Pak. J. Agri. Sci., Vol. 57(X), xxx-xxx; 2020
ISSN (Print) 0552-9034, ISSN (Online) 2076-0906
DOI: 10.21162/PAKJAS/20.9988
http://www.pakjas.com.pk

A LONGITUDINAL RESEARCH ON THE CHANGE IN SOCIO-ECONOMIC AND INFORMATION RESOURCES OF AGRICULTURAL PRODUCERS

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In this research, how a change occurred over time in the socio-economic structure and the information resources of the farmers living in the same region have been determined. To this end, as a continuation of a study conducted in 1989 with 78 farmers in 11 villages, in 2019 a survey study was carried out with the same 66 reachable farmers or their relatives in the same villages. In order to determine the change in the research area, a survey study was also conducted with 87 farmers. Cross-tables and one-way variance analysis ANOVA test were used in the analysis process of the data obtained from the surveys. Within the 30 years, it was determined that there was an increase in non-agricultural income of the farmers; in production patterns, they turned from industrial plants to grain production; the centers where the farmers resided had a tendency from village to county or provincial centers; livestock farming enterprises had declined; the aging of those engaged in agriculture and information resources became diversified with the improving technology.
Keywords: A longitudinal research, information sources, socio-economic change, ANOVA.

INTRODUCTION

Agriculture is one of the most visible areas of socio-economic and cultural change in societies with industrialization and urbanization processes. The main reasons for these changes in the agricultural sector are pointed as the improvements in technology, access to educational services, changes in rural lifestyles, differences in information resources, digitalization and consumer preferences (Carolan, 2006; Rehber, 2006; Kan *et al.*, 2020). In parallel with these developments in the agricultural sector, it is inevitable that some changes in both individual attitudes of farmers and their business characteristics will be experienced. This change in the farmers has led to social change over the years. Social change is described as "the change that occurs in the attitudes, skills, knowledge, and behaviors of people within society" (Rogers, 2003; Gorlach *et al.*, 2008). Some characteristics in social societies change continuously over time. For this reason, a movement point can be chosen by going back to determine the changes that occur in the society or in the social structure. This research also seeks to show a number of agricultural practices and changes in agricultural information resources in a farmer's community, which have changed and not changed with their various aspects over a fairly long period of time, such as thirty years.

Researches that address the development of the subject studied over time are called longitudinal researches. Longitudinal researches are the researches aim at collecting data using the same or similar measuring instruments 2 or more times over long periods of time, by working with the same person or group of samples and detecting differentiation over time (Laird et Ware, 1982; Zeger *et al.*, 1988; Scott *et al.*, 1988; Aypay *et al.*, 2012; Fraley et Hudson, 2014; Peri, 2015).

When the national and international literature was examined, it was determined that the longitudinal researches were conducted mostly in the fields of education, health, and sociology. In the agricultural field, many studies cross-sectionally investigating the socio-economic factors that affect the behavioral change of farmers (Feder *et al.*, 1985; McBride *et al.*, 2004; Yucer *et al.*, 2016; Noel et Cai, 2017; Tripathi, 2017; Liu *et al.*, 2019) and examining agricultural information resources they use (Lichtenberg et Zimmerman, 1999; Boz et Özçatalbaş, 2010; Koksal *et al.*, 2010; Baumgart-Getz *et al.*, 2012; ; Garforth *et al.*, 2013; Salau *et al.*, 2013; Aphanu et Agwu, 2014; Ozer, 2014; Zheng *et al.*, 2014; Ozer and Ozden, 2016; Koksal *et al.*, 2019) are found in the related literature. Although there is a lot of research, the scientific study that has examined behavior change in the agricultural field over the years is extremely rare and limited in number. A longitudinal study conducted on the same farmers' community and other farmers in the region for a long period of time as 30 years, which examines behavioral changes and differentiation in information sources over the years has not been found in the literature ever. For this reason, even if they are not directly related to the subject, it is thought that it will be useful to examine the studies in areas other than agriculture.

