The KFMA Operator Database: A short note on age and experience of Kansas farmers

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ABSTRACT
Age, experience, and other demographic information are of interest to many applied research projects. This short note is intended to serve as an example to assist researchers using farm demographics such as age and experience from the Kansas Farm Management Association (KFMA) Operator Database. This unique KFMA data empowers researchers to conduct advanced analyses. This data demonstration supports applied research and outreach projects by reporting details otherwise not readily available in respective studies.

INTRODUCTION
Information on farmers' age and experience has historically been of interest to the agricultural community and industry stakeholders. The USDA NASS Census of Agriculture reports average age of farmers every five years. The most recent nationwide statistics report the average age of farmers was 57.5 in 2017, up by 1.2 years from 2012 (USDA NASS, 2019). The average age of farmers across the US have consistently increased for several decades. The data on age and experience of farmers are useful for marketing efforts by manufacturers and educational programming by the Land Grant University System. The Kansas Farm Management Association (KFMA) data provides an opportunity for detailed analyses of age and experience.

DATA AND METHODS
The Kansas Farm Management Association (KFMA) maintains archives of farm-level production and financial data since 1973. At full capacity, twenty-five KFMA economists work cooperatively with farm families to provide members with production and financial management information for use in decision making. Diverse Kansas farms are categorized as cropping, livestock, mixed cropping-livestock, irrigated, and other characteristics. Currently there are approximately 2,500 KFMA member farms.

There are multiple databases in the KFMA system that serve different applied research roles. The KFMA Operator Database provides demographic data for each operator, including sole proprietors and each

individual engaged in management on multiple-operator farm operations. Multiple operator farms are usually in a partnership, LLC, or corporate entities.

Although the KFMA Operator Database is retrospective, demographic data are not reported as far back as the KFMA Whole Farm Database. The KFMA Operator Database provides annual data from 2012 to the present (2018 at time of this writing). The KFMA Whole Farm Database includes operation-level production and financial data from 1973 to the present. Because the KFMA Whole Farm Database has one record per farm per year, limited operator characteristics are reported. For multiple-operator farm operations, the KFMA Whole Farm Database reports operator birth year as an average across all operators since 2012 (and principal operator prior to 2012). It should be noted that the KFMA Whole Farm Database does not include years of farming experience.

Data on operator demographics

Farmers' demographic data including birthyear, year began farming and number of dependents are maintained in the KFMA Operator Database (Table 1). The 2018 KFMA Operator Database contains 1,795 unique farms. Farms with birthyear or year began farming equal to zero were omitted, leaving 1,764 farms. A subset of remaining farms was taken to omit KFMA "super farms" so that double counting larger farms was avoided (i.e. setting v007 equal to 0); leaving 1,001 farms with 1,267 operators suitable for demographic analyses. Most farms were single operator, i.e. sole proprietor, however several farms had multiple operators involved in management decision.

Table 1. Variable description in KFMA Operator Database

Variable	Variable description	Comments or notes
FMNO	Unique identification number	Key to merge datasets*
DATAYR	Year data collected	Available from 2012 to 2018
OPNO	Operator Number	Not necessarily ordered by age
OPBIRTHYR	Operator birthyear	
BEGFMYR	Year began farming	
FAMILYNO	Number of people in household	
CHILDBIRTHYR	Birthyear of oldest child	
OPERAGE	Operator age (years)	DATAYR-OPBIRTHYR
CHILDAGE	Age of oldest child (years)	DATAYR-CHILDBIRTHYR
YRSFARMED	Farming experience (years)	DATAYR-BEGFMYR

*Langemeier (2010)

ANALYSIS

When data were subset such that only sole proprietors were chosen, 824 farms or 82% of the 1,001 farm operations remained (Table 2). Multiple-operator farms included 443 operators across 177 farms. On average, Kansas farmers began farming at 23.9 years old. Sole proprietors began farming on average at 23.3 years old. Farmers joining multiple operator farms began farming at 25 years old. The slightly older beginning farming age of multiple operator farms may indicate some flexibility to explore off-farm income and higher education.

Each operator on multiple-operator farms were assigned to an age rank group based on age. The oldest operator on multiple-operator farms was assigned the value of 1, the second oldest operator was assigned the value 2, and so on. When multiple operator farms were chosen with exactly two operators, 177 observations (40% of operators from multiple-operator farms) remain. Fifty-seven farms have exactly three operators, or 13% of operators from multiple-operator farms. The average age of the oldest operator on multiple-operator farms were 67.5 years old with a minimum and maximum age of 33 and 96, respectively. The average age of second oldest operator on multiple operator farms were 51.4 (Table 2). Average age of third oldest operator on multiple operator farms were 45.5, 5.9 years less than second oldest operators. Given different sample sizes for each age rank group, it is possible for mean operator age to be younger or older than other age rank groups. One farm had nine operators but only the first five age rank groups are presented due to sample size less than five observations.

