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MECHANISMS FOR ECONOMIC INCENTIVES FOR CULTIVATING COVER CROPS TO INCREASE SOIL FERTILITY: US EXPERIENCE

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Annotatsiya. Maqolada qoplama ekinlar (cover crops) orqali tuproq unumdorligini saqlash va tiklashni iqtisodiy rag‘batlantirish mexanizmlari AQSh tajribasi asosida tahlil qilingan. Tadqiqotda rag‘bat miqdori va texnologiya xarajatlari o‘rtasidagi shartli tafovut hisoblangan, to‘lovning fermer foydasiga teng emasligi asoslangan. Natijalar qoplama ekinlar uchun to‘lovni joriy etishning dastlabki xarajatlari, agrotexnik sifat va davomiy qo‘llanish bilan bog‘lash zarurligini ko‘rsatadi.
Kalit so‘zlar: qoplama ekinlar; tuproq unumdorligi; iqtisodiy rag‘batlantirish; qoplama ekinlar uchun subsidiya; AQSH; Merilend; xarajatlarni qoplash; ekologik qo‘shimcha.

Аннотация. В статье на основе опыта США проанализированы механизмы экономического стимулирования сохранения и восстановления плодородия почв посредством выращивания покровных культур (cover crops). В исследовании рассчитана условная разница между размером стимулирующих выплат и затратами на применение данной технологии, а также обосновано, что получаемые выплаты не эквивалентны прибыли фермеров. Результаты исследования свидетельствуют о необходимости увязки стимулирующих выплат за выращивание покровных культур с первоначальными затратами на внедрение технологии, качеством выполнения агротехнических мероприятий и продолжительностью её применения.
Ключевые слова: покровные культуры; плодородие почвы; экономические стимулы; субсидии на покровные культуры; США; Мэриленд; возмещение затрат; экологическое дополнение.

Abstract. The article analyzes economic incentive mechanisms for preserving and restoring soil fertility through cover crops based on US experience. The study calculated the conditional difference between the amount of incentive and the costs of the technology, based on the fact that the payment is not equal to the benefit of the farmer. The results indicate the need to link the introduction of the fee for cover crops with initial costs, agrotechnical quality, and continued application.
Keywords: cover crops; soil fertility; economic incentives; subsidy for cover crops; USA; Maryland; cost recovery; environmental add-on.

INTRODUCTION

Soil fertility is a multifactorial economic and ecological process, and its preservation is not determined solely by mineral fertilizer consumption or the current season's harvest. The organic matter, structure, moisture retention properties, microbiological activity, and erosion resistance of the soil determine the long-term potential of agricultural production. Cover crops - crops grown to cover the soil surface with plants after the harvest of the main commodity crop or between crops - are one of the agrotechnical methods serving these tasks [5; 6].

Cover crops can reduce erosion and nutrient leaching, and stimulate root biomass and organic matter circulation. However, for their planting, costs such as seeds, machinery, fuel, labor, and in some cases, lost alternative income arise. Furthermore, the type of cover crop, the timing of its loss, and the lack of moisture

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do not always have the same impact on the yield of the main crop. For this reason, economic incentives and agrotechnical advice are considered interconnected during wide implementation [4; 6].

In the United States, the use of cover crops is encouraged by conservation programs at both the federal and state levels. Data from the U.S. Department of Agriculture's Economic Research Service (USDA ERS) note a significant expansion in the use of cover crops between 2012 and 2017, with financial and technical assistance programs intensifying during this period [8]. In Maryland, payment for cover crops is linked to the goals of reducing nutrient runoff and protecting the water resources of the Chesapeake Bay [2; 9].

The aim of the study is to analyze the economic logic of stimulating cover crops in the USA based on official field statistics and specific payment rates, as well as to draw practical conclusions from this experience for soil fertility policy. The study proposes the following hypothesis: if the incentive covers the main costs and creates additional payments for high-quality agrotechnical methods, the probability of increasing the farmer's voluntary participation increases.

MATERIALS AND METHODS

The first group of sources consisted of the USDA ERS analysis prepared based on 2022 Agriculture Census data,[1] a report dedicated to the trend of cover crops [8], and a 2026 study on the long-term use of cover crops [7]. The second group included the Maryland Department of Agriculture's 2026–2027 payment terms[2] and the 2025 grant program's official information[9]. The USDA NRCS cover crop economics publication [3] was used to compare economic costs, while scholarly articles [4–6] were used for theoretical discussion.

Maryland's payment terms are for 2026–2027, and the sample cost estimates provided in the USDA NRCS are from a previous publication. Therefore, their comparison should be interpreted not as the real profit of 2026 or the accounting records of the same farm, but as a conditional scenario explaining the mechanism. One acre was taken as equal to 0.404686 hectares.

RESULTS

According to USDA ERS estimates released in 2024, the area under cover crops in the U.S. was 15,390,674 acres in 2017 and 17,985,831 acres in 2022.[1] Thus, over five years, the area increased by 2,595,157 acres, or 16.86%. When converted to hectares, the figure is approximately 6.23 million and 7.28 million hectares, respectively. In 2022, cover crops covered 4.7% of all cultivated land in the United States. Such growth confirms the expansion of technology, but it is impossible to determine how much of it occurred under the influence of state incentives without a separate econometric assessment.

The State of Maryland Department of Agriculture's 2026-2027 program sets the base incentive for cover crops at $35/acre. An additional payment is provided for early sowing or the selection of a specific type of cover crop. Table 1 shows payments broken down by practical methods [2].

