

цього були створені шляхом використання ґрунтозахисних технологій з безплужним обробітком ґрунту із застосуванням 12–14 т/га органічних добрив і 111–246 кг/га д. р. мінеральних добрив.

Деградація ґрунтів, відтворення родючості ґрунтів, чорноземи, мінімальний і безплужний обробіток ґрунту, органічна речовина ґрунту, екологічно збалансована агроєкосистема, ґрунтозахисні технології, консалтинг.

Экологически сбалансированная агроэкосистема может быть сформирована путем самоорганизации и контролируемой эволюции плодородия почвы и изменения интенсивности и направления процессов преобразования вещества и энергии в почве. Наши исследования показали, что наилучшие условия для этого были созданы путем использования почвозащитных технологий с бесплужной обработкой почвы с применением 12–14 т/га органических удобрений и 111–246 кг / га д. в. минеральных удобрений.

Деградація ґрунту, виробництво плодородія ґрунту, мінімальна і безплужна обробка ґрунту, органічне речовина ґрунту, екологічно збалансована агроєкосистема, ґрунтозахисні технології, консалтинг.

UKRAINE'S SUNFLOWERS: MODERN DAY TRAGEDY OF THE COMMONS

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Ukraine's intensive cultivation of sunflowers has left nutrient-depleted soils and a destructive scenario akin to Garrett Hardin's observations in his essay "The Tragedy of the Commons." While some have endorsed Ukraine's current moratorium on land sales as a means of maintaining Ukrainian agricultural autonomy, the ban is creating complicated relationships between lessees and the long-term fertility of the lands they manage. Although agricultural advisors recommend planting sunflowers sparingly in rotation, the vast majority of farmers are choosing to forgo rotation schemes in order to maximize their short-term profits. Hardin is steadfast in arguing that there are few "technical" solutions; however, in the case of Ukraine's sunflowers there is certainly an attainable solution, built on a combination of technical and moral grounds.

Ukraine, sunflowers, soil quality, agriculture, sustainability.

In his 1968 essay “The Tragedy of the Commons,” ecologist Garrett Hardin theorized that in the long-term, the best interests of a population are lost when individuals act independently in managing a common resource (Hardin). In depleting the shared resource, Hardin suggested, rational choices are based in an individual’s self-interest and unfortunately come at the expense of the group at large. The theory is often tied to England’s enclosure movements in which individual shepherds benefited from grazing their voracious sheep in the town’s commons, while herders of more tempered cows shared in the damage to the grass-depleted commons.

Ukraine’s modern tragedy is much less visible and rooted in severe soil nutrient depletion, with the widespread cultivation of sunflowers playing the role of hungry sheep. Ukrainian farmers are taking advantage of a perfect storm of disorganized agricultural policies and high profitability of sunflower oil in global markets. Although agricultural advisors recommend planting sunflowers sparingly in rotation, the vast majority of farmers are choosing to forgo rotation schemes in order to maximize their short-term profits. With Ukraine providing over half of the world’s sunflower oil, the sector is celebrating a boom rarely experienced since the country’s independence from the Soviet Union in 1991; however, this production system is unsustainable and will ultimately deplete the nation’s famously rich black soil.

Background. Intensive cultivation of sunflowers is a relatively new venture for Ukraine. After gaining independence in 1991, the state greatly reduced its support to the agricultural sector. In the early 1990s, agricultural input prices increased by an order of four compared to output prices, which resulted in declining output levels and farm incomes (Johnson et al.). The use of fertilizers and plant protection became too expensive for the average farmer, and agricultural producers struggled to compete in international markets. In tandem with the newly costly livestock market, forage crops declined nearly 40 percent, and farmers were at a loss for how to move forward (FAO). Because land managers were used to planting according to the production targets assigned by a centrally planned system, they floundered with the profit-based options of their new market-oriented system. Although progress was achieved somewhat consistently throughout land reform efforts, advancements have been slow and unsteady (Csaki and Lerman).

