Title: Economic justification of the selection process for the creation of a new pear variety

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Abstract

The article provides a calculation of capital investment costs for the stages of the selection process. After determining all the costs at each stage, the total minimum financial resources required to carry out the entire selection process were calculated. This amounts to 245.5 thousand manats.

Considering that the creation of the variety serves a certain purpose, it is necessary to justify the method of deducting the costs incurred. Among all existing methods, a more progressive method is to pay for the costs incurred through deductions from the financial resources obtained from the sale of seedlings. This method is possible as a result of obtaining copyright for the created variety. With low costs, the created variety pays for its costs through the sale of 613,750 seedlings.

Keywords: Selection process, pear cuttings, copyright, payment of costs.

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Agriculture plays an exceptional role in providing the country's population with various food products throughout the year, as well as in the economy of our republic. Thus, increasing the volume and variety of fruit production in order to continuously meet the population's demand for fresh fruit products is one of the main tasks in a market economy. In this regard, one of the main directions of agriculture is the creation of new plant varieties, including fruit and berry varieties. In every country where agriculture exists and is developed, selection work is carried out to create new varieties, hybrids, as well as clonal forms of known and popular varieties.

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In our republic, breeding work on all agricultural plants is carried out through state-funded scientific programs [1,5]. In foreign countries, some large companies themselves create new varieties and receive high income (from the sale of seeds and planting material) by using copyrights.

Compared to other areas of plant breeding, the selection process in fruit growing is distinguished by the extremely long period of time for the creation of a particular variety. Thus, the period from the hybridization to the submission of the created variety to the state variety testing network can often be 25 or more years. In this case, there is a need for larger land areas and the identification of additional sources of funds. There is a lack of economic calculation data in the literature sources of our country to determine the cost of creating any plant variety. The guarantee of the success of the production of a variety or any commercial product is considered to be the economic feasibility of the implemented project and the return on investment.

Considering the economic importance of the selection process, we considered it important to justify the costs incurred in carrying out this process.

Purpose of the work

It consists of estimating the total costs of carrying out the selection process to create a new pear variety.

Research results

To determine the cost of developing a variety, a selection program must first be developed. This program should take into account each stage considered important for developing a variety with the desired quality characteristics, as well as the time until the variety is submitted to the state variety testing network [2,3,6]. The standard selection process for creating a pear variety through hybridization is as shown in Figure 1.

