The Technology of Opening a Furrow and Creating a New Garden Bed in Cotton Stalk Fields

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Abstract:- The development of investment processes in all areas is the most necessary condition for the effective organization of farming in a transitive economy. Investment analysis provides an information base for making important decisions on the inclusion of projects in investment portfolio, analysis of the structure of sources and its financing, the feasibility of investing in various conditions, thereby ensuring an increase in the efficiency of investment activities of business entities. The main goal of the work is to systematize the classifications of investment portfolios, substantiate the choice of models for diversifying the investment portfolio, analyze the methodological and practical approaches of the strategic directions of interregional interaction and integration, economic and statistical assessment of investment activity at the regional level.

Keywords: Diversification, investment, region, aspect, portfolio, income, classification

I. INTRODUCTION

On fields over 450 thousand hectares of land in the Republic of Uzbekistan ridges are taken for sowing cotton seeds.

Because the soil and climatic conditions of many regions of our republic require this approach and this is due to two reasons: firstly, if the cotton seeds are sown in flat fields, with a frequent decrease in temperature and increased soil moisture, the seeds do not have time to germinate and begin to rot; secondly, if the soil is dry and the temperature is high, the emerged shoots will dry out. As a result in both cases, there is a need for re-sowing.

The indicated drawbacks can be avoided by the formation of ridges for sowing cotton seeds, and it will be as following: If the temperature is low and the precipitation is much, the ridge will be higher rather than the temperature of the surface layer and it is prevented from being thick mud as a result of flowing the rain water into the furrow. If the soil has become excessively dry with increasing temperature, then seedlings get only additional watering. This means that these situations can be prevented only by sowing along ridges.

When comparing the ridge with a flat field with the same dimensions, it was determined that, on the ridge, the soil temperature is 2-3°C higher, and the total area where sunlight is incident on the ridge field is 1.5 times higher [1].

According to the data of the Physic technical Institute at the Academy of Sciences of the Republic of Uzbekistan the magnitude of solar radiation on the ridges is 1.5 times greater, and the soil temperature is 8–9 °C higher relative to fields with a flat surface [2].

A technology has been developed for the formation of ridges in one pass of the aggregate in fields with harvested cotton stems. This will reduce the cost of the formation of new ridges and irrigation furrows, after plowing with mandatory harvesting of stems, the soil is sewn up and its fertility is increased [3-12].

On developing the technology, the following available opportunities were taken into account: compliance with the deadlines for cleaning fields from cotton stalks and basic tillage, the need to perform operations in a short time, and ensuring agro technical requirements for performing the processes separately; the fitness of the working bodies to carry out technological operations simultaneously; reduction of negative effects of climatic conditions; productivity increase; reduction in specific fuel consumption and a sharp reduction in operating costs.

On the proposed technology the following operations are carried out (Fig. 1): from the initial position (a), the cotton stalks are bent into the side furrow (b), then the upper part of the ABS ridge along with the curved cotton stalks is cut off and laid on the bottom of the old furrow (c). After that, the remaining lower layer of the ASBMLK ridge is divided in the middle into formations in the form of ASLK and BSLM, each of them separately is turned and laid on stems already laid in the right and left bottom of the furrow (g). As a result, new ridges are formed on the site of old furrows with cotton stems buried beneath them, and new furrows (e) instead of old ridges.

With this technology deep closing of cotton stalks accelerates the process of their decay and increases the efficiency of their use as from organic substances.

a - the initial view of the field with cotton stalks; b — bending of cotton stalks to adjacent furrows; c - soil laying in an adjacent groove of the old ridge with roots; g - cutting the bottom layer of the existing ridge; d - view of the formed new ridges and furrows

