

FARMER ASPECTS OF THE EFFECTS OF GOOD AGRICULTURAL PRACTICES ON THE SUSTAINABILITY OF SOIL AND WATER SOURCES: THE CASE OF ADANA PROVINCE

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Abstract

To reveal the opinions of producers on the impact of good agricultural practices on the sustainability of soil and water resources, a total of 85 lemon and mandarin farmers, consisting 72 farmers from Yüreğir subprovince and 13 farmers from Seyhan subprovince of Adana province were surveyed for this study. A second survey was also conducted with the same number of farmers who did not apply good agricultural practices. The 67.06% of the farmers thought that good agricultural practices were positive regarding soil quality. The 68.42% of the farmers reported that the use of fertilisers with good agricultural practices decreased and consequently the factors causing pollution were left behind. 47.37% stated that soil fertility was also increased as a result of good agricultural practices and balanced fertilisation. About 65.88% of the farmers in the region believe that good agricultural practices give positive results regarding water quality. Nearly all of these producers have stated that there are no drug residues in irrigation and underground waters and that the factors that cause pollution in groundwater by reducing fertiliser use are decreasing.

Key words: Soil, water, sustainability, good agricultural practices, Turkey

INTRODUCTION

Agricultural environment pollution increased in the World. Notably, with the green revolution, intensive chemicals used to increase the crop productivity accelerated this pollution. For this reason, alternative agriculture systems came up for removing the negative effects of agriculture on the environment (Çukur and Işın, 2008). Sustainable development concept was first used in Brundtland Report which World Environment and Development Commission published in 1987. Sustainable development was defined as; the supply of today's requirements by not endangering the supply of the requirements of the next generations in the report (Anonymous, 1987). Thus, sustainable farming can be defined as the redirecting of agricultural activities for protecting the productivity and environment in the long-term, providing economic development and raising the rural life quality (Tan and Köksal, 2004).

Development of agriculture in Turkey might be provided by adoption of new global agricultural techniques to the country and by increasing the scales of farms in Turkey. In this context, good agricultural practices (GAP) played a significant role for high quality and controlled agricultural production (Gözen, 2010).

Good Agricultural Practices (GAP), aims to decrease the chemical usage in the agriculture, minimise the applications which damage the soil and the environment, increase the productivity and provide the agricultural sustainability. The primary purpose is to adapt the existing agricultural applications to new agriculture techniques within sustainability (İçel, 2007).

Sayın (2002) discussed the scope, content and achievements of Good Agricultural Practices in his study. As a result of the study, the achievements of EUREPGAP to the farmers and economy of our country were ordered as more productive and qualified production, entering to new markets, developments in farmer welfare with high incomes, environment conscious production and balance in natural resource use. In the study conducted by Sayın et al. (2004), EUREPGAP applications in EU and the probable effects of this development on fresh fruits and vegetable export were examined. EUREPGAP applications in the World, Europe and Turkey, were discussed, and the problems in fresh fruits and vegetable marketing and the solution offers were discussed. As a result of the study, all of the positive and negative

sides, risks and opportunities of the subject were evaluated by SWOT analysis. Akpınar et al. (2006) aimed to reveal the fruit foreign trade perspective of Turkey in their study. The fruit kinds which were subject to foreign trade and economically significant were selected in the study. Although the fruit production was significant regarding the amount, it was determined that the export ratio below. Gül and Akpınar (2006), determined that there were significant increases in the production of acreages and volumes of 22 fruit species in the world. Fruit production areas in Turkey differed regarding kinds, but production increases are arising from yield was executed. In the study, it was determined that Turkey be an expert country with the production amounts of hazelnut, quince, fig, apricot and cherry fruits. Poyraz (2009) aimed to put forward the applicability, contributions and risks of EUREPGAP in Turkey. For this purpose, secondary data and the research results in this respect were used, and the situation of EUREPGAP in our country and the solution offers were discussed. Hurma et al. (2010), conducted a study related to the knowledge level of the consumers about good agricultural practices in Tekirdağ province. They searched for healthy living and healthy consumption consciousness and confidence of the consumers in these crops. In the study conducted by Hasdemir (2011), personal and enterprise characteristics of cherry producers in Afyonkarahisar province were examined, and the factors effective on the adoption of good agricultural practices (GAP) were determined. The researcher has also studied the effects of new applications and constraints experienced by farmers adopted to GLOBALGAP (EUREPGAP) system, and environmental and human health aspects forcing farmers to shift to this system.