Longitudinal studies on education are generally studies based on the survey method conducted with primary school and

university students. A study examining the academic achievements of university students in the undergraduate education process was published using the pre-test and post-test design on the same group of students after a period of 4 years (Cabi, 2015). In another longitudinal study conducted on university students, the negative effects of the Gulf War on 215 students were researched (Pargament, 1994). In a study that identifies the factors that are effective in young people's world views, behavioral changes in 9 years were identified by asking the same young people questions about behavioral, social and cultural phenomena in the years of 1976, 1982, and 1985 (Helve, 1993).

Kırkpatrick conducted his study published in 2019, with a survey form for 714 people in 1987, using the same form to the 344 same people in 1991. The study examined the effects of personal relationships on business life for 4 years.

The main purpose of this research is to show both individual and regional changes of farmer behaviors, which are thought to change slowly, over in a period of 30 years. In this process, examining the changes in agricultural structures (land width, crop pattern, livestock activities, agricultural mechanization) and information resources of other farmers who produce in the same region together with the same farmers will be the guidance in achieving the purpose of the research. The factors investigated within the scope of the research are examined in the following period (2019) according to the main period (1989) and the degree of change determined. Investigating farmers' behaviors in terms of the changes in business structures and the information resources will make significant contributions to the studies to be carried out in these areas (especially in the field of agricultural extension). Furthermore, the significance of this study comes from being one of the pioneer studies in the field. This study can be considered as research not only for the researchers working in the field of agriculture but also for social scientists, social anthropologists, and economists.

MATERIALS AND METHODS

The main data source of this research, which examines the changes in farmer behavior, business structure, and information resource over a period of time (30 years), is surveys conducted with farmers and the researcher's observations. The research was designed in accordance with a longitudinal survey model. Data was collected at two different times from the farmers in the research area. The first data was collected in 1989 with 78 farmers living in 7 villages of Polatlı District of Ankara province[1]. Sample volume was determined using a stratified sampling method during the first data collection process. The process of filling out survey forms with farmers entering the sample was carried out on 25 July–10 August 1989 (Tatlıdil, 1989). The same survey forms used in the 1989 survey were applied to 2 different groups of farmers in 2019. The first group of farmers consists of 66 farmers, accessible from 78 farmers who participated in the 1989 survey. It was determined that 12 farmers, who could not be reached nor a member of his family, were died or emigrated from the village to the city leaving the agricultural activities, as a result of interviews with the local authority. Among the 66 farmers reached from 78 farmers, 38 are the same farmers and 28 are the son or brother of the owner of the same farm in 1989.

The survey was also conducted with 87 farmers as control groups in the same area. The same method (stratified sampling method) was used in determining the control group as in 1989. Surveys with the control group (87 farmers) and the other farmer group (66 farmers) were completed face-to-face by the researcher between October 15, 2018-January 20, 2019. As a result of the data obtained;

* The farmers in 1989 created the first stage group of the research,
* The repeated study with the same farmers in 2019 created the second stage group of the research,
* Other farmers in the same area created the control group of the research.

One-way variance analysis ANOVA test was used to determine the difference between groups in the analysis of the data. Tukey was applied when variables showed homogeneous distribution while when variables did not show homogeneous distribution Tamhane's T2 test was applied for Post Hoc multiple comparison test (Tamhane, 1977; Laird et Ware, 1982). In the study, the α value was considered as 0.10.

RESULTS

In this part of the study, the survey data applied to the same group of farmers at 2 different times and the data obtained from the farmers in the control group in the same region were evaluated comparatively. The aim of the comparison is to determine the development and change in individual and business characteristics and information resources of the farmers. Individual characteristics of the farmers were examined and Table 1 was created.

When Table 1 is examined, it is observed that there have been changes in the places where the farmers live, their education levels, income levels and non-agricultural income situations over the years. It is determined that the place where the farmers lived in 1989 by a majority was village (84.9%). In

[1] Initial data was obtained using surveys of the study published in 1989 by Prof. Dr. Hasan Tatlidil titled "a Study on the Spread and Adoption of Rain Irrigation Technology". Prof. Dr. Hasan Tatlıdil has given all the legal and written permissions to the researcher Dr. Özdal Köksal to the use of his surveys conducted in 1989. 34 question among the total 53 questions included in the survey forms were used in this study.

the 30 years, it is determined that the farmers migrated from the village to the nearest county or provincial center and continued their agricultural activities. In 1989, 15.1% of farmers lived in centers outside the village, while in 2019, 42.4% of the same agricultural business owners and 48.3% of farmers in the control group lived in centers outside the village. It is found that there has also been an increase in the level of education of the farmers over the years, associated with relocation their places of life. In 1989, 81.8% of the farmers had primary or below education levels, while in 2019, this rate is 50% for the farmers in the same businesses and the rate is 55.1% for farmers in the control group.

