

Farmers' Perceptions and Concerns: The Risks of Driving Farm Vehicles on Rural Roadways in North Carolina

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ABSTRACT. *This study focuses on farmers' perceptions of roadway safety and reviews specific and pertinent North Carolina rural road crash data to evaluate their perceptions and concerns. A survey was mailed to 1,357 prospective participants throughout North Carolina. Of these, 656 (48.3%) North Carolina farmers completed and returned the survey. The study revealed that while the majority of respondents took a number of specific safety measures to ensure their safety while driving their tractor on rural roads, most believed that driving their tractor on rural roads was more dangerous than it was five years ago. Few respondents believed that laws governing tractors on rural roads are well known by urban residents. While a majority of the respondents would support a law to mandate the use of a slow-moving vehicle (SMV) emblem on the back of slow-moving farm equipment, a majority also believed that a more effective way to mitigate potential crashes would be to ensure that all farm vehicles had blinking or flashing lights, that diamond-shaped caution signs depicting a tractor were posted on roadways with frequent tractor traffic, and that roadway shoulders were created or widened on roads with heavy farm traffic so that tractors could move off the roadway. Only 22% of respondents felt safe driving their tractor on rural roadways in North Carolina. Most respondents felt that the biggest problem with roadway safety was the lack of respect and increased speed of other drivers. Recent data indicate that in crashes involving farm vehicles, citations were issued to 34% of the non-farm vehicle operators and 24% to farm vehicle operators. For those driving non-farm vehicle who were deemed at fault, 66% were cited for failure to reduce speed. For those driving farm vehicles, the most frequent citation involved the lack of safe movement.*

Keywords. *Agriculture, Crash data, Farm vehicle crashes, Farm survey, North Carolina, Rural road safety, Traffic hazards.*

Driving farm equipment on rural roads is an important workplace safety issue for farmers. For a segment of North Carolina farmers working with the North Carolina Department of Labor (NCDOL), it is the most important workplace safety issue (Costello et al., 2003).

Since 1990, NCDOL has conducted an annual housing registration, inspection, and compliance program to ensure the safety and healthful condition of migrant housing.

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Any farmer who owns or operates a housing unit for any number of migrant workers must register the housing with NCDOL and have the housing inspected prior to occupancy. Inspections are conducted throughout the state in approximately 80 of North Carolina's 100 counties where housing is provided and registered. On an annual basis, approximately 1,300 North Carolina farmers register their housing. As an incentive to provide housing that meets or exceeds the standards, in 1992 NCDOL created a recognition program, the Gold Star Grower program, to award those farmers who were 100% in compliance at the time of the preoccupancy inspection.

Annual meetings are conducted across the state to recognize the Gold Star Growers. The annual meetings serve as a forum for a discussion of agricultural workplace issues. At an annual meeting in 1998, the North Carolina Gold Star Grower attendees were asked their views on workplace safety hazards. Specifically, they were asked, "What is your number one workplace safety hazard?"

A number complained of increased traffic on their rural roadways and expressed concern that driving their farm equipment on winding, rural roads was now their number one workplace safety hazard. The group, located in the Piedmont region, was composed of approximately 40 farmers and their spouses or guests. All present agreed that a crash involving a farm vehicle and a non-farm vehicle was likely to cause a serious injury or fatality, and all agreed that the winding, hilly roads in their region made such an occurrence highly likely.

This concern came as a surprise to the NCDOL representatives hosting the meeting. In addition to performing preoccupancy housing inspections, the NCDOL also investigates agricultural fatalities and unintentional injuries, and typical accident investigations were more likely to involve injuries with equipment used in the field, such as tobacco harvesters, or in workshops, such as fork lifts.

Why did the farmers feel so strongly that rural road traffic posed the greatest threat to their safety? Was their concern unique to that region of the state, or was it a reflection of the general changes occurring in agriculture and rural land use? Would actual crash statistics confirm that it was a serious hazard? What safety measures were currently required of those operating farm equipment on public roadways? Did farmers adopt the required safety measures? This article responds to those questions.

Background

The structure of agriculture has changed dramatically in North Carolina during the 1990s. A wider variety of crops are grown, so agricultural practices may be a year-round activity in many counties. Despite recent declines in tobacco production, agriculture is still an important part of the North Carolina economy.

Statistics published in 2000 indicate that agriculture in North Carolina is an industry that accounts for approximately 30% of the state's revenues and employs approximately 29% of the state's workforce (North Carolina Agricultural Statistics, 2000). North Carolina ranks first, nationwide, in the production of tobacco, turkeys raised, and sweet potatoes cultivated. It is also a top-ranking state in the production of pork, pickle cucumbers, poultry and eggs, and Christmas tree cultivation, harvest, and sales (North Carolina Agricultural Statistics, 2000). A farmer raising cucumbers, tobacco, and sweet potatoes may have farm vehicles on the roadways beginning in March and continuing until November.

Population growth has led to an increase in traffic as well. From 1990 to 1999, the state's population increased by more than 15% annually (North Carolina Office of State Planning, 1997). In certain areas of the state, where agriculture plays an important role,

the non-farming annual population growth has been higher than 15%. Population growth has occurred while the farming community has declined statewide.

Reductions in tobacco allotments, a function of a national anti-smoking initiative as well as the growth in tobacco production and processing in foreign markets, contributed to smaller farm acreage, and in some cases, farmland has been sold for suburban development. In addition, farm operators are often working a patchwork of different fields, often in several different counties, and many move from field to field using state roadways. So as farmland shrinks, and suburban housing grows where crops were once planted, the rural traffic profile changes, and roads carry more traffic at increased rates of speed.

Preliminary review of crash data indicated that in North Carolina, 46% of all crashes occur on rural roads. Traffic fatality rates in rural areas are four times greater than in urban areas (NCDOT, 1997a). In North Carolina, 50,000 miles of the 78,000-mile system are considered "rural" miles, and two-lane roadways are particularly hazardous. Factors in rural road crashes include: aggressive driving and/or speeding, which is the primary violation; alcohol, which is a factor in 57% of all crashes; and engineering factors, such as two-lane roads, narrower shoulders (NCDOT, 1997a).

According to the North Carolina Department of Transportation (NCDOT), in 1997 there were 305 crashes involving farm equipment traveling on rural roads (NCDOT, 1997a). This was less than 1% of all statewide crashes that year. However, 51% of these reported crashes resulted in a death or serious injury. NCDOT data indicate that the top-ranking agricultural counties led the state in the average number of reported farm vehicle-related crashes (NCDOT, 1997a). These counties are in various parts of the state, not solely in the Piedmont, where farmers brought the issue to our attention.