During this transition, sunflowers were quickly identified as a multi-use crop that demands a high price, is consistently in high-demand internationally, and requires a very low cost of production. In comparing the cost of production to the sale price, the profitability level of sunflowers at 45.4 percent out-competes all of Ukraine’s other main crops with wheat at 4.9, maize at 22.4, and sugar beet at 14.2 (Vlasenko and Prokopenko). This unusually high production efficiency prompted a boost in sunflower cultivation from 1626.3 thousand hectares in 1990 to 5081.7 thousand hectares in 2012, with the majority of this increase taking place in the last decade (Vlasenko and Prokopenko).

These consistently profitable harvests come at a price. Due to sunflowers’ deep rooting systems, they extract greater amounts of water and nutrients than most other crops. In the short run, these attributes make

sunflowers less susceptible to drought and excellent in managing weeds; however, these same attributes can cause significantly negative impacts on soil quality in the long run. In addition to reducing soil fertility, sunflower-planted land plots are often host to a variety of soil-borne fungal diseases that can only be minimized through crop diversity and crop rotation schemes. There is debate amongst agriculturalists over the ideal crop rotation strategy for sunflowers and their associated complications, but most agricultural advisors recommend including sunflowers in rotation no more than once every four to seven years (USDA and FAO).

While no comprehensive soil fertility study has been completed, the Institute for Soil Science and Agrochemistry Research has acknowledged that the state of soils in Ukraine has deteriorated in recent decades (FAO). A compulsory crop rotation policy was employed to combat this problem; however, few farmers have responded to this new legislation due to a current lack of penalty enforcement. There are exorbitant costs associated with the new policy: farmers need to pay for state agency-approved experts to develop individualized crop rotation strategies, which includes surveying the property, planning the rotation scheme, and repeated strategy revisions. Because this service is financially inaccessible to most small and medium scale farmers, policy-makers are considering a revision that makes the national plan more realistic for the current farmer demographics of Ukraine.

Materials & methods. The following discussion is based on the review of scholarly articles and peer-reviewed commentaries on the production of sunflowers in Ukraine and the long-term predicted effects of the ongoing moratorium on agricultural land sales.

Discussion. Because it is in the best interest for farmers to employ strategies that ensure the long-term fertility of their farmlands, why aren't many Ukrainian farmers striving to preserve the soil health of their property? The answer is simple: for many farmers, the land that they manage is not their own. Following independence from the Soviet Union, Ukrainian collective farms were divided into individual land units and distributed among the workers and pensioners associated with the collective farm, with an average land plot size of 3.63 hectares (USAID and CSS).

Over time, many of these new landholders became disinterested or unable to work their land; however, because of the ban on disposal of agricultural land established in 2004, they are unable to sell their land plots. Extended in December 2012 and currently set to expire on January 1, 2016, the moratorium on agricultural land sales has created a national agricultural management system based on leases (Verkhovna Rada). While some have endorsed the ban as a means of maintaining Ukrainian agricultural autonomy, the moratorium is creating complicated relationships between lessees and the long-term fertility of the lands they manage.

A recent USAID/CSS survey found that only 12 percent of landholders farm their land themselves; 79.3 percent lease out their land units; and 8.6 percent choose to do nothing with their land (USAID and CSS). This means that of the people managing agricultural lands, only a select few have long-

term incentives to maintain the soil nutrient levels for future farming. In fact, half of all leases are for less than five years and 85 percent are for less than ten years (USAID and CSS). In terms of crop rotation strategies, this leasing period is just long enough that the full-fledged effects of nutrient depletion are negligible. With short leasing periods, lessees have the opportunity to maximize their profits without suffering the long-term consequences of their poor farming practices. Because they have no incentive to preserve the soil quality for future use, the rational course of action is to select the most profitable crops and disregard rotation schemes. As a consistently profitable crop, sunflowers are often the logical choice.

