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## ECOLOGICAL ASSESSMENT OF PESTICIDE USE IN THE REPUBLIC OF KARAKALPAKSTAN

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**ABSTRACT:** This study analyzes the extensive use of pesticides in Karakalpakstan from 1980 to 2000, with a recorded application of 75.8 kg/ha based on 100% active ingredient. The peak years for pesticide usage were 1981, 1982, 1986, 1987, and 1990, followed by a gradual decline starting in 1995. The most common types were inorganic metal-containing compounds (61.18%) and halogen-substituted anilides of carboxylic acids (14.5%), while organophosphorus and organochlorine pesticides constituted smaller shares. Recent environmental studies, including collaborative research by "Doctors Without Borders" and the WHO European Centre for Environment and Health, revealed critically high contamination levels in food products rich in lipids—such as mutton fat, chicken fat, eggs, and cottonseed oil. These findings highlight the urgent need to prioritize food safety, as over 90% of human exposure to pesticides comes from food consumption.

### KEYWORDS

Karakalpakstan, pesticides, environmental contamination, food safety, organophosphorus, organochlorine, dioxins, polychlorinated biphenyls (PCBs), public health, lipid-rich foods.

### INTRODUCTION

At present, one of the most significant factors impacting human health is pesticides—a specific group of chemical substances intentionally introduced into the environment, which, under certain conditions, increase the risk of health disorders (Atabayev et al., 1970; Roustan, 2014). Long-term and large-scale application of pesticides in countries around the world has revealed a number of negative consequences, such as environmental pollution, contamination of food products, and adverse effects on human health.

The Southern Aral Sea region, due to its geographical location, irrational use of natural resources, and mismanagement, is under severe anthropogenic pressure. In the Southern Aral region (Republic of Karakalpakstan), 4.8 thousand tons of pesticides—including persistent and highly toxic substances—were used during the period 1980–1989. The application density reached 13.2 kg/ha. In the spring, the level of hexachlorocyclohexane (HCH) in the soil in some cases reached 3–5 times the maximum permissible concentration (Kurbanov et al., 2002).

At the same time, by the late 1980s, 12 thousand tons of expired chemical substances had accumulated in the warehouses of various farms in Uzbekistan. Among them were 1,112 tons of banned pesticides, which posed a serious disposal problem. According to 1992 data, 2.5 thousand

tons of butiphos, banned in 1987, remained in storage. An additional 2.7 thousand tons of pesticides and mineral fertilizers were discovered at agricultural airfields and cotton fields.

As a result of excessive pesticide use, there has been contamination of soil, water, and plants, as well as an increase in disease rates among the population residing in these areas.

According to experts, from 1980 to 2000, a total of 75.8 kg/ha of pesticides (based on 100% active ingredient) were applied to the agricultural lands of Karakalpakstan (see Table 1). Particularly large amounts were applied in the years 1981, 1982, 1986, 1987, and 1990, followed by a gradual decline in the subsequent years (starting from 1995). The most frequently used pesticides belonged to the groups of inorganic metal-containing compounds (61.18%) and halogen-substituted anilides of carboxylic acids (14.5%). Organophosphorus and organochlorine pesticides accounted for 3.8% and 1.7%, respectively (Kurbanov et al., 2002). In recent years, the contamination of the environment in the Aral Sea region with chemical toxicants has reached critical levels.

According to research conducted by the organization "Doctors Without Borders" in collaboration with the WHO European Centre for Environment and Health to determine levels of contamination by dioxins (PCDD/PCDF), polychlorinated biphenyls (PCBs), organochlorine, and organophosphorus pesticides in food consumed by the residents of Karakalpakstan, it was found that the highest contamination levels were present in foods with high lipid content (mutton and chicken fat, eggs, and cottonseed oil).

Thus, when addressing the issue of pesticide impact on health, special and primary attention must be given to the safety of agricultural products, since more than 90% of all pesticides entering the human body from the environment come from food.

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