Finally, preliminary research indicated that regulations governing farm machinery are minimal in North Carolina. Anyone temporarily driving or operating any road machine, farm tractor, or implement of husbandry on a highway is not required to have a driver's license (NCGS, 1977). In addition, registration of farm tractors and other vehicles designed for work off-highway is not required by the state; likewise, there is no requirement that a certificate of title be issued to a purchaser (NCGS, 1997a). Farm tractors traveling at night are required to have one front white light and one rear red light (NCGS, 1997c). Two rear red reflectors, each having a diameter of at least four inches, can replace the rear red light (NCGS, 1997c). Farm tractors are also exempt from the provision requiring inside rear-view mirrors (NCGS, 1997b).

Methodology

In reviewing statistics from NCDOT, a number of questions arose. Was this really a North Carolina traffic hazard, or was it an isolated case of a few farmers driving on hilly rural roadways in the north central Piedmont? What did current NCDOT crash data have to tell us? What would a five-year summary of these data tell us? In addition, if certain laws governing farm vehicles on rural roadways were currently in place, were farmers aware of these laws? Were they in compliance? How did North Carolina rank, nationwide, in the number of regulations governing the use of farm equipment on rural roads? Finally, if North Carolina laws governing farm vehicles were less rigorous than those in effect in other parts of the U.S., would farmers agree to increased regulation?

To assist in responding to these questions, we first analyzed recent crash data from NCDOT. In 1999, according to NCDOT, there were 270 reported crashes involving farm equipment, 35 fewer crashes than in 1997 (NCDOT, 1999). NCDOT refers to farm equipment in two ways: it may be a farm tractor (coded FTR), or self-propelled farm

equipment, such as a combine (coded FE). The vast majority of these incidents involved farm tractors. There were no citations issued in 101 (37.4%) of the 270 crashes. Of these 101 crashes, 87 were coded FTR.

Of those citations issued only to the driver of the non-farm vehicle, 92 drivers (34%) were cited (table 1). Of these, 83 were coded FTR. Typical violations involving non-farm vehicles included failure to reduce speed, improper passing, and driving left of center (table 2). One fatality occurred in these 92 crashes, that of the farm operator driving his tractor. The tractor operator had moved to the shoulder of the road to allow traffic to pass. The driver of the sedan who struck and killed him was charged with misdemeanor death by motor vehicle.

Of those citations issued only to the driver of the farm vehicle, 62 drivers (23%) were at fault. Of these citations, 60 were coded FTR. Of the 62 total, 8 tractor operators (13%) did not have valid driver licenses at the time of the crash. Since this is not a requirement under North Carolina law, no citation was issued. Lighting violations and yield violations were commonly listed in these citations. On several occasions, the crash occurred in the late evening, and the tractor was not using proper lighting. Unsafe movement, particularly left turns onto a dirt roadway, was another often-cited violation for those driving farm equipment. Damages to both vehicles for these 62 crashes, as estimated by the attending officers, exceeded \$300,000. Two of the 62 incidences resulted in fatalities. In both cases, the individual driving the non-farm vehicle was fatally injured.

In 12 (4.4%) of the 270 crashes, both parties received citations. Seven driving while impaired (DWI) citations were issued to drivers involved in these 12 crashes. In one of the 12, both drivers were cited for DWI. Three crash reports (1.11%) involved only a farm vehicle, most often an overturn.

Table 1. Summary of 270 reported crashes involving farm equipment in North Carolina in 1999.

	Citation Received		Ambulance Summoned		Resultant Fatalities
	<i>n</i>	%	<i>n</i>	%	
Farm vehicle driver	62	23	25	40	2 (to non-farm drivers)
Non-farm vehicle driver	92	34	53	58	1 (to farm vehicle driver)

Table 2. Selected citation summary of 154 farm equipment/motor vehicle crashes.

Violation / citation	Farm Vehicle Driver		Non-Farm Vehicle Driver	
	<i>n</i>	%	<i>n</i>	%
Driver's license revoked	0	—	3	3
Driving while impaired (DWI)	3	5	10	11
Failure to reduce speed	0	—	61	66
Following too close	0	—	2	2
Improper passing	1	2	19	21
Left of center	8	13	3	3
Operating vehicle without proper lighting	7	11	0	—
Misdemeanor death by motor vehicle	1	2	1	1
Seat belt not worn	0	—	2	2
Safe movement violation	29	45	2	2
Failure to yield	9	14	0	—

Source: NCDOT, 1999.

Were rural roadway crashes involving farm vehicles increasing or decreasing? According to NCDOT (Hughes and Rodgman, 2000), from 1995 to 1998 there were a total of 1,234 reported crashes involving farm equipment in the state. However, the NCDOT also reported that, in general, the number of rural road crashes decreased over this five-year period. Table 3 documents this decrease.

When viewing these data, it is important to understand that the number of North Carolina farms has decreased during this time period as well, as indicated in table 4. Figures from the USDA indicate that working farms with \$10,000 to \$99,999 in income have fallen by 30%, from 16,000 to 12,200, during the same period. Because the number of farms has decreased, the decrease in crashes does not indicate a reduced hazard. In fact, the rate remains the same: roughly 2% of farms will report a crash. Again, following the history of NCDOT research, half of these will result in a death or serious injury.

Survey Preparation and Administration

In response to the Gold Star Growers concerns over workplace safety on rural roads, in the summer of 1999, the Agricultural Safety and Health Bureau of NCDOL prepared a four-page survey for distribution to all registered growers (refer to the Appendix for a facsimile of the survey form).

The survey focused on participants' opinions about occupational safety hazards regarding vehicle safety on rural roads. The survey was then submitted to the North Carolina Center for Urban Affairs and Community Service at North Carolina State University for review and pre-testing. The Center was also contracted to post the surveys, receive and code the completed survey forms, and create an SAS software data set for analysis (SAS, 1998).

