

PESTICIDE USAGE AND ITS EFFECTS ON THE ENVIRONMENT IN THRACE REGION

N. METIN^a, A. KUBAS^b, H. HURMA^b, E. R. ERBAY^{b*}

^a*Faculty of Economics and Administrative Sciences, Department of Econometrics, Marmara University, Istanbul, Turkey*

^b*Faculty of Agriculture, Department of Agricultural Economics, Thrace University, Tekirdag, Turkey*

E-mail: erbay@tu.tzf.edu.tr; akubas@tu.tzf.edu.tr

Abstract. Productivity per unit area in agricultural production is getting more important from the point of view of both feeding the increasing population and increasing the income level of the farmers. However, keeping high productivity target or production level depends on control of diseases and insects. Thrace region is among leading regions with regard to agricultural potential in Turkey. The products such as rice, sugar beet in irrigated areas in addition to wheat and sunflower are grown on 95% of 1.2 million hectare agriculture land in the region. In this study, pesticide usage has been analysed based on the data obtained from questionnaires made with wheat, sunflower and rice producers. Topics used in production of these products like trademark, purchase place, amount of usage of pesticides, conscience level of farmers, information sources have been examined. Gala lake as an important watery area is one of the most affected areas by pesticides. Flora and fauna as well as birds and fishes kinds in lake are affected by pesticides used in agricultural production. According to the results obtained from research findings, the amount of pesticide used per decare in terms of effective matter in wheat, sunflower and rice has been determined to be respectively 76.2, 87.6, 391.66 g/da. Considering that pesticide average is 63 g/da in Turkey, it has been concluded that the amount of pesticide used for basis productions grown in region is much. Due to the wrong pesticide applications of the farmers, this case comes out to be a distinct environment problem which results in environment pollution in the Thrace region.

Keywords: pesticide, environmental pollution, cluster analysis, agricultural product, Thrace region.

AIMS AND BACKGROUND

Plant diseases and pests have increased with the development of technology in agricultural production. Thus, the losses in agricultural production due to the diseases and pests have been worked in order to reduce crop losses.

Although all applications leading to increased output such as appropriate land cultivation, high yielding hybrid seed usage, appropriate fertilising and irrigation have been applied in vegetable production in order to take high quality and ample crop, an effective control of diseases, pests and wild plants is needed.

* For correspondence.

An important part of pesticides and fungicides are the wide spectrum compounds. Therefore, natural enemies that keep pests control also suffer. Consequently, pests that were kept under by their enemies control may become harmful.

Chemicals contaminated in the soil in various ways prevent activities of microorganisms. This causes partial or complete destruction or the loss of activities of microorganisms for certain periods¹.

Pesticides affect all fauna depending on peculiarity of toxics and permanence. Human beings are the most sensitive targets in this interaction. Chronic poisoning in human beings and mammals due to pesticides result in due to pesticide decay derivatives that are taken with food chain. Chronic poisoning happens from obstinate pesticide decay derivatives that are long permanent time.

PESTICIDES USAGE IN TURKEY AND THRACE REGION

Agricultural chemicals are produced approximately 3 million tons in the world. Total annual sale changes between 25 to 31 billion dollars. Herbicides are first in the row with 47% share in pesticides consumption².

Pesticide consumption is approximately 32 000 t according to 1999 data. The quantity of pesticide used in farming differs according to the regions and crop varieties.

Insecticides form 35.25% of total pesticide usage in Turkey. The shares of fungicides and herbicides are 23.03 and 22.98%, respectively, in total consumption. The remaining part consists of oils, akaracides, nematocides, and other pesticides³.

Pesticide usage is low in Turkey as compared to the developed countries in unit area. Pesticide usage per hectare in France, Germany, Italy, Holland, Greece and Belgium is 4.4, 7.6 kg, 17.5, 6, and 10.7 kg, respectively. However, pesticide usage per hectare is 0.63 kg in Turkey².

Thrace region is among the leading regions in agricultural production of Turkey. According to 2002 data, Turkey provides an important part of wheat (8.05%), sunflower (63.25%) and rice (44.12%) production in the Thrace region. In addition, barley (2.05%), grape (2.59%) and sugar beet (1.45%) are produced in the same region⁴.

