Supplementary Appendix S1. Survey questions made available online in spring 2019 to determine and assess commonly used ground and aerial herbicide application practices in Arkansas.

1. County(ies) farmed and/or serviced:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Acres farmed and/or serviced:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. What is your primary role for these acres?

1. Farmer
2. Consultant
3. Salesperson/Agronomist
4. Applicator
5. Other (please specify): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. What percentage of the total acres above do you service of each crop listed below?

1. Corn (% acres) : \_\_\_\_\_\_\_
2. Cotton (% acres) : \_\_\_\_\_\_\_
3. Grain Sorghum (% acres) : \_\_\_\_\_\_\_
4. Rice (% acres) : \_\_\_\_\_\_\_
5. Soybean (% acres) : \_\_\_\_\_\_\_
6. Wheat (% acres) : \_\_\_\_\_\_\_
7. Other (please specify crop) (% acres) : \_\_\_\_\_\_\_

Total : \_\_\_100%\_\_\_\_

5. What is your current age?

1. 30 years old or less
2. 31 - 40
3. 41- 50
4. 51- 60
5. More than 60 years old

6. How many years have you been a certified pesticide applicator?

1. 0-2
2. 3-5
3. 6-10
4. 11-15
5. 16-20
6. 21-25
7. 26-30
8. 30+

7. What percentage of your total acres are sprayed with herbicides from ground equipment versus aerially?

1. Ground: \_\_\_\_\_\_\_
2. Aerial: \_\_\_\_\_\_\_

8. What percentage of rice acres receive a preflood herbicide application from ground equipment versus aerially?

1. Ground: \_\_\_\_\_\_\_
2. Aerial: \_\_\_\_\_\_\_

9. Do you use rate controllers on your sprayer?

1. Ground rate controllers only
2. Aerial rate controllers only
3. Both ground and aerial rate controllers
4. Neither ground or aerial rate controllers

10. Do you use GPS sprayer boom/nozzle control?

1. Ground GPS sprayer boom/nozzle control only
2. Aerial GPS sprayer boom/nozzle control only
3. Both ground and aerial GPS sprayer boom/nozzle control
4. Neither ground nor aerial GPS sprayer boom/nozzle control

11. Do you use any specialty-type sprayer?

1. Pulse-width modulation (e.g. AIM Command, PinPoint, ExactApply, etc.)
2. Direct injection
3. Electrostatic
4. Other (please specify): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. None

12. How many different nozzle types do you typically use in a growing season on your **ground equipment**?

1. 1
2. 2
3. 3
4. 4
5. 5+

13. How many different nozzle types do you typically use in a growing season on your **aerial equipment**?

1. 1
2. 2
3. 3
4. 4
5. 5+

14. For your **ground applications**, what nozzle and carrier volume do you typically use for systemic herbicides (i.e. Roundup, Bolero, Command, 2,4-D, etc.)? If unknown, please state "unknown."

1. Manufacturer (i.e. Greenleaf, Hypro, TeeJet, Wilger, etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Nozzle type (i.e. XR, AIXR, TTI, AirMix, Guardian, DR, etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Nozzle size/color \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Carrier volume (GPA) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

15. For your **ground applications**, what nozzle and carrier volume do you typically use for contact herbicides (i.e. propanil, Flexstar, Liberty, etc.)? If unknown, please state "unknown." If same as systemic herbicides, please state "same."

1. Manufacturer (i.e. Greenleaf, Hypro, TeeJet, Wilger, etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Nozzle type (i.e. XR, AIXR, TTI, AirMix, Guardian, DR, etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Nozzle size/color \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Carrier volume (GPA) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

16. For your **aerial applications**, what nozzle and carrier volume do you typically use for systemic herbicides (i.e. Roundup, Bolero, Command, etc.)? If unknown, please state "unknown."

1. Manufacturer (i.e. CP, TeeJet, Accu-Flow, etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Nozzle type (i.e. XR, Straight Stream, etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Nozzle size/color \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Nozzle deflector angle (0 = horizontal, 90 = vertical) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Carrier volume (GPA) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

17. For your **aerial applications**, what nozzle and carrier volume do you typically use for contact herbicides (i.e. propanil, Flexstar, Liberty, etc.)? If unknown, please state "unknown." If same as systemic herbicides, please state "same."

1. Manufacturer (i.e. CP, TeeJet, Accu-Flow, etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Nozzle type (i.e. XR, Straight Stream, etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Nozzle size/color \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Nozzle deflector angle (0 = horizontal, 90 = vertical) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Carrier volume (GPA) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

18. What is your target boom height for ground applications (above the target)?

1. 0 - 20 inches
2. 21 - 30 inches
3. 31 - 40 inches
4. 41 - 50 inches
5. 51+ inches

19. What is your target flight height for aerial applications?

1. 0 -5 feet
2. 6 - 10 feet
3. 11 - 15 feet
4. 16 - 20 feet
5. 20+ feet

20. What is your average sprayer speed for ground equipment?

1. 0 - 5 mph
2. 6 - 10 mph
3. 11 - 15 mph
4. 16 - 20 mph
5. 21+ mph

21. What is your average sprayer speed for aerial equipment?

1. Less than 120 mph
2. 120 - 130 mph
3. 131 - 140 mph
4. 141 - 150 mph
5. 151 - 160 mph
6. 161 - 170 mph
7. 171 - 180 mph
8. 181+ mph

22. What do you feel is the biggest advantage of using newer application technologies?

23. What is your biggest herbicide application challenge?

24. What application research would you like to see the University of Arkansas conduct in the next 3 years to address your concerns?