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SOCIO-ECONOMIC ASPECTS OF WEED CONTROL IN EAST EUROPEAN COUNTRIES

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Land reform, privatization and farm restructuring are important components of transition in socialist countries. The ownership changes, from state to private property, were accompanied by changes in the farming system and consequently crop rotation, nutritent supply, soil tilage, mechanization and use of farm chemicals. Fields were heavily infested with weeds. The evolution of certain weeds and changes in weed flora are well documented.

Key words: socio-economic aspects of transition in East European countries; weed control

INTRODUCTION

The last decade of the 20th century was marked by radical changes in former socialist-bloc countries, bringing forth a new name for them countries in transition. Transition from a command economy to a market economy, deferred in this sub-region, caused specific problems to the economy as a whole, particularly, to agriculture, which represents an important sector of the European economy. Land reform and farm privatization are important components of transition. The social and political transition has resulted in the evolution of many different forms

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of land property and agricultural production systems. The number of private farms has been increasing all the time, but transition also had a negative impact, especially on rural development. Rural areas have been deprived of the young and most vital part of the population. The process of modernization of agricultural production was not followed by an adequate development of industrial capacities, crafts, service workshops and other services in the rural areas. Land-ownership changes brought about small fragmented areas of abandoned agricultural land, which can be invaded by weeds and exotic species.

As a result of the political and economic reforms started in 1990, agriculture in Bulgaria, Russia, the Ukraine and other East European countries has been undergoing dramatic changes and is currently in the stage of stagnation. During the reformation period, most of the land was abandoned and was no longer used for agricultural purposes. Specific economic and complex soil-climatic conditions in various regions of most former socialist countries resulted in very complicated weed problems on many farms. In the last few years, the increase in weed infestation has been observed in many countries, especialy with ruderal weed species that spread fast. A unique situation has emerged in the teritory of the former USSR (ZAKHARENKO, 1997). Some unfavorable economic and political changes occurring in Hungary over the past 10 years, have had a significant impact on the productivity and efficiency of the Hungarian agriculture (FARKAS, 2003). Polish agriculture has been undergoing significant changes (ADAMCZEWSKI *et al.*,1997). As in other East European countries, farm lands are being reduced in the Ukraine, (BORONA *et al.*, 2002). A high level of weed infestation is one of the major factors influencing the level of maize productivity in the Ukraine. The harmfulness of weeds has increased and resulted in a yield loss of 28-34%, and in some cases even more (WESSELOVSKYI AND ZHEREBKO, 1996).

Land-ownership changes were accompanied by changes in the farming system and consequently the crop rotation, nutrient supply, soil tillage, mechanization and the use of farm chemicals. Shortage and high prices of chemicals (fertilizers and pesticides) and a lack of labour for hand-weeding had an impact on the growth and spreading of weed populations which mutiply by seed or vegetatively. Small farmers very often plow too shallow as a result of insufficient knowledge and machinery. After plowing it is sometimes very hard to obtain good physical condition in a seedling layer. Changes in the farming system have caused changes in the weed flora of arable fields. As information and knowledge of the weed species predominating on agricultural fields is of great importance to farmers and their weed control methods, national weed assessment was organized in some East European countries. The four national weed assesments perfomed in Hungary since 1950 have yielded information about the weed condition in arable fields and changes in the weed flora (KADAR *et al.*,1995). The research conducted in Romania during 1973-2000 recorded a reduction of some weed species in agricultural fields, but a significant increase in the importance of others (CHIRLA AND BERCA, 2002). Based on the results of a research project in Latvia during the period 1997-1999, there were significant

changes in the occurrence of individual species in the field (VANAGA *et al.*, 2002). During 1999 in Bosnia and Hercegovina, new species (*Autilon theophrasti*, *Xanthium strumarium* and *Datura stramonium*) were found, as well as the spreading of very invasive species such as *Avena fatua, Sorghum halepense* and *Ambrosia artemisifolia* (ŠARIĆ *et al.*, 2000). An investigation within the maize agroecosystem in Croatia showed an increasing tendency of a dominance of grasses like: *Sorghum halepense*; *Echinohloa crus-gali*; *Digitaria sanguinalis*; *Setaria* spp. or *Cynodon dactylon*, (HULINA,1995). DIDYK (2002) reported that *Agropyron repens*, as a cosmopolitan rhizomatous weed, is economically important in a number of regions of Europe. Peach orchards in Romania are infested with a number of perennial weeds (*Agrpyron repens*, *Cynodon dactylon*, *Convolvulus arv*nsis). SARPE AND IANCU (1996) recommended strategies for their effective control by applyng post-emergence herbicides. The invasion of mainly exotic plant species has been increasing during the last decade. Among the predominant weed species *Ambrosia aremisifolia* and *Iva xanthifolia* are newly-imported species in East Europe (VELJKOVIĆ, 1996; MILANOVA, 1999; HODI AND TORMA, 2002). Study of the floristic composition in maize crop in Serbia shows significant changes in weed association in maize fields (ŠINŽAR *et al.*,1996).

Different projects of investigation of the changes in weed population size relative to crop practices have been conducted in many countries. Effects of reduced tillage and herbicides on weed biomass and wheat yield were studied in Croatia (KNEŽEVIĆ *et al.*,1999). Trends in distribution of specific weed species have always readily reacted to the changes in the structure of crop plants, soil tillage technology, cultural practices and application of herbicides (MIKULKA AND CHODOVA, 1999). CIUBERKIS (1996) reported that weed flora changes in Lithuanian fields depended on the soil reaction and fertilization. Over a 16 year period of herbicide application in rotation in Poland, STUPINCKA-RODZYNKIEWICZ (1996) found that a 40% share of maize in a crop rotation system caused an increase in the number of weeds typical for maize cultures. Based on a long-term study of weediness with different crops and herbicides in some regions of the Czech Republic, KOHOT *et al.* (2003) confirmed that crop rotation can be very helpful in reaching the optimal state. Great differences in weed infestation between years, depending on nutrient availability, were found in a winter wheat field trial conducted in East Slovakian lowlands (TOTH, 1999).