Farmers in this region especially prefer herbicide usage because it is cheaper and more effective for the control of wild grass compared to killing the wild plants by farm machinery or hand tools. In sunflower agriculture, chemicals containing high proportions of triflin are used for the control of wild grass.

In the same way, in wheat agriculture, chemicals containing amin are preferred for the control of wild grass⁵. In addition, in Thrace region *Eurygaster integriceps* has been controlled through air spray by state support in the years of

epidemy. Pesticide quantity used in the region, including fungicides for mushroom diseases and insecticides for pests, reaches approximately 2314 t in 1999. This number corresponds to 7.1% of total pesticide usage in Turkey⁶.

The quantity of pesticides used per unit area, for the crops such as wheat, sunflower, barley, rice, grape which are grown intensively in the region, is given in Table 1.

The quantities of pesticides used per unit area for sunflower, rice, barley, wheat and grape agriculture are 87.6, 391.66, 82.69, 76.2 and 1123.6 g/da, respectively, according to the effective matter species.

Table 1. Amount of pesticides used per unit area in term of effective matter species⁷

Product	Pesticide usage (g/da)
Wheat	76.2
Sunflower	87.6
Barley	82.69
Paddy	391.66
Grapes	1123.6

EFFECTS OF PESTICIDES ON THE ENVIRONMENT

Paddy farming is commonly made on agricultural lands surrounding the rivers Meric and Ergene in Thrace region. On lands where paddy agriculture is made, herbicides, fungicides, and insecticides are used over the proposed doses. Paddy agriculture made with intensive water threats flora and fauna in and around the lake Gala (Nature Protection Area) which is the one of the important natural resources.

Side effects of pesticides negatively affect honey bee-keeping in the Thrace region as well. Especially during the sprays made by airplane for *Eurygaster integriceps*, bees die. Thus, honey output per hive falls significantly. The periods that air sprays made are announced to producers by various organisations. However, some producers can not obtain this information.

Sericulture made in total 10 settlement locations also suffers from *Eurygaster* sprays (7 in central and Meric districts of Edirne province, 2 in central and Babaeski districts of Kirklareli province, and 1 in Ucmakdere region of Tekirdag province)⁸. Following pest control, chemical residues remain effective and impact live animals negatively and may even cause death⁹.

Effects of pesticides on natural resources and human health¹⁰ have been evaluated by means of a cluster analysis (Fig. 1).

According to analyses, underground and surface waters form a similar group. However, probable effects on vegetables and human health move into the same cluster since these are affected in different levels and distinct groups form. Pets and poultry are the same group because of being affected similarly. By taking place in the same group in as birds, all of these factors form a cluster.

Bees and fish that are more sensitive to pesticides show the same character-

Dendrogram using average linkage (between groups)

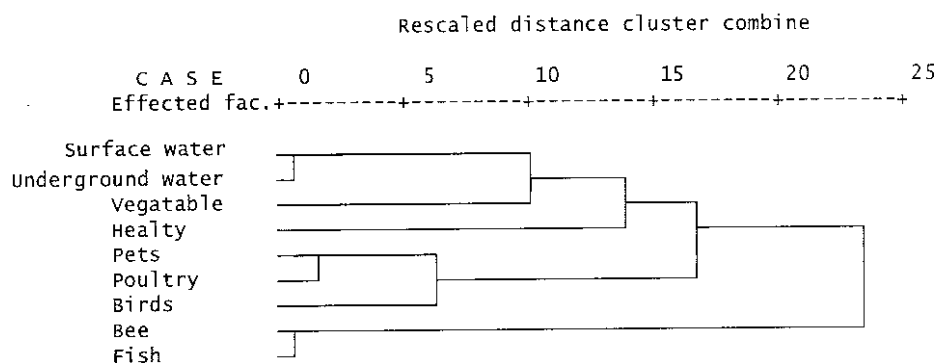


Fig. 1. Effects of pesticides on natural resources and human health

istics and move into the same cluster in second cluster.