This aim of this study was to reveal the farmers' opinions who applied and did not apply good agricultural practices about the effects of good agricultural practices on the sustainability of soil and water sources.

MATERIAL AND METHOD

The material of the research was composed of the data obtained by survey method from citrus (lemon and mandarin) producers which applied and did not apply good agricultural practices in Adana province.

According to Adana Directorate of Provincial Food Agriculture and Livestock registrations, it was determined that good agricultural practices were applied in citrus farming at most. Yüreğir and Seyhan districts were chosen as good agricultural practices in citrus farming were applied mostly. It was determined that there were 120 lemon and mandarin producers in Yüreğir district and 22 lemon and mandarin producers in Seyhan district which applied good agricultural practices. It was determined that approximately 60% of these enterprises execute lemon and mandarin farming. Data were obtained from a total of 85 lemons, and mandarin producers who applied good agricultural practices in Adana province by survey method and 72 of these producers were in Yüreğir district, and 13 of these producers were in Seyhan district. The same questionnaire was also conducted with the same number of farmers who did not apply good agricultural practices for the comparison of the enterprises.

Average and percentage calculations, crosstabs and frequency distributions were used for the analyses of the data. Socio-economic characteristics of the producers and the effects of good agricultural practices on the sustainability of soil and water sources were determined.

RESULTS AND DISCUSSION

Agricultural production differs regarding production decision and production technique. General information about the farmers such as age, education level and agricultural experience is important.

The ages, education periods, household sizes and agricultural experiences of the farmers applying versus non applying good agricultural practices were given in Table 1.

According to the research results, the average ages of the farmers are applying versus non applying good agricultural practices were calculated as 56.78 and 50.87 years, respectively. As a result of the t-test, the difference between the ages of the farmers is applying versus non applying good agricultural practices was determined to be statistically significant in 1% ($p=0.003$) difference level.

The education periods of the farmers applying and not applying good agricultural practices were found at 12.56 and 9.27 years, respectively. As a result of the t-test, the difference between the education periods of the farmers applying and not applying good agricultural practices was determined to be statistically significant in 1% ($p=0.000$) difference level.

The household sizes of the farmers applying and not applying good agricultural practices were found at 3.82 and 4.71, respectively. As a result of the t-test, the difference between the household sizes of the farmers applying and not applying good agricultural practices was determined to be statistically significant in 1% ($p=0.002$) difference level.

The agricultural experience was determined as 26.85 years for the farmers applying good agricultural practices and 27.24 for the farmers not applying good agricultural practices.

In a similar study carried out in this region, the average ages, education periods and agricultural experiences of the farmers were found as 45.30, 6.7 and 28.90 years, respectively and it was determined that 24.7% of the farmers deal with non-agricultural activities (Demirtaş, 2005).

Table 1. Some socio-cultural indicators for the farmers in Adana province

	GAP	Non GAP
Age	56.78	50.87
Education period	12.56	9.27
Household size	3.82	4.71
Agricultural experience	26.85	27.24

When the non-agricultural activity of the farmers was examined, it was determined that a significant majority of the farmers deal with agricultural activities. It was determined that 32.94% of the farmers applying good agricultural practices and 37.65% of the farmers not applying good agricultural practices have non-agricultural activities. The difference between the farmers applying versus non-applying good agricultural practices according to the non-agricultural activities was not statistically significant.

Table 2. Non-agricultural activity

Non-agricultural activity	GAP		Non GAP		Total	
	Number	%	Number	%	Number	%
Yes	28	32.94	32	37.65	60	35.29
No	57	67.06	53	62.35	110	64.71
Total	85	100.00	85	100.00	170	100.00

Chi-square: 0.412

p: 0.521

Participation status of the farmers in village management was given in Table 3. It was determined that 10.59% of the farmers applying good agricultural practices and 4.71% of the farmers not applying good agricultural practices to participate in the village management. According to the chi-square test, the difference between the participation status of the farmers in village management was not statistically significant.

Table 3. Distribution of the farmers according to the participation in village management

Participation in village management	GAP		Non GAP		Total	
	Number	%	Number	%	Number	%
Yes	9	10.59	4	4.71	13	7.65
No	76	89.41	81	95.29	157	92.35
Total	85	100.00	85	100.00	170	100.00

Chi-square: 2.082

p: 0.149

Membership of the farmers to agricultural organisations was given in Table 4. It was determined that 95.29% of the good agricultural practices farmers and 84.71% of the classical farmers were affiliated to the agricultural organisations. Chi-square test was conducted to determine the difference between the farmers applying and not applying good agricultural practices according to the membership to agricultural organisations statistically. It was determined that the difference between the farmers was statistically significant in the 5% level.