In preparation for mailing the surveys, in October 1999, the head of the Agricultural Safety and Health Bureau of NCDOL sent a letter to all registered growers informing them of the upcoming survey and requesting their participation and support. A self-addressed, postage-paid card accompanied the letter. This card allowed the growers to decline to participate in the survey, to agree to complete the questionnaire, and to request a slow-moving vehicle sign free of charge, regardless of whether or not they participated in the survey. Responses would be anonymous, so neither the authors nor NCDOL would know who completed the survey and who did not. The NCDOL did not pursue information concerning the non-respondents. As a regulatory agency, it wished to avoid any hint of targeting, when performing compliance inspections, those who had failed to submit surveys. Only 18 farmers returned cards saying that they did

Table 3. Reported farm equipment and farm tractor crashes in North Carolina, 1995–1999.

	1995	1996	1997	1998	1999
Farm equipment	28	18	40	26	25
Farm tractors	330	294	265	232	245

Source: Hughes and Rodgman, 2000.

Table 4. Number and acreage for North Carolina farms with \$10,000 to \$99,999 in income, 1995–1999.

	1995	1996	1997	1998	1999
Number of farms	16,000	15,000	14,000	14,000	12,200
Number of acres (thousands)	2,200	2,100	2,000	1,900	1,900

Source: North Carolina Agricultural Statistics, 2000.

not wish to participate, one indicating that the survey questions were not relevant to their farming practices.

In November 1999, 1,357 surveys, accompanied by a letter from the Center director explaining its purpose, were mailed to all North Carolina growers who had registered with NCDOL as owning or operating migrant housing. The letter noted that the survey was part of an effort undertaken by NCDOL and the Gold Star Growers to improve safety on rural roadways and encouraged them to complete and return the questionnaire. A total of 656 (48.3%) were returned, and the data were analyzed to generate descriptive and summary statistics.

Survey Results

The survey revealed that the respondents represented a diverse group of farmers across the state. Respondents ranged in age from 79 to 24. The mean age was 51 years. They had farmed from 1 to 53 years. As a group, they had been farming for an average of 27.6 years. The most important crop cultivated was tobacco, followed by soybeans. Secondary crops cultivated included wheat, corn, cotton, sweet potatoes, Christmas trees, and peanuts, among others. Animals raised included cattle, hogs, and poultry. The average tobacco acreage farmed was 50 acres, and the average for soybeans was 100 acres.

A total of 618 respondents (94%) planned to continue farming during the next three years. Regarding their education, 276 (42%) had completed high school or an equivalent, 128 (19.5%) had attended college or a vocational school, and 147 (22.4%) had earned a college degree. Only 1.7 % had completed less than eight years of school. The respondents were also geographically diverse within the state. Sixty-seven of North Carolina’s 100 counties were listed as having roads that were hazardous to farm traffic, and this distribution included the mountain area in the west, the Piedmont, and the coast. Respondents came from 80 counties registering with the NCDOL, and the non-responding counties were located next to counties with respondents, so no geographical region went unrepresented. Non-responding counties included Bertie, Currituck, Camden, and Burke. The heavily agricultural counties, such as Sampson, Duplin, Greene, Johnson, Columbus, and Nash, were all well represented.

Specific vehicular concerns of the respondents included: too much traffic (24%); speeding (20%); can’t see/narrow, winding roads (11%); and lack of respect for or knowledge of farm equipment (5%). The survey also had questions pertaining to the steps the respondent took to ensure safety while driving farm equipment on rural roadways. Table 5 indicates that the majority of the respondents used rollover bars, seat

Table 5. Respondents’ tractor safety precautions (survey item 4, see Appendix).

Do you...	<i>n</i>	Yes (%)	No (%)
Have rollover bars?	637	80%	17%
Use a seat belt?	623	73%	22%
Make sure that tractor drivers on your farm have a valid driver’s license?	634	58%	39%
Use signal lights and flashing lights to warn others that you are on the road?	640	92%	6%
Have a “slow moving” triangle symbol on the back of your equipment, visible to others?	641	88%	10%

belts, signal lights and flashing lights, and slow-moving vehicle signs. Thirty-nine percent did not require tractor drivers to have a valid driver's license.

It is worth noting that when the results of the survey were presented informally to NCDOL's Agricultural Safety and Health Council, a number of council members, particularly those who were currently farming, regarded the results listed in table 5 with skepticism. Several council members felt that respondents had not been objective or perhaps had exaggerated the use of seat belts and rollover bars. It is possible that the farmers who completed the survey and submitted it are also the more safety-conscious farmers. It is also possible that only one of several tractors owned has the proper safety equipment, while others on the farm do not. Note that nearly 40% do not require those driving the tractor on public roadways to be licensed. This confirms the statistics regarding crashes in 1999, discussed earlier. Of the farm vehicle operators, 13% did not have valid licenses at the time of the crash. No citations were issued, since it is not a violation under current North Carolina law.

Table 6 indicates that the majority of respondents did not feel safe driving their tractors on rural roadways. Most respondents felt that farmers knew the rules governing farm equipment, including ASAE recommendations. Most respondents also believed that highway safety rules were known by the farmworkers they employed.

Thirty-five respondents (5.3%) reported knowledge of unreported traffic crashes or collisions (survey items 6 to 9, see Appendix). Of those unreported crashes, 91% involved a farm tractor. The reasons for not reporting include: no damage or minor damage (28.6%), insurance rates (5.7%), no injuries (11.4%), the damages were paid (5.7%), and leaving the scene of the accident (8.6%). This response indicates that reported traffic crashes involving farm vehicles might not be an accurate measure of crashes occurring.

Respondents also were asked for ways to improve safety on their rural roads. Suggestions included posting signs alongside roadways to indicate that tractors were in use. When asked which signage to use, 456 respondents (69.5%) preferred the traditional diamond-shaped "slow moving" tractor sign (table 7). Ninety-seven (14.8%) preferred the circular sign indicating the speed limits of an automobile and a tractor, and only 68 (10.4%) preferred a rectangular sign noting "speed limit" and stating 20 mph for a tractor and 55 mph for an automobile. Seven (1.1%) preferred a combination of the signs.

Another suggestion for improving highway safety was to install blinking or flashing lights on all farm vehicles. In addition to the lighting requirement, 88% of the respondents thought that most farmers would support a law requiring that the slow-moving vehicle (SMV) emblem, a reflective triangular sign, be placed on the back of farm equipment. Seventy-five percent believed that compliance with laws would be greater if penalties and citations for non-compliance were increased.

One of the goals of this survey was to adequately estimate rural road safety throughout North Carolina. In this survey, the respondents, who are growers of labor-intensive crops, particularly tobacco, throughout the state, listed specific roadways in 67 of the 100 North Carolina counties as dangerous for farm equipment and farm equipment operators. The perception of hazardous roadways exists in all regions of the state: the Piedmont, the mountains, and the coastal plain.