The lessees are not entirely at fault for the deterioration of Ukrainian soils. The USAID/CSS survey revealed that nearly half of land share owners had never set foot on their land. This negligence on the part of the lessors is more a reflection of the shortcomings in the design of the moratorium legislation than on the landholders themselves. The moratorium keeps the land owned by people who have little interest in agriculture and managed by people who have no incentive to preserve the soil quality beyond their lease agreement. Additionally, many landholders are not educated on their rights as property owners. When USAID/CSS survey administrators asked landholders if there is a requirement for farmers to protect soil fertility, responses were mixed: yes (37.4 percent), no (18.9), and uncertain (43.8). This mixed response illustrates a failure of the state to educate landholders on their rights and mandatory land practices, and all Ukrainians are suffering the consequences.

Ukraine's agricultural sector has yet to achieve output levels typical of pre-independence, and sunflower cultivation is still on the rise. Gross harvests of sunflower have increased nearly twentyfold, from 86.3 thousand tons in 1995 to 1589.1 thousand tons in 2012 (Vlasenko and Prokopenko). In 2012, Ukraine's sunflower seed production was valued at over 2.25 billion dollars, the country's second highest production value only to milk (FAOSTAT). Furthermore, sunflower oil has become an essential export for Ukraine, ranked as the highest export value of 3.15 billion dollars in 2011 (FAOSTAT). While this growth ought to be celebrated in the short-term, the sector's current prosperity is unsustainable and temporary. Flooding the market with sunflower products will ultimately decrease prices and the crop's current high rate of profitability. Furthermore, the consequences of repeated cultivation of sunflower without the temperance of other crops year to year will eventually be revealed in the form of shrinking harvests and diseased soils.

It is difficult to blame people for doing what they can to maximize their earnings when they have no incentive to preserve the land for the future. Traditional farming techniques were inherently conservation-based because the cultivators had a long-term connection to their land, which was developed through family histories and direct sustenance. While this is still true for some families, the moratorium on land sales has severed this relationship in many landholders by creating a farming culture of leases and temporary ownership. Managing land under short-term leases removes the responsibility to care for the longevity of the soil's productivity and nutrient balance.

Although Hardin's essay is primarily concerned with addressing the ethics of population control, he provides important insights that can be applied to any tragedy of the commons scenario. Hardin is steadfast in arguing that there is no "technical" solution to the population problem; however, in the case of Ukraine's sunflowers there is certainly an attainable solution, built on a combination of technical and moral grounds.

First, Ukraine's legislators must work on technical policy revisions that create a transparent market of private property owners who are invested in the long-term health of their soils. The land sales ban has created an abundance of leases, most of which are designed in intervals that do not inspire farmers to plan for the long-term health of the land. Rationally, the land managers act selfishly and try to maximize their profits in the short-term because they will not be around to reap the benefits of their foresight. Hardin recognizes this cycle and acknowledges that "we are locked into a system of 'fouling our own nest,' so long as we behave only as independent, rational, free-enterprisers." This unfortunate situation can be resolved through policy revisions that effectively eliminate the context of common lands that was originally devised by the moratorium.

The second component is necessarily a moral one. For Ukraine, this moral education will lie in strengthening the understanding between agricultural actions and long-term production consequences as well as general environmental education. Skeptical of the quantifiable effect of education, Hardin argues that "education can counteract the natural tendency to do the wrong thing, but the inexorable succession of generations requires that the basis for this knowledge be constantly refreshed." He says this as a warning; however, this constant refreshing is a nonissue in the context of Ukraine. The country's agricultural history is built upon the familial lines of land and farming tradition. Once the environmental and economic benefits of this new education are realized, the new strategies and techniques will be shared within families and communities and developed through generations. The country has proven again and again its capacity to adapt and evolve and the agricultural sector is no different.

