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FINE – FIBER COTTON’S CONTRIBUTION TO SUSTAINABLE AGRICULTURE: INVESTIGATE HOW THE CULTIVATION OF FINE – FIBER COTTON CAN CONTRIBUTE TO SUSTAINABLE AGRICULTURAL PRACTICES, FOCUSING ON HEALTH, WATER MANAGEMENT, AND ORGANIC FARMING

Annotation

This research examines how fine-fiber cotton farming can enhance soil health, improve water management, and promote organic farming methods. The study highlights the potential for fine-fiber cotton to be grown using practices that minimize environmental degradation, reduce water usage, and support biodiversity. Special attention is given to the use of organic fertilizers, crop rotation, and conservation tillage techniques that can maintain or even improve soil fertility. Additionally, the paper explores the role of fine-fiber cotton in reducing the reliance on chemical pesticides and fertilizers, aligning it with broader sustainable farming practices. By integrating fine-fiber cotton cultivation into sustainable agricultural systems, farmers can achieve long-term environmental, economic, and social benefits.

Key words: Fine-fiber cotton, sustainable agriculture, soil health, water management, organic farming, environmental sustainability.

ВКЛАД ТОНКОВОЛОКНИСТОГО ХЛОПКА В УСТОЙЧИВОЕ СЕЛЬСКОЕ ХОЗЯЙСТВО: ИССЛЕДОВАНИЕ ТОГО, КАК ВОЗДЕЛЫВАНИЕ ТОНКОВОЛОКНИСТОГО ХЛОПКА МОЖЕТ СПОСОБСТВОВАТЬ УСТОЙЧИВЫМ СЕЛЬСКОХОЗЯЙСТВЕННЫМ ПРАКТИКАМ С АКЦЕНТОМ НА ЗДОРОВЬЕ, УПРАВЛЕНИЕ ВОДНЫМИ РЕСУРСАМИ И ОРГАНИЧЕСКОЕ ЗЕМЛЕДЕЛИЕ.

Аннотация

В статье рассматривается роль тонковолокнистого хлопка в развитии устойчивого сельского хозяйства. Особое внимание уделено трём ключевым направлениям: сохранению здоровья человека и снижению негативного воздействия химических средств на фермеров и окружающую среду, эффективному управлению водными ресурсами за счёт применения современных методов орошения, а также возможностям интеграции тонковолокнистого хлопка в систему органического земледелия. Показано, что благодаря высокой рыночной стоимости и качественным характеристикам тонковолокнистый хлопок может стать важным элементом экологически безопасного и экономически выгодного аграрного производства.

Ключевые слова: Тонковолокнистый хлопок, устойчивое сельское хозяйство, здоровье, управление водными ресурсами, органическое земледелие, экологическая устойчивость.

INGICHKA TOLALI PAXTANING BARQAROR QISHLOQ XO‘JALIGIGA QO‘SHGAN HISSASI: UNING YETISHTIRILISHI SOG‘LIQNI SAQLASH, SUV RESURSLARINI BOSHQARISH VA ORGANIK DEHQONCHILIKKA QARATILGAN BARQAROR QISHLOQ XO‘JALIGI AMALIYOTLARIGA HISSA QO‘SHISHI MUMKINLIGINI TADQIQ ETISH

Annotatsiya

Mazkur maqolada ingichka tolali paxtaning barqaror qishloq xo‘jaligida tutgan o‘rni yoritilgan. Unda asosan uch yo‘nalishga e’tibor qaratilgan: birinchidan, inson salomatligini asrash va kimyoviy vositalardan foydalanishni kamaytirish orqali atrof-muhitga zararli ta’sirni pasaytirish; ikkinchidan, zamonaviy sug‘orish texnologiyalari yordamida suv resurslarini samarali boshqarish; uchinchidan, ingichka tolali paxtani organik dehqonchilik tizimiga qo‘shish imkoniyatlari. Tadqiqot natijalari shuni ko‘rsatadiki, yuqori sifatli va bozorda qadrlanadigan ingichka tolali paxta ekologik xavfsiz va iqtisodiy jihatdan foydali ishlab chiqarishni rivojlantirishga xizmat qilishi mumkin. Shuningdek, maqolada tuproq unumdorligini saqlash, biologik xilma-xillikni qo‘llab-quvvatlash hamda tabiiy resurslardan oqilona foydalanishga qaratilgan agroekologik yondashuvlarning istiqbollari ham ko‘rib chiqilgan.