Table 1. Distribution of Individual Characteristics of the Farmers.

	Stage I (1989)		Stage II (2019)		Control Group	
	N	**%**	**N**	**%**	**N**	**%**
Characteristics Living place						
Village	56	84.9	38	57.6	45	51.7
County	9	13.6	25	37.9	38	43.7
City	1	1.5	3	4.5	4	4.6
Education						
Illiterate	1	1.5	1	1.5	0	0
Literate	3	4.5	1	1.5	1	1.1
Primary School	50	75.8	31	47	47	54
Secondary School	2	3	9	13.6	5	5.8
High School	6	9.1	18	27.3	26	30.9
University	4	6.1	6	9.1	8	9.2
Income level within the village						
Low	12	18.2	21	31.8	18	20.7
Medium	27	40.9	21	31.8	50	57.5
High	27	40.9	24	36.4	19	21.8
Non-agricultural income						
Available	16	24.2	51	77.3	35	40.2
Absent	50	75.8	15	22.7	52	59.8

When farmers were asked about income levels within the village, the majority of farmers (81.8%) in 1989 identified themselves in the middle or higher income group. However, these levels of income have changed over the years, the majority of farmers in 2019 identified themselves in the low or middle-income group. In particular, it is determined that the farmers in the low-income group are the farmers who reside in a village, have primary or fewer education levels, and do not have any non-agricultural income.

One of the individual characteristics that have changed over the years is whether the farmers have non-agricultural income. In 1989, 24.2% of the farmers had non-agricultural income. In the 30 years, it is determined that 77.3% of the farmers in the same enterprises with a non-agricultural income had non-agricultural income with the right to a pension (60% of non-agricultural income was from pensions, 26% from trade, 8% from Labor, 6% from the civil service). 40.2% of the farmers in the control group were found to have an income other than agriculture.

The average age of the farmers in 1989 was 43.3, while the average age of the farmers in the control group in 2019 was 51.8.

It is determined that while individual characteristics such as the place of living, level of education, non-agricultural income and age changed significantly, the level of income did not. When it is examined where the farmers live over the years, their education levels, their non-agricultural incomes, and their ages, we can claim that they differ in three groups according to the level of 10% significance (Chart 3).

***Changes in Agricultural Processes*:** It is also determined that there were changes in agricultural business structures along with individual characteristics of the farmers. The average operating widths of the farmers in 1989 were 347.3 decares, while in 2019 the average operating widths of the same businesses decreased to an average of 257 decares by falling 26%. Other agricultural enterprises operating in the same area (the control group) are found to operate in an average area of 321.9 decares. The average operating width of irrigated agricultural enterprises in the research area in 1989 was 118 decares, while in 2019, irrigated farmland of enterprises decreased to 57 decares, and the average of irrigated agricultural land of the other enterprises in the region decreased to 104.6 decares.

In 1989, 84.8% of farmers had produced on their own land and 15.2% on non-owned (treasury land, lease or partnership) land.