CONCLUSIONS

Pesticides used for wheat, sunflower and rice produced in the region are used commonly against pathogens and wild grass in order to increase productivity. Since these pesticides used in agricultural production are not used at optimum levels, the agricultural structure in the region affects human health and natural structure negatively. Fishing, bee-keeping and sericulture have been determined to be agricultural activities directly suffering from pesticide use.

As long as restrictive politics and arrangements for inputs used in agricultural production are not made, chemical contaminations of underground fresh water resources will be the first and foremost pollution problem which threatens the region. Then the contamination of land, water resources, lakes, and seas will follow.

Firms producing and marketing pesticides in Turkey have to determine the doses of pesticides in the instructions by making investigations and setting up trials in order to find optimum amount of pesticide per unit area according to the regions. In addition, farmers should be educated by the firms that are producing and marketing pesticides, or other extension agents pre-sale and post-sale. In this study, it has been concluded that the information levels of the farmers are not at the desired level concerning pesticide use.

In order to ensure optimum levels of pesticide usage, subsidies may be removed. In addition, regarding chemical applications, different doses of pesticides have to be tried and consequently relevant doses of pesticide applications should be recommended to farmers.

General evaluation of pesticide usage with respect to environment and health:

- natural environment conditions are neglected;
- pesticide residues remains in agricultural crops;
- damages in the biologic circle;
- animals negatively affected;
- contamination of underground and surface water sources with chemicals;
- flora and fauna negatively affected;
- fishing, bee-keeping and sericulture negatively affected;
- useful organisms negatively affected;
- farmers negatively affected.

Necessary precautions:

- biologic production methods might be given priority;
- the advices regarding low cost and protective agricultural production methods can be given to the farmers;
 - government must take a supportive role concerning crops that will be produced by these methods;
 - farmers should be donated by the information about the effects of pesticides on live animals and environment;
 - the farmers should be informed concerning the optimum level of pesticide for the control of diseases and pests;
 - environmental factors should be taken into consideration during pest controls;
 - consumers should be informed about the crops that are produced by organic agricultural methods in order to increase the demand of organic farm products.

REFERENCES

1. E. OLHAN: Environment Problems that Input Usage Causes in Vegetal Production. Organic Agriculture Practice: Such as Manisa. Ankara University, Natural Sciences Institute, Ph. D. Thesis, Ankara, 1997.
2. H. TANRIVERMIS: Economic Analysis of Agricultural Drug Usage in Tomato Production in Middle Sakarya River Basin. TEAE, Publication No 42, Ankara, 2000.
3. A. KUBAS, H. HURMA: Usage of Pesticides in Agricultural Production World, Magazine of Food, (6), 64 (2002).
4. ANONYMOUS: Agricultural Structure and Production. GSI, Ankara, 2002.
5. ANONYMOUS: Licensed Agricultural Battle Drugs. Agriculture and Village-works Ministry, Protection and Control Directorate, Ankara, 1999.
6. ANONYMOUS: Agriculture and Village-works Ministry. Plant Protection Office Recordings, Ankara, 2000.
7. A. KOC, H. TANRIVERMIS, F. BUDAK, E. GUNDOGMUS, I. H. INAN, A. KUBAS, H. HURMA: Usage of Pesticides in Turkish Agriculture: Effectiveness, Problems and the Effects of Alternatives Regulations. Report of Project, Agricultural Economics Research Institute (AERI), Ankara, 2001.

8. CITIR: Evaluation of Control Means of Sunn Pests *Eurygaster* Spp. (Heteroptera:Scutelleridae) on Wheat in Trakya Region and Their Effects on Other Agricultural Practices. In: 2nd International Symposium on New Technologies for Environmental and Agro-Applications, Tekirdag, 2000.
9. H. H. TOK: Pesticide Usage and Its Effects on the Environment in Thrace Region. In: Industrialisation and Environment Symposium for Today and Future of Thrace in Thrace. Mmo Publication, Corlu, 1996, 402-411.
10. A. KUBAS, I. H. INAN, H. HURMA, I. BASER, M. O. AZABAGAOGLU: The Analysis of Agricultural Pesticide Use in Point of Sustainable Agricultural Policy in Turkey: An Example of Trakya Region. Trakya University Research Fund (TUAF), Project number 279, Edirne, 2001.

Received 7 November 2002

Revised 20 February 2003