Kalit so‘zlar: Ingichka tolali paxta, barqaror qishloq xo‘jaligi, sog‘liqni saqlash, suv resurslarini boshqarish, organik dehqonchilik, agroekologik amaliyotlar.

Introduction. Sustainable agriculture has become a critical focus in addressing global challenges such as food security, environmental degradation, and climate change. Fine-fiber cotton, known for its superior quality and versatility, presents a unique opportunity to integrate sustainability into the agricultural sector. As a crop with high economic value and demand in the textile industry, fine-fiber cotton offers farmers the potential to balance profitability with eco-friendly practices. This theme explores how the cultivation of fine-fiber cotton can contribute to sustainable agricultural practices by emphasizing soil health, water management, and organic farming. Proper soil management techniques, such as crop rotation and organic amendments, can enhance soil fertility and reduce erosion. Efficient water management strategies, including precision irrigation and water recycling, can mitigate the impact of cotton farming on

water resources. Furthermore, the adoption of organic farming methods can reduce chemical dependency, promote biodiversity, and align with sustainable production standards. By focusing on these aspects, this investigation aims to highlight the potential of fine-fiber cotton as a catalyst for sustainable agricultural development, providing insights into how this crop can support a healthier environment and a more resilient farming system. More than 76% of the areas where fine-fiber cotton is grown in our republic are planted with the 5904-I variety, which does not fully meet the quality requirements of the textile industry.

Literature review. According to the data from the Central Scientific Research Institute of the Spinning and Weaving Industry, it is classified as Type III. The textile industry does not require this type of fiber extensively.

The fibers of the 133 variety, classified as Type III, are of great practical significance. This variety’s yield in the Kashkadarya region is 44% higher than the 590-I variety, with 38% more fiber. In the Bukhara and Surkhandarya regions, the yield of this variety was tested in various ways. Additionally, it matures 8–9 days earlier than the 5904-I variety, and its bolls are larger and less susceptible to wilt disease. The C-6002 variety has been planted in the Surkhandarya region. It belongs to Type II in terms of fiber quality. However, this variety of fine-fiber cotton is more susceptible to macroporiosis disease. The fine-fiber cotton varieties with Type I and II fibers have great potential. These varieties were propagated in seed farms, and the C-6029 and C-6030 varieties, in particular, hold significant practical importance. Additionally, the “T-7” variety was tested at the Surkhandarya regional experimental station. The 5595-B variety, created by Tajikistani breeders, is also notable for its Type II fiber quality. This variety is more productive than the 5904-I variety and was well-suited for the Kashkadarya region. In the regions of Termiz, Sherabad, and Jarkurgan, varieties with Type I and II fibers were planted.

Research Methodology. The study adopts a descriptive and analytical design, focusing on both historical and contemporary data related to fine-fiber cotton cultivation. The aim is to examine how its production practices contribute to sustainable agriculture, with special emphasis on human health, water management, and organic farming.

Data Collection Methods.Literature Review: A wide range of academic journals, books, international reports (FAO, ICAC, WWF), and policy documents are reviewed to establish the theoretical background.

Archival Sources: Historical data on fine-fiber cotton cultivation in Central Asia (especially Uzbekistan) are examined to trace long-term changes in farming practices and sustainability outcomes.

Qualitative Analysis – Thematic analysis is used to evaluate interview transcripts and field notes, focusing on farmers’ experiences with health impacts, irrigation techniques, and organic practices. As a result of the expansion of fine-fiber cotton fields, it was planned to reconstruct the existing cotton ginning factories and build specialized new cotton factories and points, as well as establish seed farms in the Jarkurgan and Sherabad districts of the Surkhandarya region. It should also be noted that breeders were encouraged for their efforts in developing and propagating new cotton varieties. According to the requirements of our textile industry, the yield of a variety with Type I fiber should make up 3% of the total yield, a variety with Type II fiber should account for 4%, and a variety with Type III fiber should contribute 3%. It should be noted that valuable fabrics are woven from the fiber of fine-fiber cotton of Type I and II. Type I fibers are used to make strong threads required by the footwear industry. Type II fibers are used to produce high-quality knitwear, "extra" fabrics, and various batiste and trimmings. Type III fibers are used to make various fabrics, household threads, and other items. Our breeders have worked hard to create high-yielding, disease-resistant fine-fiber cotton varieties, which has provided the opportunity to supply the textile industry with high-quality fibers.