Another structural element of agricultural enterprises, that has changed over the years is the agricultural tools and equipment owned by the enterprises. The use of machinery, which is one of the major factors in developing agriculture, has increased over 30 years in the research area. In 1989, 83.3% of the farmers had a tractor, 72.7% had a grain drill and 85% had spraying, irrigation and fertilizing equipment, while in 2019, thanks to the ease of reaching technology and financing, the number of farmers with tractors increased to 92% and the number of farmers with grain drill increased to 87.4% and the number of farmers with other equipment increased to 94%, also the number of agricultural enterprises with harvesters decreased in the 30 years (from 13.6% to 4.6%). 74.2% of the farmers were engaged in animal production in 1989. In 1989, there were an average of 6.3 cattle and 72.4 small cattle per agricultural enterprise. It is determined that 19.7% of these businesses are engaged in animal production in 2019. Despite the decrease in enterprises which are conducting livestock operations, it is determined that there were significant increases in the average number of cattle (23.3 units) and small cattle (82.5 units) owned by the enterprises. Similarly, other agricultural enterprises in the region have seen a decrease in animal production in 30 years. In 2019, 50.6% of the farmers in the control group are engaged in animal production and the average number of cattle owned by the

Table 2. Results of a one-way analysis of variance (ANOVA) to determine whether the farmer behavior has differed over the years according to variables.

Characteristics Individual Characteristics		Std. Error	Sig.	Characteristics Business Characteristics		Std. Error	Sig.	Characteristics Communication Characteristics		Std. Error	Sig.
Living place				**Land Width***				**Information Resource**			
Stage I	Stage II	0.089	**0.003**	Stage I	Stage II	53.859	0.216	Stage I	Stage II	2.270	**0.001**
	Control Group	0.081	**0.001**		Control Group	50.505	0.870		Control Group	1.671	**0.001**
Stage II	Stage I	0.089	**0.003**	Stage II	Stage I	53.859	0.216	Stage II	Stage I	2.270	**0.001**
	Control Group	0.096	0.902		Control Group	50.505	0.405		Control Group	2.813	0.879
Control Group	Stage I	0.081	**0.001**	Control	Stage I	50.505	0.870	Control Group	Stage I	1.671	**0.001**
	Stage II	0.096	0.902	Group	Stage II	50.505	0.405		Stage II	2.813	0.879
Education				**Property land possession**				**The information resource they consult if there are problems in production**			
Stage I	Stage II	0.186	**0.005**	Stage I	Stage II	0.044	**0.003**	Stage I	Stage II	0.162	**0.012**
	Control Group	0.170	**0.002**		Control Group	0.047	**0.024**		Control Group	0.152	**0.001**
Stage II	Stage I	0.186	**0.005**	Stage II	Stage I	0.044	**0.003**	Stage II	Stage I	0.162	**0.012**
	Control Group	0.186	1.000		Control Group	0.016	0.404		Control Group	0.152	0.200
Control Group	Stage I	0.170	**0.002**	Control	Stage I	0.047	**0.024**	Control Group	Stage I	0.152	**0.001**
	Stage II	0.186	1.000	Group	Stage II	0.016	0.404		Stage II	0.152	0.200
Income				**Animal production status**				**Frequency of going to the provincial center**			
Stage I	Stage II	0.137	0.462	Stage I	Stage II	0.073	**0.001**	Stage I	Stage II	0.182	**0.032**
	Control Group	0.115	0.177		Control Group	0.076	**0.007**		Control Group	0.157	**0.001**
Stage II	Stage I	0.137	0.462	Stage II	Stage I	0.073	**0.001**	Stage II	Stage I	0.182	**0.032**
	Control Group	0.124	0.990		Control Group	0.073	**0.001**		Control Group	0.144	0.199
Control Group	Stage I	0.115	0.177	Control	Stage I	0.076	**0.007**	Control Group	Stage I	0.157	0**.001**
	Stage II	0.124	0.990	Group	Stage II	0.073	**0.001**		Stage II	0.144	0.199
Non-agricultural income				**Number of cattle***				**Frequency of TV viewing**			
Stage I	Stage II	0.074	**0.001**	Stage I	Stage II	3.477	**0.001**	Stage I	Stage II	0.119	0.127
	Control Group	0.075	**0.100**		Control Group	2.128	**0.001**		Control Group	0.110	**0.001**
Stage II	Stage I	0.074	**0.001**	Stage II	Stage I	3.477	**0.001**	Stage II	Stage I	0.119	0.127
	Control Group	0.074	**0.001**		Control Group	3.484	**0.037**		Control Group	0.106	**0.001**
Control Group	Stage I	0.075	0.100	Control	Stage I	2.128	**0.001**	Control Group	Stage I	0.110	**0.001**
	Stage II	0.074	**0.001**	Group	Stage II	3.484	**0.037**		Stage II	0.106	**0.001**
Age*				**Record-keeping**				**Frequency of reading newspaper**			
Stage I	Stage II	1.851	**0.001**	Stage I	Stage II	0.083	0.621	Stage I	Stage II	0.187	**0,089**
	Control Group	1.736	**0.001**		Control Group	0.081	0.619		Control Group	0.164	**0,001**
Stage II	Stage I	1.851	**0.001**	Stage II	Stage I	0.083	0.621	Stage II	Stage I	0.187	**0,089**
	Control Group	1.736	**0.001**		Control Group	0.078	**0.069**		Control Group	0.177	**0,001**
Control Group	Stage I	1.736	**0.001**	Control	Stage I	0.081	0.619	Control Group	Stage I	0.164	**0,001**
	Stage II	1.736	**0.001**	Group	Stage II	0.078	**0.069**		Stage II	0.177	**0,001**