Perceived problems and suggested solutions are indicated and ranked in table 8. On the survey form, responses were ranked in order of the respondents' choices, with 1 as most important and 4 as least important. The text following table 8 analyzes specific preferences for each category.

Table 6. Perceptions of North Carolina rural road traffic safety (survey items 12 to 23, see Appendix).

Survey Statement	<i>n</i>	Strongly Agree (%)	Agree (%)	Disagree (%)	Strongly Disagree (%)
Traffic on my rural roads is much more dangerous than it was 5 years ago.	652	75	22	2	1
I feel safe when driving my tractor on local highways.	650	1	21	42	35
Most rural residents know and understand highway safety rules.	641	6	52	29	11
I know the regulations about driving a tractor on public roads.	648	34	59	5	0
The farmworkers working for me understand the highway safety rules and regulations.	650	21	70	8	1
Most farmers comply with the lighting requirements for farm equipment traveling on public roads.	655	17	61	20	2
Most farmers know the lighting requirements for farm equipment traveling on public roads on North Carolina.	643	13	59	24	2
Most farmers know the safety markings for farm equipment recommended by the American Society of Agricultural Engineers.	647	15	61	21	2
Most farmers would support a law requiring a slow-moving vehicle triangle to be placed on the back on their farm equipment, visible to the traffic following them.	652	33	55	10	2
Most people would comply with North Carolina requirements for traffic safety on rural roads, if they knew the laws.	648	10	55	28	6
Most people would comply with North Carolina requirements for traffic safety on rural roads, if it was less expensive to comply.	655	9	50	32	7
Most people would comply with North Carolina requirements for traffic safety on rural roads, if the penalties and citations for non-compliance were greater.	654	22	53	20	3

Table 7. Signage preferred by North Carolina respondents (survey item 11, see Appendix).




	<i>n</i> = 456	<i>n</i> = 97	<i>n</i> = 68	
The sign that warns of slow-moving tractors		A circle giving probable speed of a tractor (15–20 mph) and car (55 mph) with an image of each vehicle next to the speed.		A speed limit sign for both cars and tractors
				

Table 8. Farmers' rankings of concerns and preventive solutions related to highway tractor and motor vehicle collisions (survey item 24, see Appendix).

Survey Statement	Most Important	2nd Most Important	3rd Most Important	Least Important
The biggest problem with roadway safety in my area is...				
Lack of respect of other drivers.	204 (31.1%)	204 (31.1%)	157 (23.9%)	64 (9.8%)
Increased speed of other drivers.	179 (27.3%)	189 (28.8%)	143 (21.8%)	111 (16.9%)
City folks don't understand farming and farm equipment.	201 (30.6%)	128 (19.5%)	149 (22.7%)	143 (21.8%)
Difference between posted speed limit and speed of my tractor.	71 (10.8%)	87 (13.3%)	160 (24.4%)	299 (45.6%)
Traffic accidents on rural roads would be less frequent if...				
All farm vehicles had blinking or flashing lights.	363 (55.3%)	156 (23.8%)	60 (9.1%)	24 (3.7%)
All farm vehicles were adequately marked with a slow-moving vehicle sign.	164 (25%)	286 (43.6%)	102 (15.5%)	55 (8.4%)
Anyone who drives a farm vehicle is trained to do so.	83 (12.7%)	113 (17.2%)	331 (50.5%)	69 (10.5%)
Anyone who drives a farm vehicle has a valid driver's license.	23 (3.5%)	30 (4.6%)	87 (13.3%)	453 (69.1%)
The biggest everyday stress I have in farming is...				
Economic – I'm worried about finances.	329 (50.2%)	151 (23%)	87 (13.3%)	48 (7.3%)
Weather – the drought, heat, flooding, something I can't control.	138 (21.6%)	267 (40.7%)	136 (20.7%)	77 (11.7%)
No one cares about farmers anymore.	142 (21.6%)	110 (16.8%)	161 (24.5%)	208 (31.7%)
Traffic – I'm worried that I will be killed or hurt driving my farm equipment on these rural roads.	42 (6.4%)	82 (12.5%)	217 (33.1%)	273 (41.6%)
The best way to fix the traffic problem would be...				
Post slow-moving vehicle signs so folks could understand and slow down.	229 (34.9%)	262 (39.9%)	100 (15.2%)	32 (4.9%)
Widen the shoulders on given roads so I could get out of the way.	264 (40.2%)	118 (18.0%)	123 (18.8%)	117 (17.8%)
Have North Carolina Highway Patrol monitor certain roads for violators.	113 (17.2%)	119 (18.1%)	175 (26.7%)	208 (31.7%)
Post additional lights or signals on my tractor so folks would see me.	49 (7.5%)	104 (15.9%)	208 (31.7%)	247 (37.7%)
The laws governing tractors on rural roads are...				
Not well known enough by city folks.	320 (48.8%)	233 (35.5%)	44 (6.7%)	24 (3.7%)
Adequate.	226 (34.5%)	139 (21.2%)	127 (19.4%)	124 (18.9%)

Not well known by farmers.	48 (7.3%)	134 (20.4%)	237 (36.1%)	184 (28%)
Not strong enough.	54 (8.2%)	95 (14.5%)	184 (28%)	267 (40.7%)

Farmers thought that lack of respect of other drivers (204, or 31%, of the respondents stated that this was most important) and increased speed on rural roads (179, or 27.3%, of the respondents stated that this was most important) posed the greatest risks.

According to the respondents, traffic patterns would be safer if all farm vehicles had blinking or flashing lights (363 respondents, or 55.3%, listed this as most important) and all farm vehicles were adequately marked with a slow-moving vehicle sign (164 respondents, or 25%, listed this as most important; 286, or 43.6%, listed this as the second most important practice). When farmers in the survey ranked their concerns, the traffic hazards paled in relation to overriding concerns with the economy, the weather, and the lack of general support of farming. Stress and well-being of the farm community have been confirmed and discussed in detail in the agricultural literature (McDuffie et al., 1995), but these concepts were not the focus of this survey.