Table 2. Operator age by age rank on multiple operator farms (n=177 farms, 443 operators)

Age rank (1=oldest)	Farms	Percent of operators (%)	Mean age (years)	Minimum age (years)	Maximum age (years)
1	177	39.95	67.5	33	96
2	177	39.95	51.4	22	88
3	57	12.87	45.5	26	88
4	20	4.51	48.5	23	73
5	6	1.35	50.7	29	72

Similar relationships were observed for years of experience as for age. The average experience by the first three operator age rank groups tended to become lower as age decreased (Table 3). The shortest minimum experience for any age group was 1 year; and was observed for age rank groups 1, 2, and 3. Minimum experience for age rank group 4 and 5 were 4 and 5 years, respectively. The longest maximum experience was observed for age rank group 1 at 74 years. Maximum experience tended to become shorter as age rank group increased (Table 3).

Table 3. Operator experience by age rank groups on multi-operator farms (n=177 farms, 443 operators)

Age rank (1=oldest)	Farms	Percent of operators (%)	Mean experience (years)	Minimum experience (years)	Maximum experience (years)
1	177	39.95	42.1	1	74
2	177	39.95	26.7	1	65
3	57	12.87	20.2	1	56
4	20	4.51	23.1	4	55
5	6	1.35	27.7	5	50

Demographics across generations

Generation definitions suggested by Pew Research Service (Dimock, 2019) were applied to KFMA data. Birthyear ranges and proportion of Kansas farms in sole proprietorship and multiple-operator farms are presented in Table 4. The oldest Kansas farmers were born before 1946 and belong to the Silent generation. The following generation is referred to as Baby Boomers who were born between 1946 and 1964. Generation X was born between 1965 and 1980. Farm operators born between 1981 and 1996 are considered Millennials. The youngest Kansas farmers born since 1997 were assigned to Generation Z. The generational proportions were similar for sole proprietors and multiple operator operations.

Table 4. Kansas farms and operators across generations (n=1,001 farms)

	birthyear	Operators on single-operator farms (n=824)	Multiple-operator farms (n=177 farms)	Operators on multiple-operator farms (n=443 operators)
Silent	Before 1946	143	54	65
Baby Boomer	1946-64	455	125	193
Generation X	1965-80	145	83	118
Millennial	1981-96	79	53	66
Generation Z	1997-present	2	1	1

Nearly half of all Kansas farmers were Baby Boomers (Figure 1). Chronologically the succeeding and preceding generations from Baby Boomers were the next most common. Silent and Generation X comprised roughly twenty percent each. Generation X surpassed the number of Silent generation farm operators in 2015. In that same year, operators from Generation Z were first observed entering farm management roles. Millennials have been the fastest growing generation of farm operators in Kansas (Figure 1). The Silent generation and Baby Boomers are becoming a smaller proportion of all Kansas farms.

Table 5. Operator age demographics of sole proprietors by generation (n=824 farm operations)

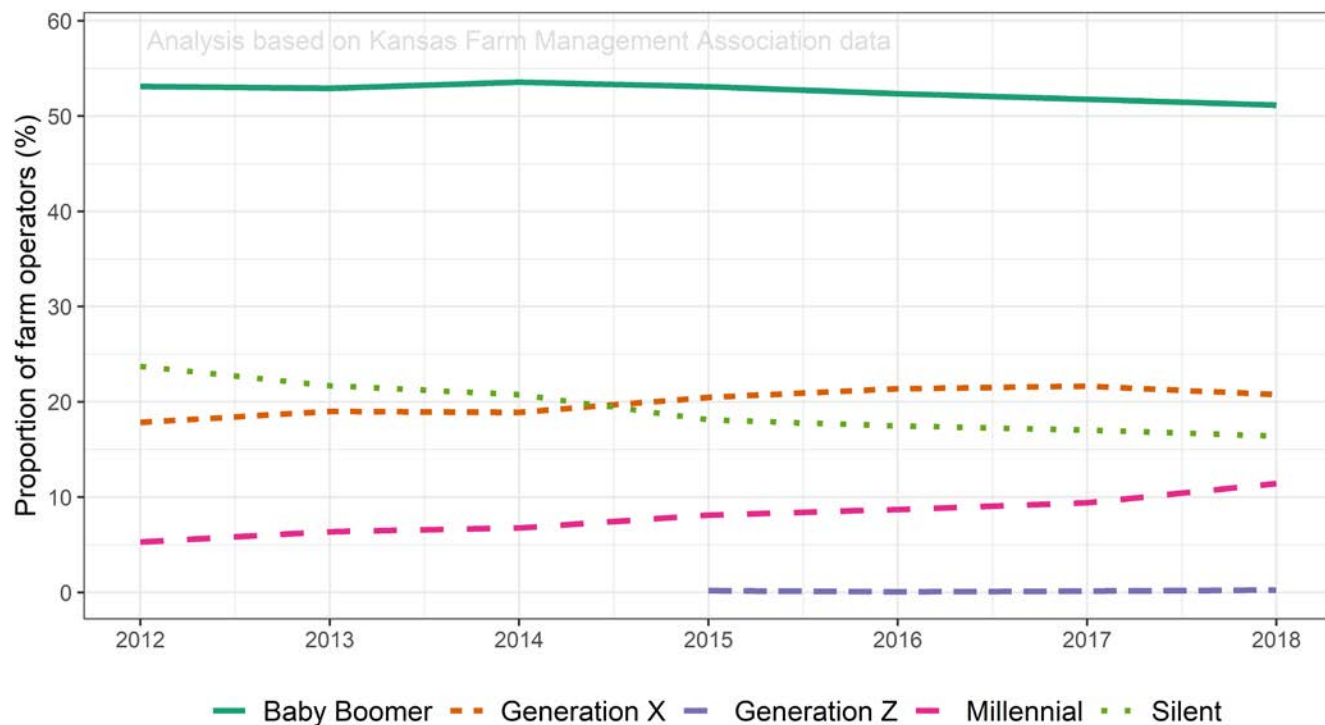|	Operators	Percent of operators	Average age (years)	Minimum age (years)	Maximum age (years)
Silent	143	17.35	78.8	74	97
Baby Boomer	455	55.22	63.9	55	73
Generation X	145	17.6	47.3	39	54
Millennial	79	9.59	32.6	23	38
Generation Z	2	0.24	21	21	21