It was determined that 153 farmers were affiliated to the agricultural organisations and 87.58%, 73.20%, 15.69% and 13.07% of these farmers were the members of Chamber of Agriculture, Irrigation Union, Agricultural Credit Cooperative and Irrigation Cooperative, respectively. Among the farmers who were the members of agricultural organisations, 82.72% and 70.37% of the good agricultural practices farmers were the members of the Chamber of Agriculture and Irrigation Union, respectively. Besides, 39.51% of GAP farmers were the members of Adana Citrus Producers Union.

Table 4. Distribution of the farmers according to the membership to agricultural organisations

Membership in the agricultural organisation	GAP		Non GAP		Total	
	Number	%	Number	%	Number	%
Yes	81	95.29	72	84.71	153	90.00
No	4	4.71	13	15.29	17	10.00
Total	85	100.00	85	100.00	170	100.00

Chi-square: 5.294

p: 0.021

It was determined that 153 of 170 citrus farmers were affiliated to the agricultural organisations and 57.52% of these farmers stated that they did not attend the training of these organisations. Besides, it was determined that 21.57% of these farmers sometimes attended to these training and 20.92% of these farmers attended to these training continuously. 40.74% and 76.39% of the farmers applying and not applying good agricultural practices stated that they did not attend the training, respectively (Table 5). Chi-square test was determined the difference between the GAP applying and non-applying farmers to attendance to training where the difference between the farmers was statistically significant in a 1% significance level.

Table 5. Distribution of the farmers according to the participation in the training of the organisations

Participation in the training of the organisations	GAP		Non GAP		Total	
	Number	%	Number	%	Number	%
None	33	40.74	55	76.39	88	57.52
Sometimes	23	28.40	10	13.89	33	21.57
Continuously	25	30.86	7	9.72	32	20.92
Total	81	100.00	72	100.00	153	100.00

Chi-square: 20.287

p: 0.000

Soil analysis execution of the farmers was given in Table 6. It was determined that 95.88% of the farmers state that they had soil analysis and 4.12% of the farmers stated that they did not have soil analysis. All good agricultural practices farmers and 91.76% of the farmers not applying good agricultural practices were analysing their soils. All the farmers who did not have soil stated that they did not need to have soil analysis (Table 6).

Table 6. Distribution of the farmers according to soil analysis execution

Soil analysis	GAP		Non GAP		Total	
	Number	%	Number	%	Number	%
Yes	85	100.00	78	91.76	163	95.88
No	0	0.00	7	8.24	7	4.12
Total	85	100.00	85	100.00	170	100.00
If no. reasons						
I do not need	0	0.00	7	100.00	7	100.00
Total	0	0.00	7	100.00	7	100.00

It was determined that 66.47% of the farmers state they obtained and applied information from the agricultural organisations about irrigation methods and amounts. Besides, 67.06% of the farmers applying good agricultural practices and 65.88% of the farmers not applying good agricultural practices stated that they obtained and applied information from the agricultural organisations about irrigation methods and amounts (Table 7).

Table 7. Distribution of the farmers according to getting information about irrigation methods and amounts and implementation

Information about Irrigation Methods and Amounts and Implementation	GAP		Non GAP		Total	
	Number	%	Number	%	Number	%
Yes	57	67.06	56	65.88	113	66.47
No	28	32.94	29	34.12	57	33.53
Total	85	100.00	85	100.00	170	100.00

Chi-square: 0.026

p: 0.871

As a result of the evaluations, 23.01% of the farmers stated that irrigation amount and methods did not change whereas 76.99% of the farmers stated that irrigation amount and methods changed according to the information from the agricultural organisations. 84.21% of the farmers applying good agricultural practices and 69.64% of the farmers not applying good agricultural practices stated that irrigation amounts and methods changed due to this informations.

90% of the farmers stated that they obtained and applied information from the agricultural organisations about fertilising and spraying. 94.12% and 85.88% of the farmers applying and not applying good agricultural practices stated that they obtained and applied information about fertilising and spraying, respectively. Farmers expertise service acceptance levels related to fertilising and spraying implementations was statistically significant in the 10% significance level (Table 8).

