

# Pollution of agricultural soils with heavy metals through irrigation water in Eastern Georgia

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## INTRODUCTION AND OBJECTIVES

Current study was conducted in Kvemo Kartli region, Eastern Georgia, in order to assess current status of irrigation water quality as well as degree of soil contamination by heavy metals already being under irrigation. Water quality is affected by open pit mining activities in upstream areas causing elevation of concentrations of heavy metals in irrigation water.

Three arable plots were selected for this study from exiting irrigated lands as potentially affected areas to evaluate heavy metal concentrations in soils and assess their bioavailability.

## METHODOLOGY

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Individual soil sampling locations was selected randomly to ensure complete coverage of the plot. In total 9 composite soil samples were taken from

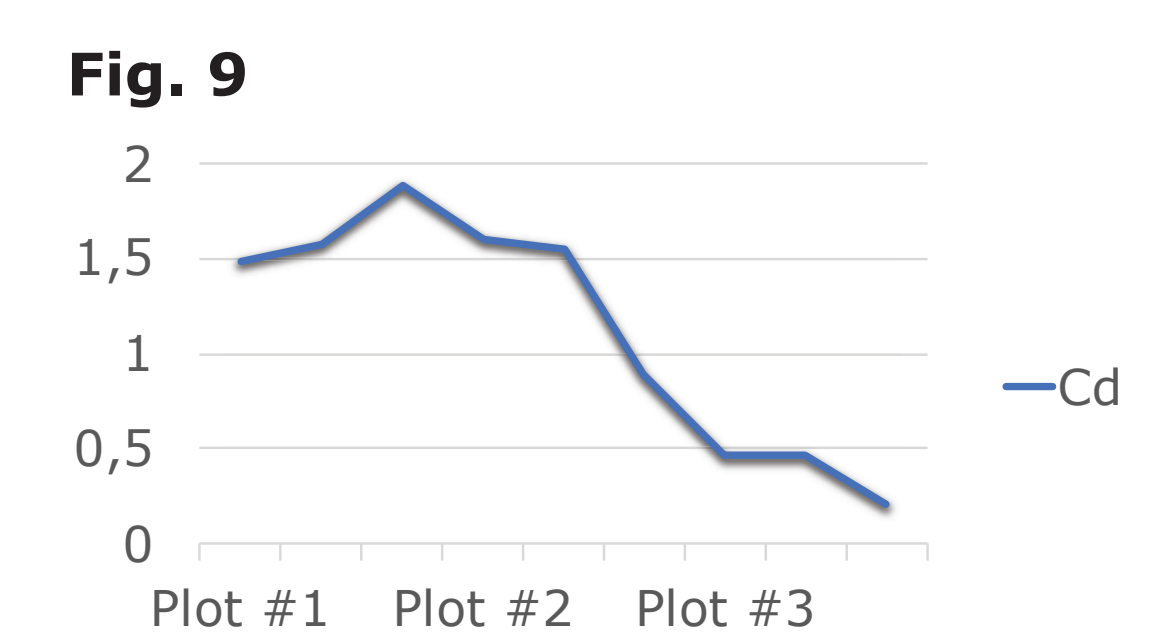
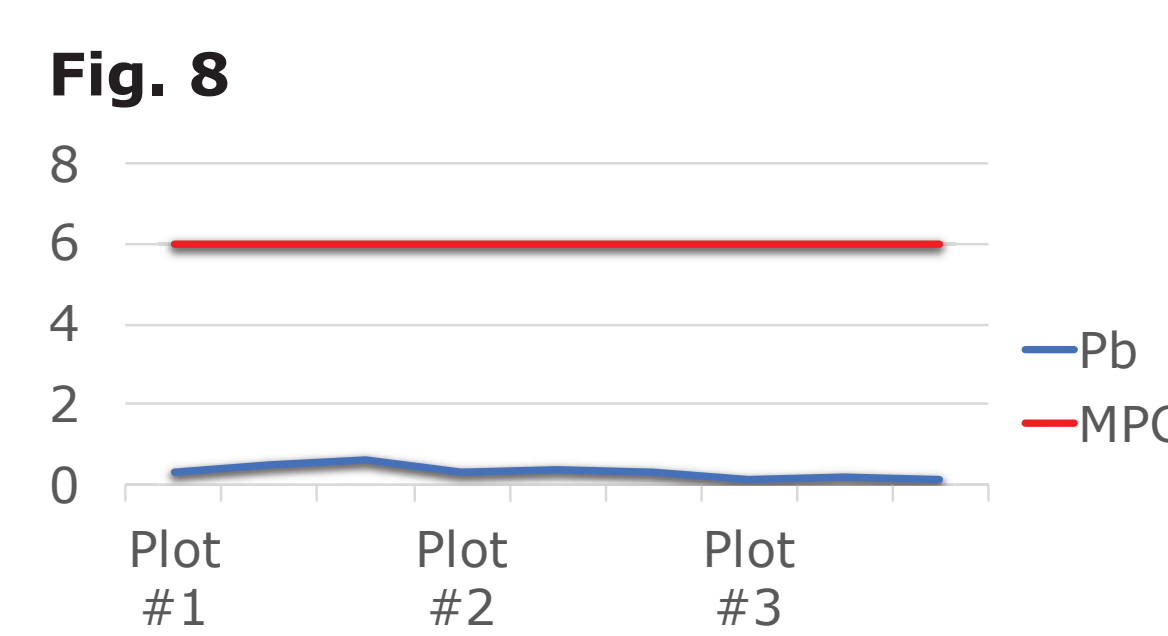
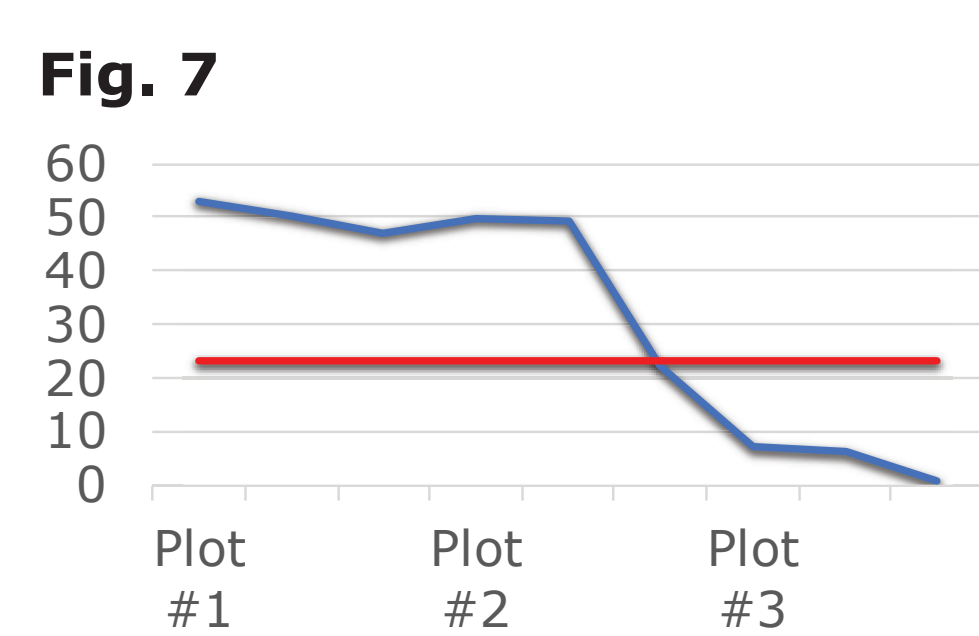
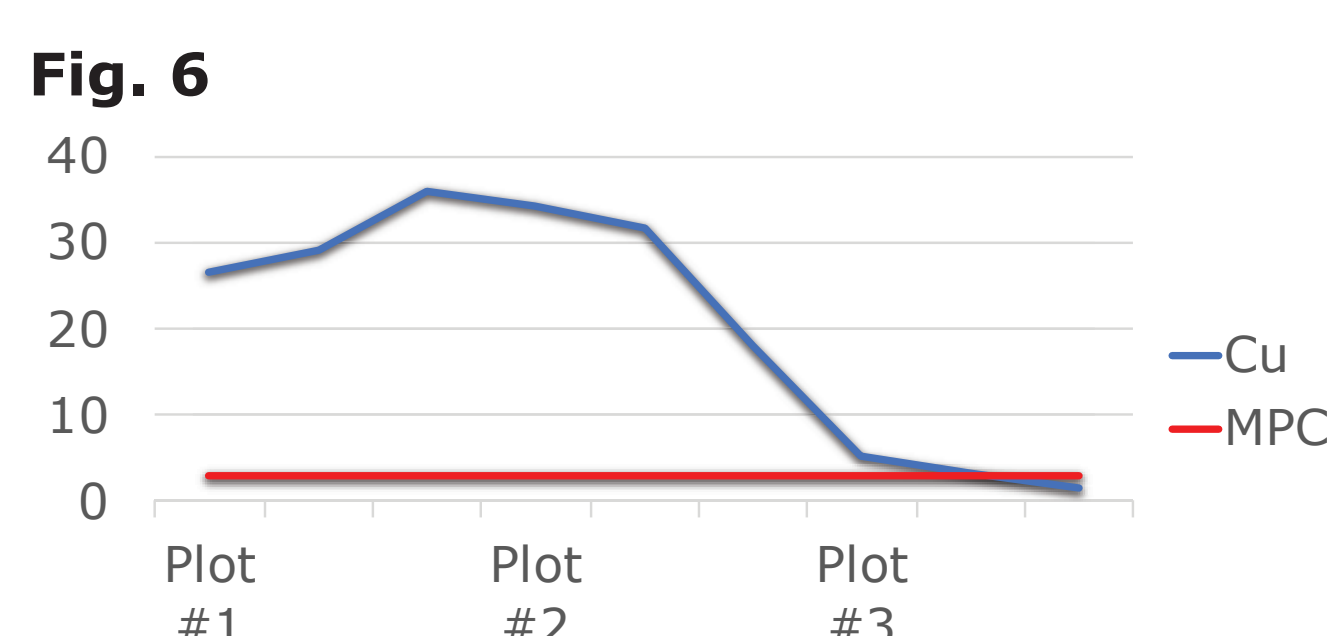
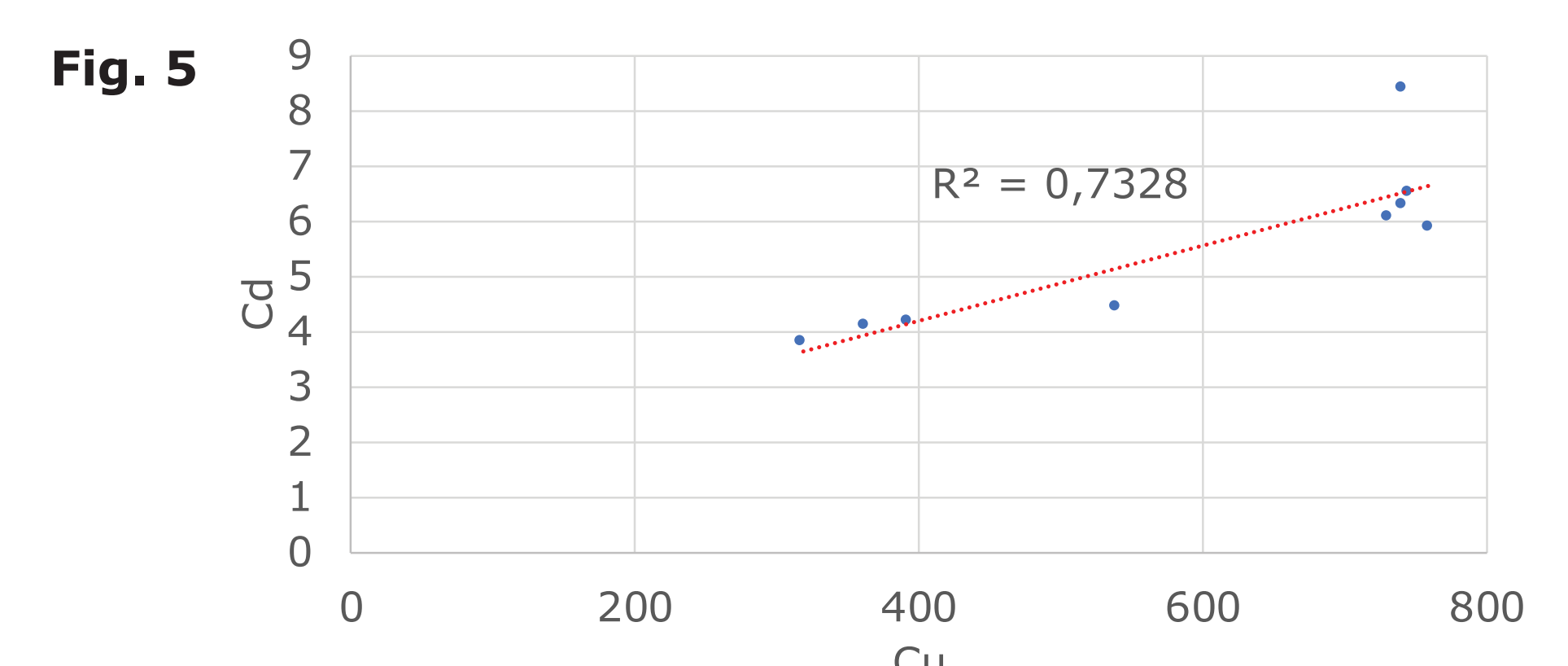
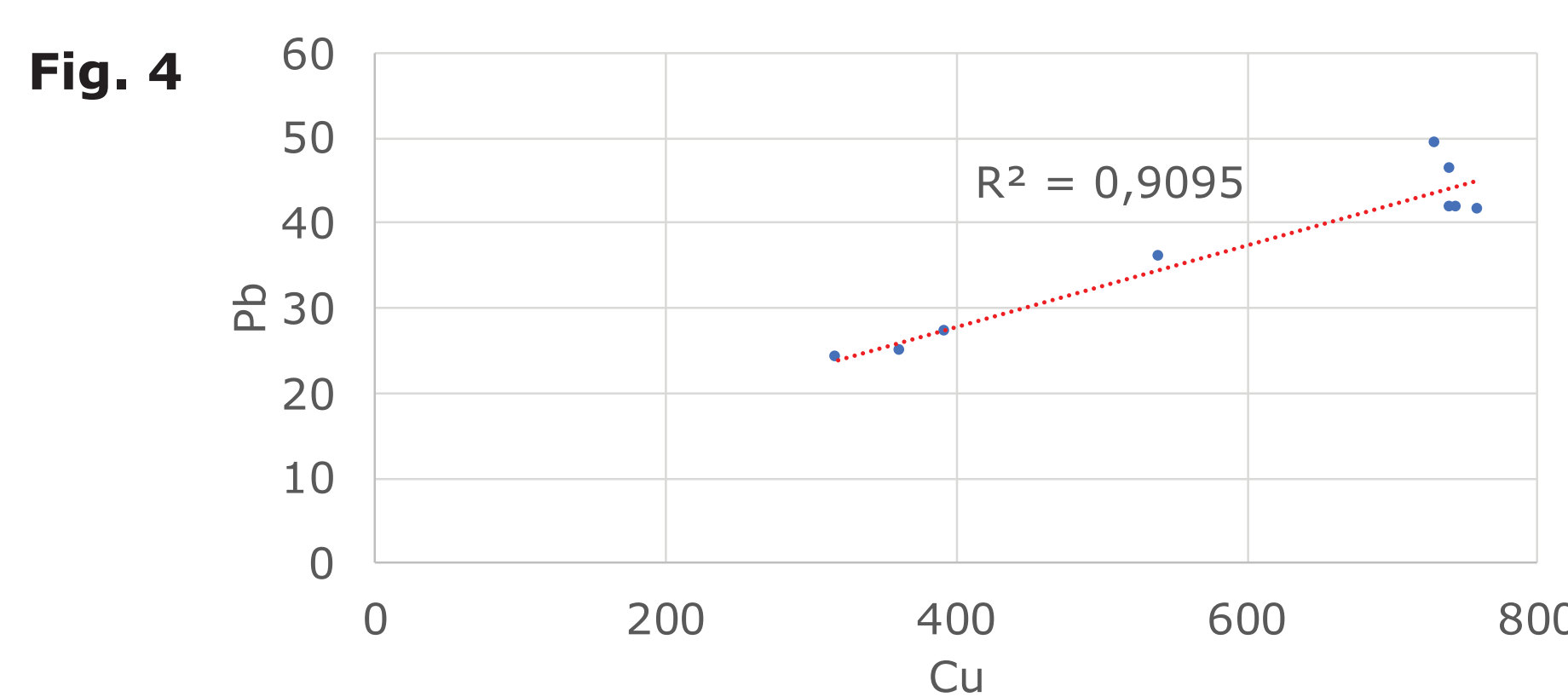