Figure 1. Proportion of farm operators by generation over time in Kansas

Although on average older generations begin farming before younger generations, this trend was not universally true. Some farm operators from Baby Boomer and Silent generations recently began farming. The minimum experience of Baby Boomers was 3 years while Silent generation had farmers with 2 years of farming experience in 2018. Millennials, Generation X, and Generation Z all had farm operators with 1 year of experience.

Table 6. Operator age demographics of multiple-operator farms by generation (n=443 operators, 177 farm operations)

	Operators	Percent of operators	Average age (years)	Minimum age (years)	Maximum age (years)
Silent	65	14.67	81.5	74	96
Baby Boomer	193	43.57	64.4	55	73
Generation X	118	26.64	45.5	39	54
Millennial	66	14.9	33.2	23	38
Generation Z	1	0.23	22	22	22

Table 7. Operator experience of sole proprietors by generation (n=824 farm operations)

	Operators	Percent of operators	Average experience (years)	Minimum experience (years)	Maximum experience (years)
Silent	143	17.4	54.5	14	77
Baby Boomer	455	55.2	39.6	3	59
Generation X	145	17.6	22.9	2	39
Millennial	79	9.6	8.2	1	21
Generation Z	2	0.2	1.5	2	3

Beginning farmers

Operator experience is a function of age and year began farming. The age that operators began farming is of interest. Operators of multiple-operator farms began farming at a slightly older age than operators of sole proprietor farms. Examining the density functions of each farm type shows how old operators of different generations were when they started farming. The average age that operators began farming was statistically lower for Baby Boomers than Silent or Generation X.

Table 8. Operator experience of multiple-operator farms by generation (n=443 operators, 177 farm operations)

	Operators	Percent of operators	Average experience (years)	Minimum experience (years)	Maximum experience (years)
Silent	65	14.7	51.2	2	74
Baby Boomer	193	43.6	39.7	6	57
Generation X	118	26.6	18.8	1	36
Millennial	66	14.9	8.4	1	19
Generation Z	1	0.2	6	6	6

DISCUSSION

The evaluation of age and experience of farm operators is possible with KFMA data. The KFMA Operator Database provides valuable information regarding the number of operators, age, and experience of each operator on a farm. Ages and experience were calculated for 2018 based on birthyear and year began farming from the KFMA Operator Database.

The KFMA Operator Database provides additional details that are either missing or misleading in the KFMA Whole Farm Database. Because the latter lists only one operator, reported information is an average across all farm operators. Thus, what might appear as a middle-aged operator in the KFMA Whole Farm Database could be a much older primary operator making decisions influenced by much younger operator on that farm.

This short note addressed issues other researchers are likely to encounter using the KFMA Operator Database; and applied those data to simple descriptive statistics including a discussion of generational attributes of Kansas farmers. Although interesting, these analyses have not answered any of the "so what" questions that future research will evaluate.

FUTURE RESEARCH

The discussion of operator age and experience may be of interest on its own. Researchers including the authors and others may desire to use this information to motivate their analyses of KFMA datasets. Younger operators on a farm likely have strong influence on farm management decisions. Two otherwise identical farms with older operators but one farm with no other (younger) operator, the farm with the younger operator would be expected to behave differently given the younger operator's influence. Populating the final dataset with ages and experience of decision makers may improve accuracy of further analyses. The authors are using KFMA Operator Database data and results of this short note to support a series of applied research projects including:

- Agricultural technology adoption by generation
- Technology manufacturers targeting potential adopters
- Farm profitability rankings by operator experience and generation

ACKNOWLEDGEMENTS

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