AGROTECHNOLOGY OF SOYBEAN CULTIVATION AS A REPEATED CROP

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Abstract: The article outlines the theoretical possibilities of growing soybeans as a repeated crop under irrigation conditions. It recommends early-maturing and medium-maturing varieties, and characterizes the key elements of agro-technology for repeated sowing of soybeans.

Key words: soybean, defoliation, protein, oil, Orzu variety, Tumaris MAN 60 variety, bean ripening terms.

Soybean is a valuable, protein-rich, and oil-bearing crop, widely grown in Uzbekistan in recent years as a food, technical, and fodder crop. In the irrigated areas of Uzbekistan, autumn wheat is sown on more than a million hectares. This crop is harvested in early summer. Such conditions allow soybean to be planted as a repeated crop, providing an opportunity to fully ripen the seeds and make the best use of land and water resources.

Soybean is grown in more than 40 countries worldwide, and among leguminous crops, it is the most widely cultivated globally, covering an area of nearly 84 million hectares. The highest yields are reported in Japan, where 84 centners per hectare were obtained.

In Andijan region, scientific data shows that about 8 billion kilocalories of physiological active radiation (PAR) fall on each hectare of land throughout the year, with 3.2 billion kilocalories during the vegetation period (April to August). The remaining PAR falls from October to March. Considering that plant vegetation in the region lasts until mid-October, it receives 2.8 to 3.0 billion kilocalories of PAR during this period. The vegetation period lasts 110–115 days.

After wheat, early-maturing (90–105 days) and medium-maturing (106–119 days) soybean varieties can be planted, allowing for a full ripening of the seeds

during the harvest period. In irrigated conditions, with a useful work coefficient of PAR of 2.5%, and assuming the energy content of 1 kg of soybean seed is 4800 kcal, one can obtain 17.5 tons of dry matter or more than 3 tons of soybean seeds per hectare from the repeated crop.

The biological characteristics of the soybean plant must be considered in order to optimize its growth and yield. The plant requires adequate nutrition during its developmental phases, protection from pests and diseases, and effective management of the irrigation and fertilization processes.

Fertilizer Requirements: Soybeans consume more nutrients than grain crops, with the maximum consumption for 1 ton of seeds being 82 kg of nitrogen, 26 kg of phosphorus, and 47 kg of potassium. The nutrients that leave the soil in the form of seed and plant mass for 1 ton of grain are 72 kg of nitrogen, 23 kg of phosphorus, and 38 kg of potassium. For cereal crops, these figures are 34 kg of nitrogen, 13 kg of phosphorus, and 27 kg of potassium, respectively. Soybeans have a higher demand for nitrogen, especially during the flowering and pod development stages.

Soybeans, like other leguminous crops, fix nitrogen through symbiosis with Rhizobium bacteria, which leads to reduced nitrogen fertilizer requirements in optimal conditions. If symbiotic conditions are favorable (adequate soil pH, phosphorus, potassium, magnesium, boron, molybdenum, and suitable bacteria strains), the plant can fix up to 250 kg of atmospheric nitrogen per hectare during the growing season. This results in yields of 3–4 tons per hectare without nitrogen fertilization.

Optimal Growing Conditions: Soybeans require specific environmental and soil conditions to grow well. They are a short-day, light-loving, and moisture-loving plant. For maximum yield, it is important that the plants are evenly spaced in the field. For a full ripening of the crop, the effective temperature sum must be between 1600°C and 2000°C.

During different development stages, the ideal temperature ranges are as follows:

- For seed germination and seedling emergence: 15–20°C
- For the third true leaf stage and branching: 18–22°C
- For flowering, pod formation, and grain filling: 20–23°C
- For ripening: 18–20°C

Water Consumption: Soybean plants are relatively drought-tolerant during their early growth stages (before flowering). However, during flowering, pod formation, and grain filling, they require higher moisture levels. The total water consumption per hectare depends on environmental conditions and can range from 3000–5500 m^3/ha, with a water consumption coefficient of 1500–3500 m^3 per ton of grain.

Soil moisture requirements vary throughout the growing season. The optimal moisture content for seed germination and emergence is 80–100% of field capacity, while the moisture content should be around 60% during ripening.

Soil Requirements: Soybeans can be grown in various soil types as long as the soil is well-drained and aerated. They do not grow well in acidic soils. The plant's root system develops optimally in soils with a density of 1.10–1.25 g/cm^3. Soils prone to waterlogging or poor aeration should be avoided.

Nutrient Requirements: For 1 ton of seed yield, soybeans require 7.5–10 kg of nitrogen, 1.7–2.5 kg of phosphorus, and 3.0–4.5 kg of potassium. The plant's demand for nutrients is greatest during certain phases of growth:

- Germination and early growth: phosphorus
- Branching: nitrogen and potassium
- Flowering and pod development: nitrogen, phosphorus, and potassium
- Seed filling and ripening: nitrogen, phosphorus, and potassium

When there is a shortage of mobile nutrients in the soil, it is essential to apply fertilizers at various stages of development, including pre-planting, during

planting, and throughout the growing season. Fertilizer applications should be based on the plant's nutrient demand during each developmental phase and the availability of nutrients in the soil.

Technology for Growing Soybeans: The following points must be considered in the technology for growing soybeans as a repeated crop:

- The previous wheat crop should be well-fertilized, with high yield and timely harvesting.
- After wheat, the field must be prepared properly for sowing soybeans in the second half of June, ensuring that the soil conditions (moisture, air, and physical properties) are optimal for seed germination.
- The seeds used should be from a registered variety, with good agronomic characteristics (class 1 quality).
- It is recommended to plant early-maturing (90–105 days) and medium-maturing (106–119 days) varieties.
- The plant population should be maintained at 300–350 thousand plants per hectare, considering soil and water nutrient reserves.
- The technology must be designed for harvesting with combines.
- Nutrient and water management should be monitored throughout the plant's development phases.
- In unfavorable weather conditions, defoliation or desiccation may be necessary, based on meteorological data.
- Timely harvesting and post-harvest processing should be ensured.

This agrotechnological approach, based on the biological characteristics of soybeans, can ensure high yields (3–4 tons per hectare) under irrigated conditions. It will also allow for better use of soil and climatic resources in Andijan region and help maintain soil fertility for future crops.

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