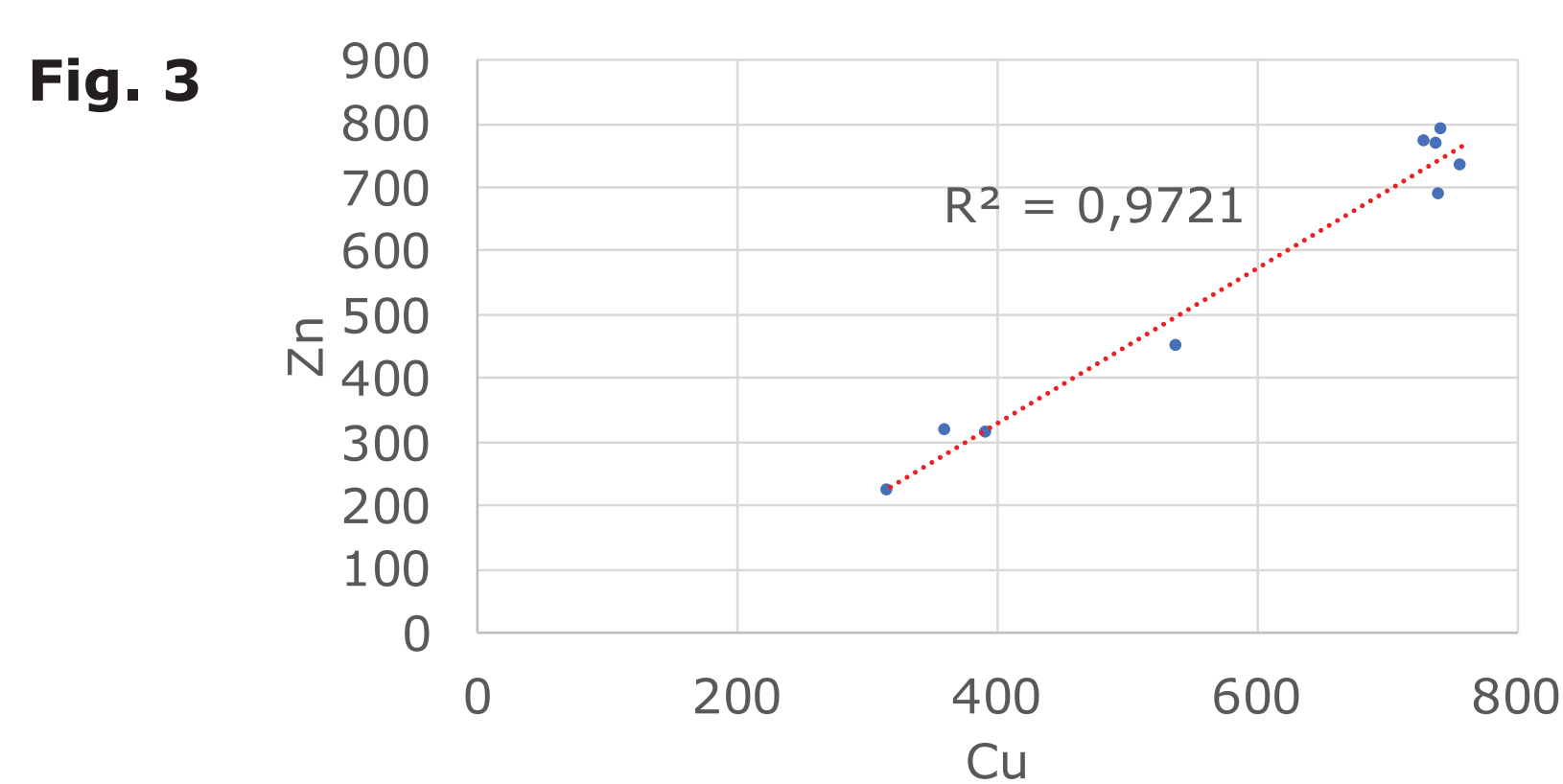
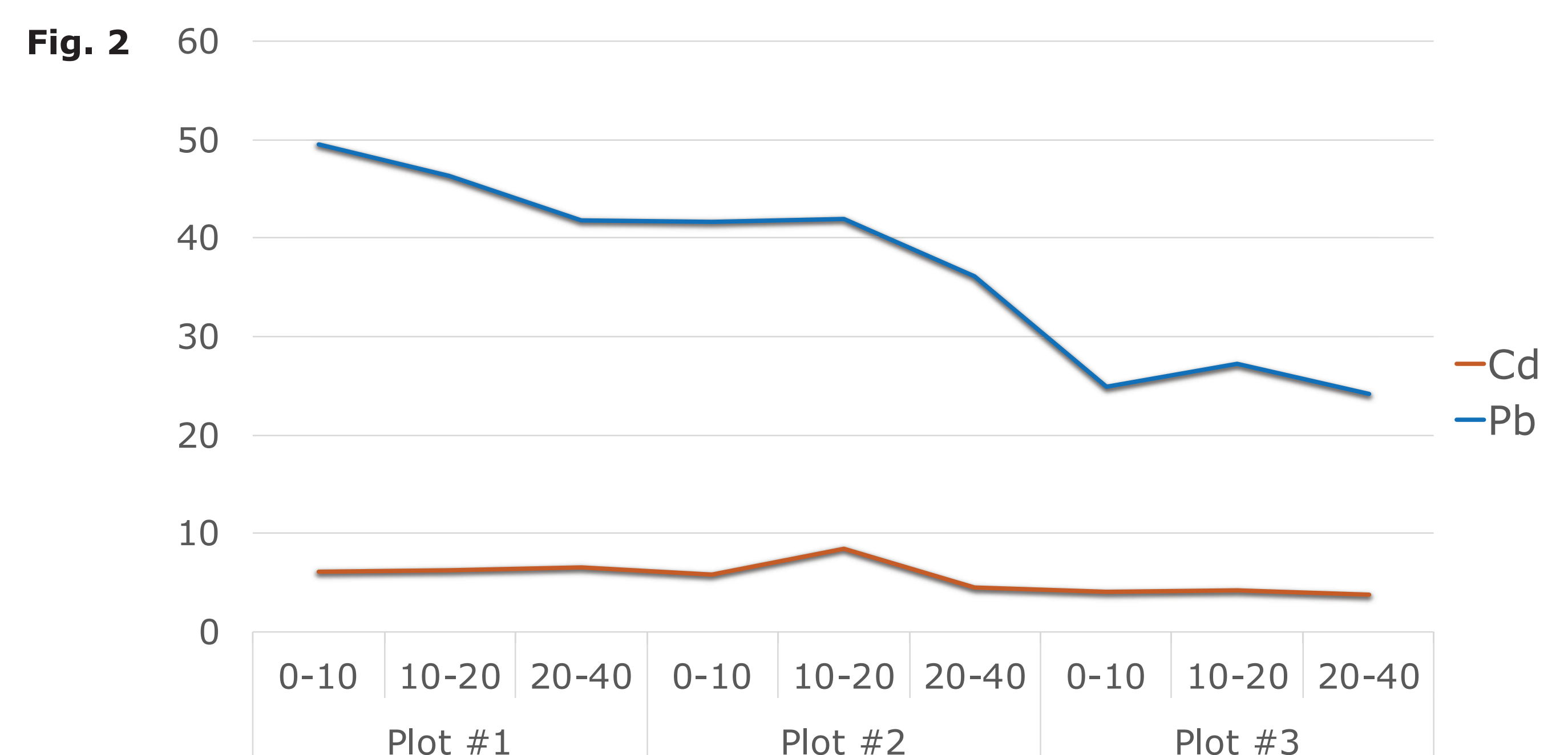
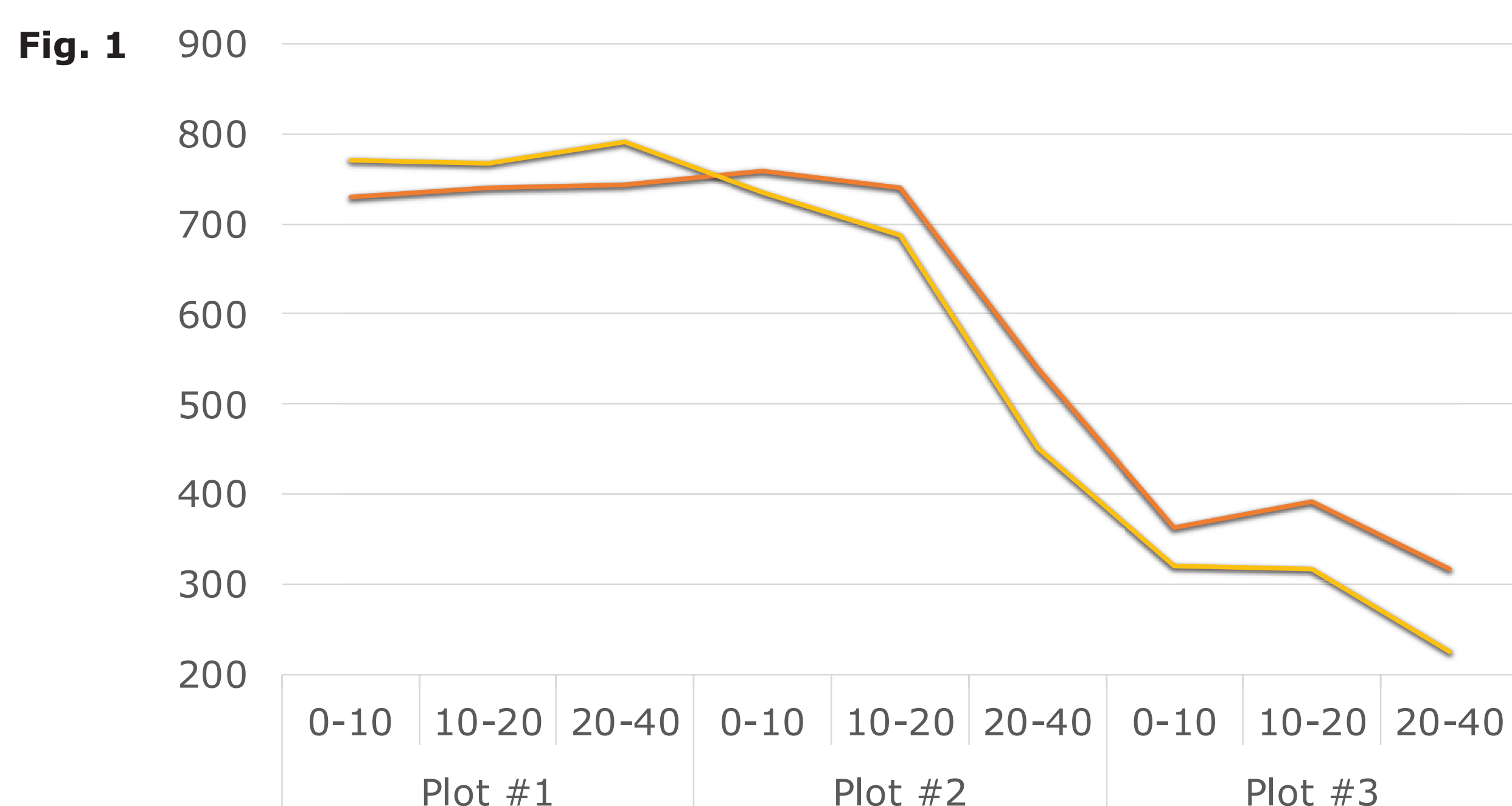
three plots and analyzed in the Laboratory of Soil Research of the Soil Fertility Research Service.