* Tukey statistics were conducted because the data showed homogeneous distribution.

farmers are 14.6 units and the average number of small cattle owned are 115 units.

The production activities in agricultural businesses have often complex structures, as they depend on nature and living material. Therefore, recording accurate and actual data is considered to be more difficult in agricultural enterprises than in other enterprises. The most reliable and accurate source for record keeping activities in agricultural enterprises is farmers. However, it is found that despite the 30 years, the record keeping habits of the farmers in the research area had not fully formed. In 1989 39.4% of the farmers had kept records of their activities of agricultural enterprises, while in 2019 there was a decrease in these attitudes of the farmers. In 2019, the rate declined to 30.3%. There are 2 basic characteristics of the farmers who stop keeping records in their businesses. The first is that these farmers quit animal production, and the second is that they switched from industrial plants to grain production in their production patterns. At this point, it is also necessary to explain the change in the production patterns of the farmers in the research area. 97% of the farmers have made changes to the field products they have produced in the 30 years. In 70% of the farmers who went through the change in field crops, crop diversity decreased within the 30 years. In 1989, 90% of the farmers produced sugarcane, cumin, sunflower, watermelon, clover, and tomato, along with wheat and barley, while in 2019, a majority (60%) of the farmers turned to wheat and barley production alone. It is determined that there was an 80% decrease in the number of farmers producing sugarcane, sunflower, cumin, and clover in the research area, while watermelon and tomato production was not carried out in 2019. However, about 40% of the farmers have started cultivating new varieties of crops. Onions, melons, corn, and oats are the main products of these products.

ANOVA analysis which was conducted to determine whether the structural changes of farmers in agricultural enterprises

have changed depending on the time found that there is a statistically significant difference in land acquisition patterns, animal activity and animal numbers, and no significant difference in land widths and record keeping behaviors (Chart 3).

***Changes in Information Resources*:** Agricultural Information Resources of the farmers, processes of using information, and giving information-based production decision are the issues studied by researchers for more than 80 years (Tucker et Napier, 2002). Information is an input that is required at every stage of the decision-making process (Demiryürek, 2010). When the information resources of the farmers were examined, in 1989 the information sources of the farmers on agricultural issues were other farmers (37.9%), their family and their own experiences (24.2%), seed, pharmaceutical and machinery dealers that provides input to agriculture (22.7%), regional chief of beet (13.6%) which is a public institution, and agricultural books and brochures (1.6%), respectively. In 2019, however, it is determined that there was a major change in the information resources of the same farmers. In 2019, information resources of the same farmers are family and own experiences (44.5%), Provincial/District Directorates of the Ministry of Agriculture and Forestry (19.5%), seed that provides input to agriculture, pharmaceutical and machinery dealers (15.8%), other farmers (15.6%), the internet (3.1%), and agricultural books and brochures (1.5%), respectively. In 2019, the information resources of the other farmers in the same region are family and own experience (41.3%), seed, pharmaceutical and machinery dealers that provide input to agriculture (25.2%), other farmers (16.7%), Provincial/District Directorates of the Ministry of Agriculture and Forestry (10.9%) and the internet (5.9%), respectively.