Suggested solutions ranked in this survey included widening the highway shoulders on specific roadways so that the tractor operator could pull off the road and allow the faster traffic to pass (264 respondents, or 40.2%, listed this as most important). Respondents were also in favor of posting the diamond-shaped “slow moving” tractor sign; table 7) on rural roadways, so that the general population traveling that road would understand the speed of farm equipment and would slow down as a reaction to this speed differential (229 respondents, or 34.9%, listed this as most important). The third-ranked recommendation was to have the North Carolina State Highway Patrol monitor rural roadways more closely and cite violators more often. The fourth-ranked recommendation involved the use of additional signage or equipment on the tractor itself, including the SMV emblem, lights, and signals.

The final question on the survey concerned legislation governing tractors on rural roadways. Most of the respondents thought that these laws were not well known by city residents (320 respondents, or 48.8%, listed this as most important). Others believed that the laws were adequate (226 respondents, or 34.5%, listed this as most important). A few indicated that they were not well enough known, even by the farm population (48 respondents, or 7.3%, listed this as most important).

Discussion

This study was initiated and driven by those on the frontlines of the hazards: the farm owners and operators who drive their farm equipment on rural roadways as a necessary part of farm work. Because of this orientation, the perceptions and concerns contained in the study are of particular interest. Researchers associated with this study had expected that safety hazards such as tractor rollovers while cultivating a crop on hilly terrain, or the use of machines such as tobacco harvesters or balers, would be perceived by farm operators as a greater safety hazard. Research often cites tractor rollovers as a high hazard, with on-road incidents as less hazardous (Karlson and Noren, 1979). This study indicates that further analysis of a combination of farm operator perceptions and current crash data may provide useful methods for proceeding.

For example, although farmers prefer that the shoulders of roadways be widened so that they can move out of traffic, one farmer fatally injured in a crash was, in fact, pulled over onto the shoulder at the time of the fatal event. The farmers’ perception that the

high speed of the non-farm vehicle was an important variable in farm vehicle crashes was borne out by data from NCDOT. The non-farm vehicle citation is most likely to be failure to reduce speed.

And, contrary to previous studies (Gerberich et al., 1996), the 1999 crash data indicate that drinking and driving is more problematic with the non-farm vehicle driver than with the farm operator. North Carolina currently has an aggressive program in place to deter drinking and driving ("Booze It and Lose It"), but these data indicate that continued enforcement and education are needed.

Most respondents believed that farmers knew and observed the laws regarding proper lighting on their farm vehicles. However, most farmers cited for roadway violations were not observing the safe movement laws, which accounted for 45% of the citations issued in 1999. The second most common violation (11% of the total citations issued) was in regard to proper lighting. As to the decline in the number of citations issued regarding farm vehicles, research indicates that the overall number of tickets issued has been declining statewide. This research indicates that in 1999, North Carolina Highway Patrol troopers were issuing citations for 20% fewer speeders and drunken drivers than they had four years previously (Gearino, 2003).

The idea of a high-speed urban invasion is not unique to North Carolina growers. In *The Embattled Farmer*, Staten writes, "A conflict between farmer and city dweller is inevitable. Farmers accuse the city dweller of taking the best land, driving up taxes, and destroying local suppliers. City dwellers accuse the farmer of polluting the streams, creating highway hazards with slow-moving farm vehicles, and voting against the schools and sewers that city people want" (Staten, 1987, p. 82).

Regardless of the philosophical discrepancy between rural and urban residents, the discrepancy between the speed of a passenger vehicle and a farm tractor is vast and measurable. The North Carolina Highway Patrol database indicated in 1999 that more than half of the recorded rural roadway crashes involved estimated speeds of farm equipment below 20 mph. In contrast, the posted speed limit on the roads where the crashes occurred was most often 55 mph. North Carolina is a uniform speed state. Studies have been conducted comparing states with a uniform speed with those using a differential rate. In Europe, differential speeds for cars and trucks are used in most countries (AAA, 2002). NCDOT (1997a) data also identified speed differential as a factor in crashes with farm equipment on public roads. This survey indicates that the farmers surveyed did not believe that displaying speed differentials would be helpful. Most (456 of the respondents) preferred the diamond-shaped sign indicating the presence of slow-moving tractors on rural roads (table 7).

Researchers have determined that a large number of tractor-related deaths occur on public roadways. Gerberich et al. (1996) analyzed crash data involving farm vehicles from 1988 to 1993 using data from the National Highway Traffic Safety Administration's Fatal Accident Reporting System (FARS). They found that the drivers of the farm vehicle were older than the drivers of the non-farm vehicle, were more likely to be male, and had more DWI convictions. Ehlers et al. (1993) mention motor vehicle crashes as one of the most common causes of farm-related deaths.

According to the National Institute of Occupational Safety and Health (NIOSH), agricultural crop production from 1990 to 1992 was ranked among the industries with the highest average annual rate of traffic-related fatalities (NIOSH, 1988).

A study conducted in Kentucky in 1994-1997 focusing on farm tractor fatalities (Reed and Struttman, 1997) documented common causes of farm equipment crashes on public roadways, by state, and mentioned remedies by state or region. In this study, California, Iowa, Wisconsin, Kentucky, and Texas led the U.S. in rates of fatal farm equipment motor vehicle crashes (MVC). The most common cause of tractor-related

fatalities in the Kentucky study was due to rollover (82%), followed by runover (18%). Of the 28 deaths, 23 (82%) occurred on farms, and 5 (18%) occurred on public roadways.

Roadway tractor crashes were examined by Iowa State University (Lehtola et al., 1995) to document frequent causes of such crashes. The three-year study, begun in 1988 and concluded in 1990, concluded that 64% of the 87 fatalities were avoidable by intervention methods already available. A 49% return rate on the surveys sent to injury victims or remaining family members indicated that tractor overturn was the primary incident resulting in a fatality. Types of tractors were analyzed for safety features and stability. The narrow-front style of tractor was more susceptible to overturns. Twenty-eight, or 16.2% of the 173 incidents reported occurred on public roadways and involved other vehicles. Factors in the roadway crashes included: tractor was hit from the rear (35.7%), tractor turning left while vehicle attempted to pass (25%), and head-on collision (21.4%). The single best solution to all crashes reviewed in this study was the use of a ROPS.

A study in Ohio (Glascocock et al., 1995) identified all crashes involving farm vehicles and equipment that occurred from 1989 to 1992. Information on 1,432 crashes was reviewed. A left turn was the action most likely to precede a crash. Operator age, weather, and alcohol use did not appear to be major indicators. Karlson and Noren (1979) explored tractor crashes in Wisconsin in 1971–1975. There were 45 fatalities from tractor crashes on public roadways during that period, with the highest death rate occurring in the oldest age group. The most common cause was overturns. The authors recommended changes in tractor safety policy that would replace the voluntary standards currently in uses.