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Table 1

Economic incentive rates for covering crops in Maryland (2026-2027 program)

Sowing method	Base Charge, $/acre	Early planting surcharge, $/acre	Allowable crop type markup, $/acre	Total top payment, $/acre
No-till	35	15	15	65
Traditional sowing	35	15	15	65
Light surface spraying	35	15	15	65
Air sowing	35	0	15	50
Grinding of stems and surface application with a roller	35	0	15	50

Source: Maryland Department of Agriculture, Cover Crop Program, Official Payment Schedule 2026-2027 [2]. Surcharges are applied only if all requirements and deadlines have been met. A crop-specific surcharge of $15 is provided for rye, triticale, or a mixture of multiple cover crops.

According to the schedule, the payment amount depends on the sowing method and compliance with established requirements. By adding two types of $15 markups to the base $35 for no-till or some mechanical methods, the maximum payment reaches $65/acre. The maximum fee under this schedule is $50/acre for aerial sowing and some surface spraying methods. This differentiation reflects the program's attempt to encourage specific agrotechnical choices rather than providing the same payment for all hectares [2].

The USDA NRCS "Cover Crop Economics" presents the national median cost of cover crop seeds as $25/acre, with the median cost of contracting the planting as $12/acre.[3] Applying these historical norms in a simple sample calculation, the sum of the two costs is $37/acre. With Maryland's base payment of $35, the difference between these two positions alone is −2 dollars/acre, and with the highest payment of $65, it is +28 dollars/acre. These figures are not the actual cost-benefit results observed over a year; they are an illustrative scenario constructed from data from different time periods and coverage.

For unit comparison, $35/acre is approximately $86.49/acre and $65/acre is $160.62/acre. If a similar program is developed in Uzbekistan, it is necessary not to directly transfer rates in US dollars, but to separately assess the costs of local seeds, machinery, water, wages, soil and risk.

The 2025 Maryland official report stated that the program's budget for that year was set at $22 million, with farmers planting nearly 500,000 acres of cover crops in the previous season and utilizing over $30 million in reimbursement grants [9].

Scientific meta-analyses confirm that cover crops have the potential to increase organic carbon in the soil. For example, in a meta-analysis by Poeplau and Don (2015), the average annual change in organic carbon stocks was estimated at 0.32 Mg C/ha/year during the first approximately 50 years [5]. This average value is not a guaranteed outcome for a specific area or farm: climate, initial carbon, crop type, and care method change the degree of impact [6].

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DISCUSSION

The economic reason for paying for cover crops is that private and public benefits do not fully match each other. The farmer does not receive some environmental benefits as direct monetary revenue, while society is interested in water quality, reduced erosion, and carbon sequestration. Therefore, targeted payment serves as a means of partially internalizing positive externalities. At the same time, budget efficiency may decrease if the payment exceeds the potential social benefit, or if the operation was carried out without payment [4].

The second problem is the duration of incentives. Once a farmer has planted a cover crop, it is not necessary to use it regularly in subsequent years. The USDA ERS 2026 "Persistence of Cover Crop Use" report notes that the overall increase in coverage may mask the suspension or reduction of technology in certain areas[7]. Consequently, state programs should measure not only the number of initial admissions but also the proportion of internships performed in consecutive seasons.

The third issue is the difference in the efficiency of the same rate across different soil-climatic zones. In an area with low moisture, a cover crop can increase competition for water while reducing erosion and nutrient loss in another area. A study summarizing 43 meta-analyses and reviews published in 2024 also indicates that cover crops can have positive outcomes for soil functions in many respects, but different outcomes for yield and water supply [6]. Therefore, the incentive mechanism should be linked to agronomic advice and regional recommendations.

The fourth issue is the decreasing or conditional structure of payments. Schnitkey, Sellars, and Gentry (2024) discuss a gradually declining supply in the form of $50, $40, $30, and $20/acre over four years in a scientific paper on incentivizing cover crops [4]. This scientific proposal is not an official rate of the current Maryland program. Its economic logic is to cover higher initial transition costs and reduce budgetary dependency as the farmer gains experience. However, the effectiveness of such a scheme must be verified by experimental data.

Monitoring the differences between similar farms participating in such pilot projects and those selected for comparison will increase the possibility of assessing the actual impact of the subsidy. Such an experiment was not conducted in this article. For this reason, a causal relationship between the increase in cover crop areas by 16.86% and state programs in the USA was not calculated. The comparison of payment with cost is also provided as an example; it is not interpreted as local net profit or budgetary efficiency.

CONCLUSION

US experience shows that targeted incentives are an important policy tool in the practice of cover crops that serve to increase soil fertility. According to official census data, the area of cover crops increased by 2.595 million acres or 16.86% between 2017 and 2022. In its 2026–2027 program, the state of Maryland has

linked basic and additional payments to agrotechnical requirements, setting an incentive at $35–65 per acre.

Payments may alleviate the initial investment barrier, but actual ongoing costs, continuing farmer involvement, and measured changes in soil quality must be taken into account when evaluating efficiency. The recommended approach for Uzbekistan is to combine basic compensation based on regional costs, a premium for quality practices, and a verifiable incentive for repeated environmental outcomes. Implementing the financial program together with agronomic consultation, comparative monitoring, and open reporting will be more scientifically and economically justified.

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