Over the past four decades, weed research in European agriculture has been oriented strongly towards herbicide use. Yield has been greatly increased at relatively low costs during this period, but subsequent difficulties in controlling the problem of weeds and increasing environmental contamination have been observed in many European countries. The results of herbicide efficacy investigation in weed control are numerous. The use of herbicides initially led to a reduction of weed biodiversity, then to herbicide resistant biotypes and today, as the acreage of late seeded summer crops such as maize is increasing, to new weeds from Southern climates (AMMON, 1997). Weed resistant to herbicides are being reported increasingly in most European countries. The occurrence and distribution

of triazine-resistant weed species such as *Chenopodium album, Amaranthus retroflexus, Solanum nigrum* and others have been recorded in most European countries (SIMONČIĆ, 1996; GADAMSKY *et al.*, 1996).

Although a majority of European countries nowadays face the need for pesticide reduction, satisfactory alternatives have not yet been developed. Biological control may offer an environmentally friendly weed control strategy. The data dealing with biological weed control are numerous and there have been examples of effective control programs of several weed species in some countries. In the last decade an European program for biological control of weeds in crops has been established (PETANOVIĆ *et al.*, 2000).

Using herbicide resistant crops is a new approach to weed control. Experiments of the weed control efficacy and selectivity of glufosinate-ammonium and glyphosate in transgenic maize have been conducted in some countries and crops. There is a relatively large number of ongoing biotechnology projects, which are limited to the application of *in vitro* production of crop species. Field trials are primarily used to assess the performance of GMO crops. Some trials with maize, sunflower and soybean have been carried out in Serbia (MALIDŽA, 2000; STEFANOVIĆ *et al.*, 2003; KONSTANTINOVIĆ AND MESELDŽIJA 2003); Rumania, (BUDOI *et al.*, 2002); Hungary (BERZSENYI *et al.*, 1997); the Czech Republic (SOUKUP *et al.*, 2003). Harmonisation of policies within sub-regions and among neighboring countries will also be important.

Efforts have been made to establish a system of weed control using threshold levels based on economic effectivness. Based on the studies of effects of crop densities and herbicide application on weed infestation under conditions with and without irrigation in maize crops in Serbia, a significant decrease was achieved in the total number of weed plants per species and weed dry weight per m^2 (STANOJEVIĆ *et al.*, 2000). For the Ukrainean stuation, MANKO *et al.* (1996) recommended integrated weed management methods. Cultivated plants and weeds are the components of a whole agrophytocoenosis and there are specific relationships between them. Herbicide application trials can provide more objective information for the development of an economical threshold model (KLEM AND VANOVA, 1997). The yield losses caused by this biological competition depend on many factors (ZOUZA, 1997). The effect of weed pressure on crop yield has been intensively investigated and is well described by empirical models (ALEXIEVA AND STOIMENOVA, 2002).

An integrated system of weed control for row crops which is based on a rational crop rotation, quality soil tillage and a band application of low doses of effective herbicides has reduced production cost and risk of environmental pollution, but increased soil erosion processes. Integrated weed control strategies in row crops can be used depending on the competitive ability of the crop and on mechanical and other non-chemical weed control techniques. Adoption of an integrated weed management system (IWMS) would prevent the development of herbicide resistance and help recover weed flora where resistance has already occurred (BARBERI, 2003).

All countries in transition had conducted during the socialist period organized research of weed control that was implemented through projects carried out by research institutes, universities, academies of science and ministries. Nevertheless, due to a lacking system, the results of such research projects, partially financed by the state, are rarely applied in practice.

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SOCIO-EKONOMSKI ASPEKTI SUZBIJANJA KOROVA U ZEMLJAMA ISTOČNE EVROPE

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I z v o d

Socijalna i politička tranzicija zemalja istočne Evrope rezultirala je razvojem mnogih oblika vlasništva zemlje i proizvodnih sistema u poljoprivredi. Ekononomske promene su doprinele da se nivo kontrole korova u ovim zemljama razlikuje u poređenju sa razvijenim zemljama EU. U različitim klimatskim i zemljišnim uslovima proširile su se mnogobrojne vrste korova, od kojih su višegodišnje travne vrste veoma značajne za strna žita i okopavine.

U većini evropskih zemalja borba protiv korova je proteklih decenija, bila orijentisana uglavnom na primenu herbicida. Zbog problema sa zagađenjem okoline, mnoge evropske zemlje su ograničile upotrebu herbicida. Najnoviji prilaz je gajenje rezistentnih useva prema totalnim herbicidima. Međutim, odgovarajuće alternative drugih metoda suzbijanja korova još uvek nisu u potpunosti razrađene. I dalje se istražuju razne metode suzbijanja korova. Najnoviji prilaz je gajenje rezistentnih useva na totalne herbicide.

Sve zemlje u tranziciji su tokom socijalističkog perioda imale organizovana istraživanja na proučavanju korova koja su se odvijala kroz projekte u okviru naučnih instituta, univerziteta, akademija nauka i ministarstava. Ali, kako nije bilo sistema, dobijeni rezultati su slabo korišćeni u praksi.

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