In addition to this recent body of research, earlier studies indicate that farm vehicle traffic is not a new area of concern for North Carolinians. In 1975, LeGarde published an analysis of farm equipment crashes in North Carolina, after examining data collected by law enforcement officers (LeGarde, 1975). LeGarde found that almost half of all crashes were rear-end, and that speed differential was most often the factor leading to the collision. LeGarde recommended that the slow-moving vehicle (SMV) emblem be mandatory on all slow-moving farm equipment.

In addition to experiencing a recent surge in population, North Carolina is unique in that protections required in other states are not mandatory in North Carolina. Although the use of slow-moving vehicle (SMV) signage is required by an OSHA standard (1910.145(d)(10)) and by many states, it is not required by state law in North Carolina. With the exception of North Carolina, all states ranked in the top 15 for number of farms, by the 1997 U.S. Department of Census, require slow-moving vehicles to use the SMV emblem (USDA, 1977). Several states, including Michigan (Michigan Farm Bureau, 1999), have passed laws prohibiting other uses of the SMV emblem and restricting it to its original use as a visible marking for slow-moving vehicles.

Since the SMV emblem is not currently required on North Carolina tractors, licensed drivers in North Carolina are not taught its meaning. SMV emblems can be found on North Carolina roadways, and marking mailboxes and driveways. The North Carolina *Driver's Handbook* (NCDOT, 1997b) is used as the educational tool for all non-commercial drivers. As of December 1999, the North Carolina *Driver's Handbook* only displayed the "slow moving" tractor sign (the diamond-shaped sign with a silhouette of a tractor; table 7). Because most farm-related crashes involve at least one non-farm vehicle, it is important for all drivers to understand the special implication of sharing the road in agricultural areas.

Recommendations and Conclusions

Recommendations proposed as a result of this study include the following:

1. Ensure that all farm vehicles driven on public roadways use the mandated lighting. Table 2 indicates that this is a major factor in farm vehicle crashes on the part of the farm vehicle driver. In particular, one red light, mounted as far left as possible, should be used, as recommended by ASAE. While many farmers in this survey report familiarity with these ASAE standards, cooperative extension and public health personnel should extend this knowledge to all farmers.
2. Require and promote the possession and use of valid driver's licenses and seat belts by all who use public roadways, whether driving a farm vehicle or other motorized vehicle. "Share the road, share the responsibility" should be the slogan.
3. Recommend the use of rollover protection structure (ROPS) on tractors. For tractors using public roadways, the ROPS should be mandatory.
4. Require SMV emblems on the back of all farm vehicles and trailers that are to be used on public roadways. While it may not prevent crashes, at \$10.00 to \$12.00 a sign, it is an inexpensive way to increase visibility, promote safety, and adhere to OSHA regulations. The ASAE recommends the use of the SMV emblem as a cue to other driver's to slow down.
5. Use the educational materials that describe the use of farm machinery on state roadways, emphasizing the speed differential and SMV signage. The North Carolina Cooperative Extension Service has programs (NCSU, 1996) to educate farmers, and "Light and Reflect for Farm Safety" (Jones, 1999), a program that NCDOL created as part of this project with the Gold Star Growers, is a rural road safety educational tool for the farm population.
6. Develop and conduct training programs for farm owners and operators so that they learn to implement safe methods of transporting farm equipment in their daily routines. These programs could be conducted by local enforcement agencies and used to teach defensive driving techniques to those operating slow-moving farm equipment.
7. Distribute educational materials emphasizing the presence of farm equipment on rural roadways at agencies where North Carolina residents apply and are tested for and granted driver's licenses.
8. Modify the driver's education curriculum to ensure that those studying for their initial North Carolina driver's license are aware of the safety hazards involved with slow-moving farm vehicles.
9. Recommend the use of supplemental lighting, particularly the blinking or flashing lights preferred by survey respondents, on farm equipment on public roads. Recommend that the lights be in continuous use.
10. Post the diamond-shaped "slow moving" tractor sign (table 7) along roadways where crashes are likely or where multiple crashes have occurred.
11. NCDOT needs to increase the monitoring of rural highways during the harvest season to ensure that all vehicles using public roadways are in compliance. Particular effort should be made to ensure that the speed limit is followed, that drivers are not driving while under the influence of alcohol, and that seat belts are used.

While some of these objectives are in progress, others are not. Educational programs are available, both through North Carolina State University's Cooperative Extension Service, and as a result of a portion of this project. The cost of other recommendations, particularly retrofitting tractors with ROPS, could be a negative factor. However, most survey respondents indicated that ROPS were in place on their tractors. It may be

possible, with the assistance of farmers, farm associations, and legislators, to make ROPS a requirement, and issue a tax rebate for purchase and installation of ROPS. Studies, such as Karlson and Noren (1979), indicate that a combination of education and enforcement is a successful method. One without the other will be less effective. The enforcement recommendation (recommendation 11) is a result of this philosophy.

Recommendation 9, requiring blinking or flashing lights on farm equipment using public roadways, could be relatively easy and inexpensive to implement. This is the equipment marking preferred by respondents.

Recommendation 11, regarding the assistance of the North Carolina Highway Patrol in monitoring speed on rural roadways is important. NCDOT indicates that the speed differential is the reason for the majority of farm vehicle/passenger vehicle crashes. While there are high-speed tractors capable of speeds up to 50 mph, and research from companies such as John Deere indicates that dual-fuel tractors, or electric motor technology tractors, will be in use in the future (Wenzel, 2003), the old-fashioned slow-speed tractor is currently in use on North Carolina roadways. In addition, the NCDOT's "Booze It and Lose It" program would benefit those driving farm vehicles. Our research involving citations issued in 1999 indicates that alcohol consumption was a factor in a number of the crashes, more so with those driving the non-farm vehicle.

This study indicates that farmers' perceptions and concerns regarding rural road safety are understandable: a speed differential exists, a minimum of safety regulations are in place to ensure that farm vehicles are visible, there is less monitoring of rural roadways by traffic enforcement, and the speed of daily life has increased for those living in rural areas as well as in urban areas. This study also indicates that rural road safety concerns exist throughout the state and are not confined to the Piedmont. Certain safety precautions are currently in use by the farmers surveyed, and the solutions posed to resolve the problem are, for the most part, practical.