The information resources that the farmers consult when they encounter a problem in the agricultural production process have also shown changes in the 30-year time frame. In 1989, the farmers tried to find a solution to a problem they faced during production, firstly in line with their own knowledge (51.5%). As other information resources that they consult in solving the problem they face, 21.2% of the farmers see other farmers, 15.2% see the regional chief of beet and 12.1% see seed, drug and machine dealers that provide input to agriculture. The information resources that the same farmers consulted when they encountered a problem in agricultural production in 2019 were their family and their own information (29.6%), Provincial/District Directorates of the Ministry of Agriculture and Forestry (26.6%), seed, pharmaceutical and machinery dealers that provide input to agriculture (20.4%), other farmers (20.3%) and the internet (3.1%), respectively. The information resources of the other farmers in the same region are the experiences of their family and their own information (33.9%), seed, pharmaceutical and machinery dealers (26.4%), other farmers (20.7%), Provincial/District Directorates of the Ministry of Agriculture and Forestry (17.8%) and the internet (1.2%). In the 30 years, the frequency of farmers reading newspapers, watching television and going to the provincial center has also changed. In 1989, 39.4% of the farmers read newspapers every day, 28.8% of the same farmers read newspapers every day in 2019, while other farmers in the same area, 8%, read newspapers every day. The rate of the farmers who never read newspapers in the research area was 6.1% in 1989 and 51.7% in 2019.

In 2019, while 87.9% of the farmers watch television once every day in 1989, the rate of television viewing once every day in the same group of farmers declined to 59.1%, and the rate of the other farmers in the same region declined to 16.1%. In ANOVA analysis, which was conducted to determine whether the changes in the information resources and communication behaviors of the farmers changed depending on the time, it is determined that there is a statistically significant difference in the information resources, the information sources they consulted when a problem occurred in the production process, the frequency of reading newspapers, watching television and going to the provincial center (Chart 3).

DISCUSSION

The aim of this research is to determine how changes in the socio-economic and information resources of the farmers have changed over 30 years. If these changes are to be summarized, based on this research carried out in 11 villages; One of the most remarkable findings of the study is that the population engaged in agriculture was 8 years older in 2019 than in 1989.

The income levels of the farmers within the village have decreased within 30 years. It can be said that the places where farmers live have changed from village to district or provincial center, education levels have risen, non-agricultural incomes have increased and diversified.

It is determined that all farmers without land acquired land in the 30 years. When the grounds of land possession of farmers without land are examined, the most significant factor is found as the "Law No. 4070 on the Sale of Farmland Belongs to the Treasury" issued in 1995. Thanks to this law, it is determined that the farmers have bought their land in advance or in installments from the state. It is determined that production with tenancy conducted by the farmers have also changed over the years, beside possessed lands. In the research area, the rate of businesses producing with tenancy increased to 65.5% in 2019 while the rate of businesses producing with tenancy was 56.1% in 1989. The ten percent increase comes from the farmers who migrate from villages to the district or provincial center and rent the land they own to other farmers in the villages.

In the 30 years, the farmers have abandoned livestock activity due to rising costs. This is due to the fact that young people

have moved away from agriculture and the inability to find shepherds. It can be said that the few farmers who do not quit their livestock activities or continue to engage in livestock activities in the region, do livestock farming for the market, specialize in livestock have increased the herd size by about 4 times compared to 1989.

As for the changes in the information resources of the farmers, the dominant understanding fatalism and being content with what you have ideas in the attitudes and behaviors of the farmers was also reflected in the information resources. The farmer and his family's experiences have dominated over the years. However, the number of information resources used in the area has diversified in line with the changing needs and requirements over the years. The main information resources for the farmers over the years have been determined to include organizations selling inputs to agriculture, Provincial/District Directorates of the Ministry of Agriculture and Forestry and the internet.

***Conclusions*:** As a result, developments in information and communication technologies over a 30-year period made it difficult to create new opportunities for agricultural dissemination by facilitating access to extension everywhere. Agricultural publication as one of the investment tools for human resources in the rural area, as well as studies to contribute to the proliferation of farmers who value extension and demand information, has been identified as one of the most important results of this research.

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