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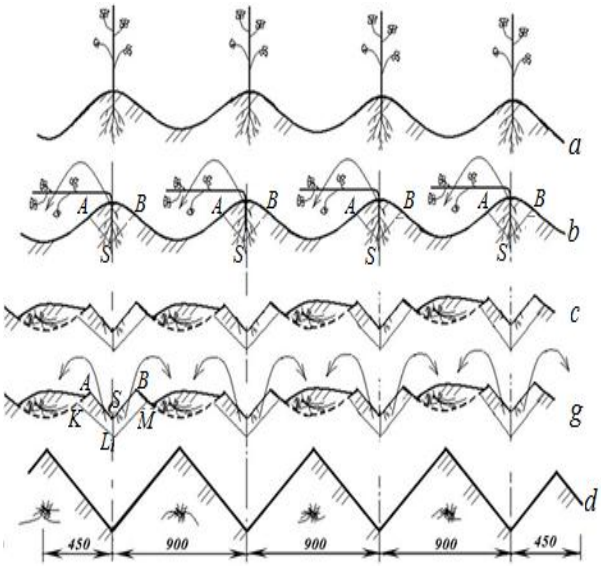

Fig.1. the scheme of the new technological process of getting ridges in the cotton stalks fields.

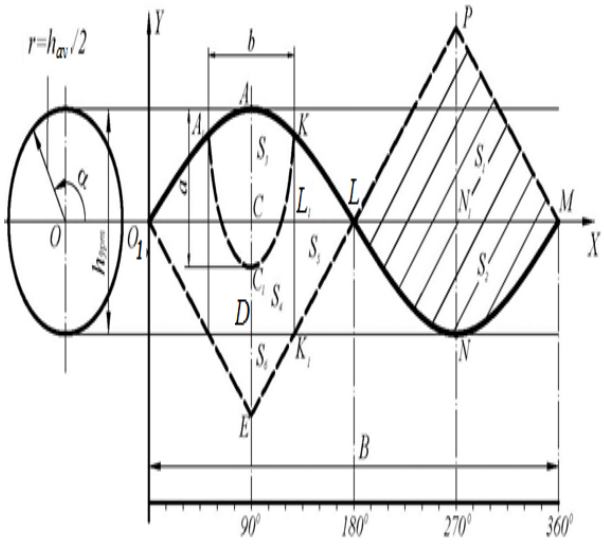

Fig.2. the cross section of existing and formed ridges

The unit processes four rows in one pass, and three complete and two half ridges are formed along the edges (Fig. 1 *d*). The half ridges in the next passes of the unit are fully formed. Existing ridges are processed layer by layer by the working bodies of the aggregate; therefore, the formation of large clods in the newly formed ridges is prevented.

RESULTS & DISCUSSIONS

The simultaneous implementation of the above operations in the fall allows you to save material and energy resources during tillage and preparing fields for sowing, i.e. minimal processing is ensured by reducing the number of passes of the unit up to 4 times.

Firstly it must be justified the parameters of the working bodies of the combined unit and the formation of new ridges according to the requirements of agricultural technology, it is theoretically necessary to determine the size of the soil layers that are shifted from old ridges to furrows.

According to the results of the studies, it is determined as following: the cross-section of the micro relief of cotton fields with cotton stalks has the form of a sinusoid with a height of 21 cm and an average angle of inclination of 35°.

To determine the size of the soil seam moved from the old ridge and by the working bodies during the formation of new ridges, we will construct the profile of the ridge and furrow OALNM in the coordinates of the XOY (Fig.2.). The origin of coordinates O_1 is compatible with the beginning of the existing ridge and the newly opened grooves.

According to the agro technical requirements developed by us, the height PN of the cross-section of the newly formed ridge PNM should be 30-33 cm.

To form a new ridge, it will be necessary to cut off the soil layer from the existing ridge in the required volume. For this, we determine the area PLNM of the new ridge.

The area of PLNM is divided into the triangle PLM (S1) and sectors LNM (S_2) of the sinusoid determined by the formulas,

$$S_1 = \frac{B^2 tg\varepsilon_н}{16}, \tag{1}$$

$$S_2 = \int_0^{90} \left[\frac{h_{av}}{2} \sin\alpha - \frac{h_{av}}{2} k|\cos\alpha| \right] \frac{L}{\pi} d\alpha, \tag{2}$$

where h_{av} - the average height of the existing ridge, m;

B - row spacing, m;

α – the angle of rotation of the rolling radius, degrees;

$\varepsilon_н$ – angle of repose of the soil of the new ridge, degrees;

L – half the row spacing, m;

k –a constant value, k = 0.12 with a row spacing of 90 cm [13].