Preventive measures have been fully documented by researchers. A renewed focus on rural roadway crashes would be beneficial to North Carolina. This study indicates that farmers would be supportive of increased regulation governing farm machinery on rural roads, particularly the mandated use of the SMV emblem and additional lighting on tractors. The farmers surveyed also support increased education of the general public as a way to prevent farm equipment/motor vehicle crashes.

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Appendix

Traffic Safety on North Carolina Rural Roads Survey		NC STATE UNIVERSITY RESEARCH DOCUMENT NUMBER:	(1-5)
All of the information you provide will be strictly confidential. Please make a check when selecting your answers and print all numbers and letters clearly in the spaces provided. (Do not write or make any marks in the shaded area.)			
<i>Card 1</i>			(6)
1. How many years have you been operating a farm?	Years <u> </u> <u> </u>		(7-8)
2. What crops do you grow or what livestock do you raise? List each crop and the number of acres planted OR list each type of livestock and the number of animals raised per year. List these items in the order of importance to your farming income.			
<i>PRINT CLEARLY IN THE BOXES PROVIDED</i>			
Most important crop/ livestock:	<input style="width: 100px; height: 30px;" type="text"/>	Number of acres / animals:	<input style="width: 100px; height: 30px;" type="text"/>
			(9-18)
Next most important crop/livestock:	<input style="width: 100px; height: 30px;" type="text"/>	Number of acres / animals:	<input style="width: 100px; height: 30px;" type="text"/>
			(19-28)
Next most important crop/livestock:	<input style="width: 100px; height: 30px;" type="text"/>	Number of acres / animals:	<input style="width: 100px; height: 30px;" type="text"/>
			(29-38)
Next most important crop/livestock:	<input style="width: 100px; height: 30px;" type="text"/>	Number of acres / animals:	<input style="width: 100px; height: 30px;" type="text"/>
			(39-48)
Next most important crop/livestock:	<input style="width: 100px; height: 30px;" type="text"/>	Number of acres / animals:	<input style="width: 100px; height: 30px;" type="text"/>
			(49-58)
Next most important crop/livestock:	<input style="width: 100px; height: 30px;" type="text"/>	Number of acres / animals:	<input style="width: 100px; height: 30px;" type="text"/>
			(59-68)
Next most important crop/livestock:	<input style="width: 100px; height: 30px;" type="text"/>	Number of acres / animals:	<input style="width: 100px; height: 30px;" type="text"/>
			(69-78)

3a. Do you plan to continue farming during the next three years?	CHECK ONE <input type="radio"/> Yes [PLEASE SKIP TO QUESTION 4] <input type="radio"/> No	(7)
3b. [IF NO:] Why not? _____ _____ _____	EDITOR CODE: _____	(8-9)




4. What safety precautions have you taken with your tractor? Do you ...	CHECK ONE CIRCLE FOR EACH ITEM																
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">A. Have rollover bars?</td> <td style="width: 35%; text-align: center;"> <input type="radio"/> Yes <input type="radio"/> No </td> <td style="width: 5%; text-align: center;">(10)</td> </tr> <tr> <td>B. Use a seat belt?</td> <td style="text-align: center;"> <input type="radio"/> Yes <input type="radio"/> No </td> <td style="text-align: center;">(11)</td> </tr> <tr> <td>C. Make sure that tractor drivers on your farm have a valid driver's license?</td> <td style="text-align: center;"> <input type="radio"/> Yes <input type="radio"/> No </td> <td style="text-align: center;">(12)</td> </tr> <tr> <td>D. Use signal lights and flashing lights to warn others you are on the road?</td> <td style="text-align: center;"> <input type="radio"/> Yes <input type="radio"/> No </td> <td style="text-align: center;">(13)</td> </tr> <tr> <td>E. Have a "slow moving" triangle symbol (<i>LIKE THE ONE PICTURED IN QUESTION 20</i>) on the back of your equipment?</td> <td style="text-align: center;"> <input type="radio"/> Yes <input type="radio"/> No </td> <td style="text-align: center;">(14)</td> </tr> </table>	A. Have rollover bars?	<input type="radio"/> Yes <input type="radio"/> No	(10)	B. Use a seat belt?	<input type="radio"/> Yes <input type="radio"/> No	(11)	C. Make sure that tractor drivers on your farm have a valid driver's license?	<input type="radio"/> Yes <input type="radio"/> No	(12)	D. Use signal lights and flashing lights to warn others you are on the road?	<input type="radio"/> Yes <input type="radio"/> No	(13)	E. Have a "slow moving" triangle symbol (<i>LIKE THE ONE PICTURED IN QUESTION 20</i>) on the back of your equipment?	<input type="radio"/> Yes <input type="radio"/> No	(14)		
A. Have rollover bars?	<input type="radio"/> Yes <input type="radio"/> No	(10)															
B. Use a seat belt?	<input type="radio"/> Yes <input type="radio"/> No	(11)															
C. Make sure that tractor drivers on your farm have a valid driver's license?	<input type="radio"/> Yes <input type="radio"/> No	(12)															
D. Use signal lights and flashing lights to warn others you are on the road?	<input type="radio"/> Yes <input type="radio"/> No	(13)															
E. Have a "slow moving" triangle symbol (<i>LIKE THE ONE PICTURED IN QUESTION 20</i>) on the back of your equipment?	<input type="radio"/> Yes <input type="radio"/> No	(14)															

5. Please name two hazardous roadways in your area. Identify each hazardous road by providing the county, nearest city or town, the exact name of the road, and the nearest intersection. <p style="text-align: center;">PRINT CLEARLY IN THE BOXES PROVIDED</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">FIRST HAZARDOUS ROAD:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%; border: none;">County:</td> <td style="width: 30%; border: 1px solid black; height: 40px;"></td> <td style="width: 40%; border: none;">Name of road (OR COUNTY ROAD NUMBER):</td> <td style="width: 10%; border: 1px solid black; height: 40px;"></td> </tr> </table> </div>	County:		Name of road (OR COUNTY ROAD NUMBER):		(15-22)
County:		Name of road (OR COUNTY ROAD NUMBER):			

Nearest town:		Names of nearest intersecting roads: (OR COUNTY ROAD NUMBERS)		(23-36)
Briefly, describe problem: ...				(37-39)
SECOND HAZARDOUS ROAD:				
County: . .		Name of road (OR COUNTY ROAD NUMBER):		(40-47)
Nearest town:		Names of nearest intersecting roads: (OR COUNTY ROAD NUMBERS)		(48-61)
Briefly, describe problem: . . .				(62-64)

6. Are you aware of any unreported traffic crashes or collisions involving farmers while they were driving farm equipment on public roads?	<i>CHECK ONE</i>	(65)
	<input type="radio"/> Yes <input type="radio"/> No [PLEASE SKIP TO QUESTION 11]	
7. [IF YES:] How many incidents of this type are you aware of?	NUMBER: ___ ___ ___	(66-68)
8. [IF YES:] For the most recent incident, what type of farm equipment was involved?		