Total concentration of four heavy metals Pb, Cd, Zn and Cu were determined in aqua regia extracts using flame atomic absorption spectrometer (Cu and Zn) and graphite furnace atomic absorption spectrometer (Pb and Cd).

## RESULTS

The results of laboratory analysis (Fig.1, 2) were compared to guide values established in Georgia for heavy metals in agricultural soils. The comparison has shown that studied soils on all three plots are polluted with Cu, Cd and Zn. The concentration of Pb is slightly elevated from the local background, but is under recommended guide value. Fig.3, 4 and 5 shows correlations of Cu with other studied heavy metals. All three metals are highly correlated indicating on similar source of pollution.

The concentration of mobile forms of studied heavy metals were above maximum permissible concentrations on the 1st and 2nd plot in nearly all samples in case of Cu and Zn. All samples were under MPC value in case of Pb. No limits for mobile forms of cadmium is established currently (Fig. 6, 7, 8, 9).



## DISCUSSION

The study of heavy metals concentrations in soils of irrigated arable lands shown that the impact of polluted irrigation water affected by industrial activities is considerable. The higher concentrations for total and mobile forms of Cu, Zn and Cd indicate the direct influence of copper-gold mining site located in the upstream areas.

The studied agricultural lands are polluted by Cu, Zn and Cd and there is a risk of translocation and accumulation of those metals in edible parts of crops grown on these plots. Therefore, additional sampling sites and monitoring of metal concentrations in foodstuff produced in the area is essential to ensure food safety and human health.

## CONCLUSION

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