To simplify the calculations, the equality of the areas O_1AC and LNN_1, the area of the sinus-shaped sector LNM is equal to $2LNN_1$ and the angle α varies within $0 \le \alpha \le 90°$ were taken into account. (Fig.2).

The width and depth of the root system of the cotton stalks, part of the ABC, were determined as the experience of the field. (Fig.1.).

The ABC form is accepted as part of the A_1AKC_1 ellipse.

The area A_1AKC_1 (S_3), the upper part of the ellipse bounded above by the sinusoid A_1AK and below A_1C_1K (Fig. 2), is determined by this formula,

$$S_3 = \int_{\frac{B}{4}-\frac{b}{2}}^{\frac{B}{4}+\frac{b}{2}} \left(\frac{h_{av}}{2} \left(\sin\left(\frac{\pi x}{B}\right) - k\left|\cos\left(\frac{\pi x}{B}\right)\right| \right) - \left(a\sqrt{\left(1 - \frac{(x-c_1)^2}{b^2}\right)} + d_1 \right) \right) dx, \tag{3}$$

where a and b are respectively the major and minor semiaxes of the ellipse, m;

d_1 and c_1 are the coordinates of the point considered respectively on the minor axes of the ellipse, m.

The height of the ridge is 21 cm, d_1 = 21.5 cm, c_1 = 22.5 cm can be assumed (the values of d_1 and c_1 vary depending on the height of the ridge).

The calculation results, formula (3) shows that, the area S_3= 205,1 cm^2

To calculate the size of the C_1KLE area, we divide it into the curved trapezoid C_1KK_1D (S_4) and the triangles KK_1L (S_5) and DK_1E (S_6) located in the lower right part of the existing ridge (Fig. 2).

The area of the curved trapezoid C_1KK_1D (S_4) is determined by the formula [14-17].

$$S_4 = \int_{\frac{B}{4}}^{\frac{B}{4}+\frac{b}{2}} \left[\sqrt{\left(1-\frac{(x-c_1)^2}{b^2}\right)} a^2 + d_1 \right] dx, \tag{4}$$

The integration boundary (point *K* of Fig.2) consists of the abscissa of the intersection point of the ellipse and the sinusoid, i.e. the results of a joint solution of the equations of an ellipse and a sinusoid,

$$\begin{cases} \dfrac{(y-d_1)^2}{a^2} + \dfrac{(x-c_1)^2}{b^2} = 1 \\ y = \dfrac{1}{2} h_{av} \left[\sin\left(\dfrac{\pi x}{L}\right) - k \left| \cos\left(\dfrac{\pi x}{L}\right) \right| \right], \end{cases} \tag{5}$$

were d_1=21,5 cm, c_1=22,5 cm.

The areas of triangles KK_1L (S_5) and DK_1E (S_6) are determined by the formulas,

$$S_5 = \frac{h_{av}(B-2b)}{8}, \tag{6}$$

$$S_6 = \frac{b^2 tg\varepsilon_н}{8}, \tag{7}$$

The calculation of the above formulas was performed according to the "MAPLE" program and the following results were obtained: the area of the newly formed ridge PLNM –770 - 800 cm^2; area A_1AKC_1– 205.46 cm^2; area C_1KK_1D – 106.40 cm^2; the area of triangles KK_1L –122.62 cm^2 and DK_1E –58.28 cm^2. The major and minor semiaxes of the ellipsoid area A_1C_1K, respectively - 25.5 and 12.0 cm.

The bottom of the new furrow relative to the existing one is located lower by DE = 11 cm (Fig. 2). As a result, the height of the new ridge is in the range of 40–44 cm.

CONCLUSION

Based on the results of theoretical calculations, the shape, height of the new ridge, as well as the necessary shapes and sizes of the soil layer cut off from the existing ridge were determined. The data obtained is the basis for choosing the type of working bodies and determining their parameters.

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