	<p><i>CHECK ALL THAT APPLY</i></p> <p><input type="radio"/> Farm truck <input type="radio"/> Farm tractor <input type="radio"/> Combine <input type="radio"/> Some other farm equipment</p> <p>[SPECIFY TYPE OF FARM EQUIPMENT INVOLVED, ON THE LINE BELOW]</p> <p>_____</p>	<p>(69)</p>
	<p>EDITOR CODE: _____</p>	<p>(70–71)</p>
<p>9. [IF YES:] Why do you believe these accidents were not reported?</p> <p>_____</p> <p>_____</p>	<p>EDITOR CODE: _____</p> <p>EDITOR CODE: _____</p>	<p>(72–73)</p> <p>(74–75)</p>
	<p><i>CHECK ONE</i></p>	
<p>10. [IF YES:] Did any of these accidents result in injuries?</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>(76)</p>
		<p>ID3 (1–5)</p> <p>Card 3 (6)</p>

<p>11. Which of the following three signs do you think would be the most effective in getting other drivers to slow down on your rural roads?</p>					<p>(7)</p>				
<p><i>CHECK ONE ONLY</i></p>									
<p><input type="radio"/> The sign that warns of slow-moving tractors</p>		<p><input type="radio"/> A circle giving probable speed of a tractor, 15–20 mph, and car, 55 mph, with a logo of each vehicle next to the mph.</p>		<p><input type="radio"/> A speed limit sign for both cars and tractors</p>					
<p>For each of the next statements, please respond by selecting only one of the following answers: “strongly agree, agree, disagree, or strongly disagree” to best indicate your response to each statement.</p>									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;"><i>Strongly Agree</i></td> <td style="width: 25%; text-align: center;"><i>Agree</i></td> <td style="width: 25%; text-align: center;"><i>Disagree</i></td> <td style="width: 25%; text-align: center;"><i>Strongly Disagree</i></td> </tr> </table>					<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>	
<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>						
<p>12. Traffic on my rural roads is much more dangerous than it was 5 years ago.</p>	<p><input type="radio"/></p>	<p><input type="radio"/></p>	<p><input type="radio"/></p>	<p><input type="radio"/></p>	<p>(8)</p>				

13.	I feel safe when driving my tractor on local highways.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(9)
14.	Most rural residents know and understand highway safety rules.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(10)
15.	I know the regulations about driving a tractor on public roads.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(11)
16.	The farmworkers working for me understand the highway safety rules and regulations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(12)

17.	Most farmers comply with the lighting requirements for farm equipment traveling on public roads.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(13)
18.	Most farmers know the lighting requirements for farm equipment traveling on public roads in North Carolina.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(14)
19.	Most farmers know the safety markings for farm equipment recommended by the American Society of Agricultural Engineers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(15)
20.	Most farmers would support a law requiring the “slow moving” triangle symbol (<i>like this one</i>) be placed on the back of their farm equipment, visible to the traffic following them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(16)
21.	Most people would comply with N.C. requirements for traffic safety on rural roads... <i>If they knew the laws.</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(17)
22.	Most people would comply with N.C. requirements for traffic safety on rural roads... <i>If it was less expensive to comply.</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(18)



23. Most people would comply with N.C. requirements for traffic safety on rural roads... *If the penalties and citations for non-compliance were greater.*

(19)

24. Please rank each of the statements in the questions below in order of their importance from 1 to 4, with 1 the **most** important and 4 the **least** important. Record a number, 1 through 4, only once in the blank beside each item. Here's an example:

My favorite ice cream is...

_____ 2
 _____ 1
 _____ 3
 _____ 4

*Vanilla
 Chocolate
 Strawberry
 Butter Pecan*

**RECORD A
 NUMBER 1 – 4
 IN EACH BLANK**

A. The biggest problem with roadway safety in my area is...

___ Increased speed of other drivers
 ___ Lack of respect of other drivers
 ___ Difference between posted speed limit and speed of my tractor
 ___ City folks don't understand farming and farm equipment

(20–23)

B. Traffic accidents on rural roads would be less frequent if...

___ All farm vehicles had blinking or flashing lights
 ___ Anyone who drives a farm vehicle is trained to do so
 ___ Anyone who drives a farm vehicle has a valid driver's license
 ___ All farm vehicles were adequately marked with a "slow-moving" sign (*LIKE THE ONE PICTURED IN QUESTION 20*)

(24–27)

C. The biggest everyday stress I have in farming is...

___ Economic – I'm worried about finances
 ___ Traffic – I'm worried that I will be killed or hurt driving my farm equipment on these rural roads
 ___ Weather – the drought, heat, flooding, something I can't control
 ___ No *ONE* cares about farmers anymore

(28–31)

D. The best way to fix the traffic problem would be...

___ Widen the shoulders on given roads so I could get out of the way
 ___ Post "slow moving" signs so folks understand and slow down
 ___ Have N. C. Highway Patrol monitor certain roads for violators
 ___ Post additional lights or signals on my tractor so folks would see me

(32–35)

	E. The laws governing tractors on rural roads are...	Adequate <input type="checkbox"/> Not strong enough <input type="checkbox"/> Not well known enough by city folks <input type="checkbox"/> Not well known by farmers
		(36-39)

And, finally, we'd like to know...		
25. How many years of schooling have you completed? <i>CHECK ONE RESPONSE</i>	<input type="radio"/> Less than 8 years <input type="radio"/> 8-11 years <input type="radio"/> Completed high school or equivalent <input type="radio"/> Attended college or vocational school <input type="radio"/> Completed a vocational training program <input type="radio"/> Completed a college degree <input type="radio"/> Completed a graduate or professional degree	(40-41)
26. In what year were you born?	BIRTH YEAR: 19 __ __	(42-43)

Thanks for your help on this very important project! Please fold this survey and place it in the envelope provided and return it right away!