimson clover.

b. Oats + field pea.

c. Sorghum–sudangrass + cowpea.

d. Ryegrass + vetch.

8. **What experimental design best describes the study?**

a. 2×2 factorial with three replicates.

b. 3×3 split‑plot with four blocks (replicates) per location.

c. Randomized complete block with repeated measures only.

d. Latin square with subsampling.

9. **In 2022, weed mass exceeded 2,000 lb/ac at some sites, and NWSG contributed <20% of ground cover.**

a. True.

b. False.

10. **For biomass sampling at JARS and EARS in 2022–2023, to what stubble height were quadrats clipped?**

a. 3 inches.

b. 8 inches.

c. 10 inches.

d. 12 inches.

11. **Which laboratory method was used in 2024 to assess forage nutritive value of NWSG samples?**

a. Gas chromatography (GC) with flame ionization.

b. High‑performance liquid chromatography (HPLC).

c. Near‑infrared reflectance spectroscopy (NIRS; DS‑3 FOSS).

d. Kjeldahl nitrogen digestion only.

12. **Which statement best describes the seasonal crude protein (CP) pattern reported for NWSG in 2024?**

a. CP was good–premium in spring (~≥9–13%+) and declined to ~7–12% in summer.

b. CP was constant at 14–16% from spring through summer.

c. CP increased from 7–10% in spring to 12–15% in summer.

d. CP was lowest in spring due to rapid growth dilution.

13. **Adding a fall rye cover crop to herbicide-based establishment was consistently more effective than herbicide alone by Year 3.**

a. True.

b. False.

14. **Which species showed the lowest in vitro digestibility (48 h) due to higher lignin concentrations, despite relatively greater CP?**

a. Switchgrass (SG).

b. Indiangrass (IG).

c. Eastern gamagrass (EG).

d. Big bluestem (BG).

15. **Which explanation best captures why establishment improved markedly in 2023 compared with 2022?**

a. Increased baseline nutrient availability across treatments improved early seedling vigor.

b. As NWSG forage mass increased post-establishment, weed mass and cover declined, allowing stands to close canopy more effectively.

c. A shift in species composition reduced early-season competition among establishing plants.

d. Modifications to planting configuration altered light interception and early growth dynamics.

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