Table 8. Distribution of the farmers according to the consultation about fertilising and spraying

Information about fertilising and spraying and implementation	GAP		Non GAP		Total	
	Number	%	Number	%	Number	%
Yes	80	94.12	73	85.88	153	90.00
No	5	5.88	12	14.12	17	10.00
Total	85	100.00	85	100.00	170	100.00

Chi-square: 3.203

p: 0.074

As a result of the evaluations, 66.01% of the farmers stated that fertiliser and pesticides amounts and application times changed whereas 33.99% of the farmers stated that fertiliser and pesticides amounts and application times did not change according to the information from the agricultural organisations. 22.50% of the farmers applying good agricultural practices and 46.58% of the farmers not applying good agricultural practices stated that fertiliser and pesticides amounts and application times did not change due to the information.

The reasons for applying good agricultural practices were given in Table 9. According to the results, 84.71% of the farmers stated that they applied good agricultural practices for supporting. Besides, 49.41%, 38.82%, 35.29%, 28.24% and 22.35% of the farmers stated that they applied good agricultural practices regarding less harm to the environment, obtaining qualified crop, security of the farmers, control in each phase and obtaining more crops, respectively (Table 9).

Table 9. Reasons for applying good agricultural practices

Reasons for applying good agricultural practices	GAP	
	Number	%*
Supporting	72	84.71
Less harm to the environment	42	49.41
Qualified crop	33	38.82
Security of the workers	30	35.29
Control in each phase	24	28.24
More crop	19	22.35

*: More than one choice

67.06% of the farmers applying good agricultural practices considered that good agricultural practices were favourable regarding soil quality. 68.42% of these farmers stated that pollutants disappeared as the fertilizer use decreased, 63.16% of the farmers indicated that pesticide residue decreased, 47.37% of the farmers stated that soil productivity increased as a result of conscious fertilizing and 43.86% of the farmers stated that soil structure improved due to proper soil tillage and fertilizing (Table 10).

Table 10. Significant aspects of GAP regarding soil quality

Significant aspects of GAP regarding soil quality	GAP	
	Number	%*
Pollutants disappeared as the fertiliser use decreased	39	68.42
Soil productivity increased as a result of conscious fertilising	27	47.37
Soil structure improved due to proper soil tillage and fertilizing	25	43.86
No pesticide residue as an excessive pesticide is not used	36	63.16

*: More than one choice

65.88% of the farmers applying good agricultural practices considered that good agricultural practices were favourable regarding water quality. 94.64% of these farmers stated that there was no pesticide residue in irrigation water and groundwater, 91.07% of the farmers stated pollutants disappeared in groundwater as the fertiliser use decreased and 1.79% of the farmers stated that the studies to decrease the pH value increased the water quality (Table 11).

Table 11. Significant aspects of GAP regarding water quality

Significant aspects of GAP regarding water quality	GAP	
	Number	%*
No pesticide residue in irrigation water and groundwater as an excessive pesticide was not used	53	94.64
Pollutants disappeared in groundwater as the fertiliser use decreased	51	91.07
pH values were high according to the analysis results and training were done to decrease the pH value, and this increased the quality of the water	1	1.79

*: More than one choice

CONCLUSION

The farmers stated that they applied good agricultural practices for less harm to the environment, obtaining qualified crop, security of the workers, control in each phase and obtaining more crops. For these reasons, the producers should be informed regarding the positive contribution of good agricultural practices regarding environmental protection and human health and consciousness on this subject should be provided.

The farmers stated that soil pollution was prevented and soil productivity increased due to the decrease in fertiliser usage and conscious usage of fertiliser. Similarly, they stated that pesticide residue in the soil decreased as an excessive pesticide was not used. More than half of the farmers indicated that they applied fertiliser according to the soil analysis results before applying good agricultural practices and some of the farmers indicated that they applied pesticides due to the suggestions of agriculture consultants. The opinions of the farmers about the effects of good agricultural practices on water quality revealed the conscious level of the farmers.

Based on these statements, it can be concluded that the citrus farmers in Adana province had a significant knowledge level about good agricultural practices and their expectations from good agricultural practices were factual.

According to these results, some applicable suggestions can be explained as follows.

- The subvention amounts in good agricultural practices should be increased.
- The marketing conditions for good agriculture products should be improved.
- It should be focused on the advertisement and presentation programs for the consumers to recognise and prefer the good agriculture products.

The farmer training on this subject should be regarded, and GAP publication programs should be done, and within this scope, some activities such as course and seminars can be arranged.

ACKNOWLEDGEMENTS

We would like to thank TAGEM (Project number: TAGEM/TEAD/12/A15/P02/009) for their financial support for this project.

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