Long-term experience shows that in many farms growing fine-fiber cotton, the spring moisture of the soil created conditions for the uniform germination of seeds and crop development. Therefore, in such districts, additional irrigation before planting ensured early and uniform germination, maintaining soil moisture for a longer period.

The experience of the Mari, Iolotan, and Termiz experimental stations shows that planting fine-fiber cotton between March 30 and April 10 yields the best results. However, it should not be planted too early, such as in the beginning of March. To achieve high yields of fine-fiber cotton, it was essential to determine the correct planting density based on the characteristics of the variety being planted. For the fine-fiber cotton of the O-type variety, 120-140 thousand seeds per hectare were used in advanced farms, while for the semi-dense varieties, 80-100 thousand seeds per hectare were planted. It should be noted that fine-fiber cotton varieties responded well to fertilizers. Fertilization practices were similar to those used for medium-fiber cotton varieties, including pre-planting and irrigation fertilization. Since fine-fiber cotton varieties have a strong vegetative mass and their bolls open later than medium-fiber cotton, they required 30% more seeds than usual.

Analysis and result. Fine-fiber cotton seedlings produced fewer bolls compared to medium-fiber cotton varieties. However, since its vegetative period was longer, it required more frequent irrigation. Depending on soil conditions and the proximity or depth of groundwater, the fields required 5-6 thousand m³ of water per hectare, and in areas with very low groundwater levels, 8.5-9.5 thousand m³ of water per hectare. Advanced farms organized irrigation based on the development stages of the cotton. In 1966, the "Kommunizm" collective farm in the Vakhsh district of the Tajik SSR harvested 30.8 quintals per hectare from 3,770 hectares of fine-fiber cotton. To achieve this yield, the farm provided irrigation seven times, starting in the first half of May. Working between the rows of fine-fiber cotton was similar to working with ordinary cotton rows. The thinning process was carried out in layers depending on the varieties’ branching characteristics. Varieties with zero branching naturally grew very tall, reaching 150 cm or even higher. Therefore, for these varieties, the thinning was done when 18-20 bolls per plant appeared, while for fine-fiber cotton varieties with normal branching, thinning was carried out when 15-16 bolls appeared.

Growing fine-fiber cotton required significant labor and investment. Farms growing fine-fiber cotton used 180-190 man-days per hectare. In the southern districts of Surkhandarya region, farms produced an average yield of 21.9 quintals per hectare, using 190 man-days per hectare. Farms in the northern districts of the region achieved a yield of 33.5 quintals per hectare, with 153.4 man-days per hectare. Despite this, when accounting for the total labor costs, the labor required for fine-fiber cotton was 15-20% higher than for ordinary cotton. This can be attributed to the higher purchasing price of fine-fiber cotton, which compensates for the additional labor costs.

Conclusion. In conclusion, the cultivation of fine-fiber cotton holds significant potential for advancing sustainable agricultural practices. By adopting methods that prioritize soil health, efficient water management, and organic farming, fine-fiber cotton can contribute to both environmental conservation and economic viability. Practices such as crop rotation, the use of organic fertilizers, and

precision irrigation not only reduce the ecological footprint of cotton farming but also enhance soil fertility and water-use efficiency. Furthermore, the natural qualities of fine-fiber cotton make it compatible with organic and low-chemical farming systems, reducing dependence on synthetic inputs and fostering biodiversity.

Integrating fine-fiber cotton cultivation into sustainable farming models can address key challenges in modern agriculture, including soil degradation, water scarcity, and the environmental impact of conventional practices. As a result, it provides a pathway for farmers to achieve higher-quality yields while aligning with global sustainability goals. The promotion of these practices, supported by research and innovation, can ensure that fine-fiber cotton contributes to a resilient and sustainable agricultural future.

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