Conclusion. Ukraine's sunflower production need not be a tragedy. Through a technical response of legislation reform and strong agricultural policies coupled with a social reaction of environmental awareness and education, sunflower production can become a long-term source of revenue and pride for the country. Although highly visible tragedy-of-the-commons scenarios like deforestation and over-fishing receive extensive attention and management recommendations, more subtle tragedies warrant equal concern. It is unclear what the effects of lifting the ban will be in 2016; however, the sustainable solution to the sunflower situation will necessarily demand coupling of several strategies: subsidized crop rotation planning with environmental education at the forefront.

On a grander scale, the global population is suffering from a tragedy of the commons scenario in the form of global environmental change. The atmosphere and oceans are the largest shared resources on the planet and the fact that they are often perceived as public goods have resulted in climate change and a collection of social inequities. Unfortunately, it is often the least responsible

populations who are most vulnerable to the detrimental effects of climate change. Although highly industrialized countries are responsible for greenhouse gas emissions, all populations share the negative effects of this pollution, often without experiencing any of the advantages of the industries. In this manner, individualistic decisions can influence entire communities throughout the globe.

It is clear that as a species, humans do not specialize in long-term planning when immediate prospects are so tantalizing. Nevertheless, environmental consciousness ought to have evolved to eliminate these small-scale preventable tragedies such as sunflower production in Ukraine. In his analysis, Hardin acknowledges that “we can never do nothing. That which we have done for thousands of years is also action.” Although the solution to Ukraine’s agricultural future is unclear, it is of utmost importance that people recognize the unsustainable methods of production and respond in a timely manner. The country’s status quo farming techniques are irresponsible and will ultimately lead to unnecessary hardship on an individual and international level, in terms of economic success and food availability, respectively. Recognizing that keeping with the status quo is also action in its own right, Ukraine might move forward in deciding to act intentionally in a productive sustainable manner of food production. In keeping a close eye on Ukraine’s farmlands, only time will tell if Ukrainians will suffer the same fate as the cow herders or if they will rise to fill the nation’s full potential as the breadbasket of Europe.

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Інтенсивне вирощування соняшнику в Україні спричинило виснаження ґрунтів, відповідно до деструктивного сценарію, описаного в есе Garrett Hardin's «The Tragedy of the Commons» [5]. За умови, коли дехто схвалює мораторій на продаж земель, що діє в Україні, ця заборона ускладнює позиції орендарів щодо довготермінових перспектив покращення якості ґрунтів. Незважаючи на рекомендації дорадників, що працюють в аграрній сфері, щодо дотримання сівозмін, більшість аграріїв ігнорують ці рекомендації, сіючи соняшник задля отримання прибутків в короткотерміновій перспективі. Hardin непохитний у своєму твердженні щодо існування «технологічних» способів вирішення цієї проблеми. У випадку ж із вирощуванням соняшнику в Україні, найкращим рішенням має бути поєднання «технологічних» та «моральних» заходів.

Україна, соняшник, якість ґрунтів, сільське господарство, стійкість.

Інтенсивное выращивание подсолнечника в Украине повлекло истощения почв, сообразно деструктивного сценария, описанного в эссе Garrett Hardin's «The Tragedy of the Commons» [5]. При условии, что некоторые одобряют мораторий на продажу земель, действующей в Украине, этот запрет усложняет позиции арендаторов касательно долгосрочных перспектив улучшения качества почв. Несмотря на рекомендации консультационных служб, работающих аграрной сфере о необходимости соблюдения севооборотов, большинство аграриев игнорируют эти рекомендации, сея подсолнечник для получения прибыли в краткосрочной перспективе. Hardin непреклонен в своем убеждении о существовании «технологических» способов решения этой проблемы. В случае же с выращиванием подсолнечника в Украине, лучшим решением должно быть сочетание «технологических» и «моральных» мероприятий.

Украина, подсолнечник, качество почв, сельское хозяйство, устойчивость.