

## ECONOMIC ASSESSMENT OF HAY MULCHING TECHNOLOGY, APPLIED IN SYRDARYA PROVINCE IN UZBEKISTAN

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### Abstract

Syrdarya province is one of the regions of Uzbekistan most affected by land degradation. Insufficiency of fresh water resources is the main constraint for agricultural development in the province. In this regard, using the technology of mulching and waters with different salinity levels is one of the appropriate technologies being implemented at this region.

Mulching is a well-known soil improvement measure. It is effective in improving soil physical properties by reducing water runoff and increasing water infiltration. It also protects the soil against raindrop impact, preventing soil crusting and contributing to soil organic matter and nutrients. Application of hay mulch to soil can reduce tail water generation at the field level and thus increase water use efficiency.

This paper shows the results of socioeconomic feasibility analysis of implementing this technology at the experimental site of Uzbek Research Institute of Cotton Growing at Syrdarya province.

**Keywords:** *mulching technology; project; cotton; hay; Uzbekistan*

### Resumen

La provincia de Syrdarya es una de las regiones del Uzbekistan más afectadas por la degradación de la tierra. La insuficiencia de los recursos del agua dulce es el principal obstáculo para el desarrollo agrícola en la provincia. En este sentido, utilizar la tecnología de la cubierta vegetal y aguas con diferentes niveles de salinidad es una de las tecnologías apropiadas implementados en la región.

El mulching (pajote) es una conocida medida de mejora del suelo. Este es eficiente en la mejora de propiedades físicas del suelo al reducir la escorrentía del agua y aumentar la infiltración del agua. También protege el suelo contra el impacto de las gotas de lluvia, previniendo la formación de costras del suelo y contribuyendo a la materia orgánica del suelo y los nutrientes. La aplicación de abono para el suelo de heno pueden reducir la generación de agua de cola en el terreno y aumentar así la eficiencia del uso del agua.

Este artículo muestra los resultados de los análisis de la viabilidad socioeconómica de la aplicación de esta tecnología en un sitio experimental el Instituto de Investigación de Algodón de Uzbekistán en la provincia de Syrdarya.

**Palabras claves:** *tecnología de mulching; proyecto; algodón; heno; Uzbekistán*

## Introduction

Some of the regions of Uzbekistan are affected by land degradation. One of them is Syrdarya province, known with its degraded lands caused by soil salinization. The reasons of this degradation are insufficient operation of drainage and irrigation systems, irregular observance of the agronomic practices, non-efficient on-farm water use and others. All of these have caused the rise of ground waters, which had led to salinization of soils.

The climate conditions of Syrdarya province also put the lands into the risk of natural degradation, due to its agro-ecological conditions - hot summers and low precipitation, leading to rapid evaporation from soil surfaces and induced salinity.

The main constraint for agricultural development in the province is the lack of fresh water resources. But it is known that there exist considerable amounts of underground saline and drainage water resources. The use of mulching technology along with using of waters with different salinity level have been studied in the frames of ADB-funded «Bright Spots» project at Ak-Altin experimental station of Uzbek Research Institute of Cotton Growing in Syrdarya province.

Mulching is a well known soil improvement measure. It is effective in improving soil physical properties by reducing water runoff and increasing water infiltration. It also protects the soil against raindrop impact, preventing soil crusting and contributing to soil organic matter and nutrients. Application of hay mulch to soils can reduce tail water generation at the field level, and thus increase water use efficiency.

The **advantages** of hay mulching are shortly described in the following:

- the hay mulching allows the moisture to stay longer in the soil, preventing rapid evaporation from soil surface under high summer temperatures, and by this reducing the need for increased irrigation.
- the compost of hay on the surface allows to increase the soil fertility by adding the organic and nutrient elements to the soil.
- using the technology of hay mulching allows to reduce the costs for weeding and inter-row cultivation.
- the yields of cotton taken from implementing the mulching technology are higher than from traditional technology. Because the moisture is kept in the soils for longer time and the hay compost allows the upper layers of soil not to become hard.
- the hay mulching generates the development of different microorganisms and insects that help the soil to remain fertile and viable without additional costly cultivation.
- cotton irrigating with drainage or mixed waters could help for efficient use of fresh water resources, but it needs the efficient operation of drainage system.

The **constraints** for using the hay mulching technology are:

- many farmers in the region prefer to use the hay for breeding the animals rather than for mulching. The reason is the higher benefits that they could get from cattle livestock production compared to cotton cultivation.
- many farmers in the region do not know about the benefits of using the technology of hay mulching and because of it they use just the traditional way of cotton cultivating.

- the use of hay in this technology of mulching considers the labour costs for its applying to the soil surface, even this technology saves the costs for inter-row cultivations.

The methodology used for economic evaluation is based on cost-benefit analysis of on-farm enterprise budgets for each treatment under the experiment. The cost-benefit analysis is a technique for evaluating the total costs of one or more technologies with their total benefits. The data, regarding the total costs including the costs of inputs, as variable costs, and fixed costs such as taxes and depreciation, represent the actually incurred costs during the on-farm trials for the treatments under the project. The total benefits represent the income from all farm outputs sold at given prices. The difference between the total benefits and total costs is the net benefit from the given technology. The following are the definitions of the main indicators applied in the economic evaluation using cost-benefit method:

- a. **Marginal Rate of Return (MRR)**: is the ratio between the change in net benefit or net gross margin)  $\text{Gross Margin «With»} - \text{Gross Margin «Without»} - (\text{Total cost «With»} - \text{Total Cost «Without»})$  and the change in total cost. It shows the returns to the additional investment due to technology adoption.
- b. **Benefit Cost Ratio (B/C)**: this is the ratio between gross margins and total costs, it is a profitability indicator, values  $>1$  indicate that the technology is profitable, values  $< 1$  suggest the technology is not profitable.

As a whole, the average marginal rate of return of mulching treatments against those without mulching was 37%. This low level of marginal rate of return of mulching treatments against no-mulching treatments is explained by the low profitability levels under mulching with high salinity waters. In fact, mulching and the use of high salinity waters yielded less net benefits than its no-mulching equivalent. Similarly, mulching and use of medium saline waters had the marginal rate of return of 19% against use of medium saline waters without mulching. Finally, use of high saline waters without mulching generated more marginal returns than with mulching. In this regard, mulching can be feasibly used only in combination with the use of low saline waters. In the other two cases, the level of additional returns from mulching are either not sufficient (medium saline waters), or even negative (high saline waters).

## Conclusions

During the research works it was found out that hay mulching could be profitable only when it is applied in combination with low saline waters. Mulching in combination with medium saline waters is slightly more profitable than the use of medium saline waters without mulching, but the level of returns is not sufficiently high to encourage farmers rapidly adopt this management approach. Using the mulching in combination with high saline waters is not preferred because of negative profitability as compared to use of high saline waters without mulching.

Using of hay mulching technology leads to improvement of soil fertility and increasing of cotton yields. But using the hay as animal feed is the main constraint for adoption of the farmers this technology, since the hay used for breeding the animals could give more higher benefits (from meat, milk) than when it used for cultivation of cotton.

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