Stages of the selection process for creating a variety (F1) by hybridization

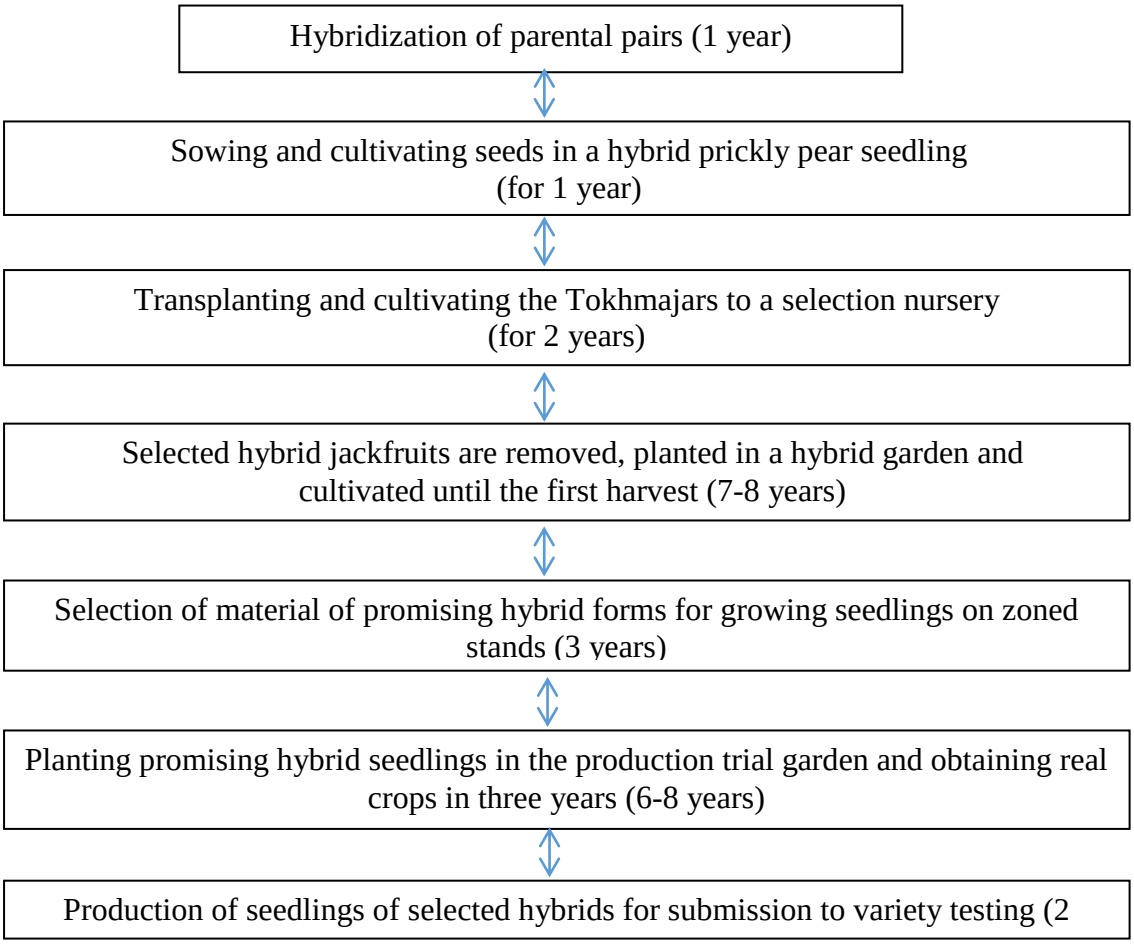

Figure 1. Scheme of the selection process for creating a pear variety through hybridization

This consists of the following stages:

1. The hybridization process primarily combines the following:

- selection of parent pairs with the desired qualities;
- on-site mating of the fertilized flowers of the mother plant through artificial pollination;
- harvesting fruits and extracting seeds at the end of the growing season after hybridization.

2. Sowing seeds in a seedling of (hybrid) poplars [3,5]. Hybrid poplars are selected based on their initial resistance to biotic factors (spot, powdery mildew) [9,12]. At this time, the level of severity of selection is determined by the selected poplars. When field selection is carried out for disease resistance, in some cases, severe selection can account for 90% of the finished (germinated) poplars. The selected poplars will later be planted in a hybrid seedling.

3. The establishment of a hybrid nursery and the cultivation of the cypresses there to a certain size are of great importance for the establishment of a hybrid orchard. This period lasts two years. During the process of cultivation of hybrid cypresses, observations are made on the main indicators in order to take into account the period when the accuracy of the jewelry is required [10,11]. As a rule, these include the determination of signs of variegation, early emergence from the period of relative dormancy, late leaf fall, growth vigor and disease resistance. Often, the selection pressure in a hybrid nursery can increase to 80%.

4. Cultivated and selected planting material for planting a hybrid orchard in the future is of great importance. In this orchard, trees develop until the end of the fruiting period and begin to give stable yields. Work on the original plants is considered completed due to their fruits, their quality and yield characteristics, and subsequently, selected forms will be propagated vegetatively to create a production orchard. At the same time, the golden period of a pear plant is considered the period from the formation of the first leaf to the formation of the first flower and the formation of the fruit, which, as a rule, is 10 years. The total period from seed germination to the full formation of the fruit cannot be less than this, but can be 11-13 years. Thus, the period of cultivation of hybrids in a hybrid orchard from planting the orchard to the selection of promising hybrid forms varies between 7-8 years. During this period, trees of hybrid forms planted in a 5x4m planting scheme are cared for in accordance with the agrotechnical cultivation measures adopted in fruit growing, the trees are given a sparsely storeyed or flat umbrella shape [4]. It is impossible to obtain a stable harvest in such a garden, since the fruit trees bear fruits of completely different quality and differ sharply from each other by the end of the period of jeweler's accuracy. It is precisely by the end of the non-productive period that the breeder can make an opinion about the intensity of the hybrid form. Therefore, plants that quickly yield and quickly form a crop are selected. As a rule, the selection accuracy in this case should be 80% of the initially planted trees. It should also be noted that for conducting a production trial, it would be good to select at least one promising hybrid form, which in the future will be compared with zoned and widespread control varieties. Thus, initially, at least 50 trees should be planted in the hybrid orchard (10 hybrids per yield: prospective hybrid yield 20% x 100% = 50). With a 5x4m planting scheme, this amounts to 0.10 ha of area for one hybrid generation.

5. Selected promising hybrid forms are used for growing seedlings for the purpose of using them in the future in the establishment of production variety testing gardens. For the establishment of a production variety testing garden, no less than 30 units of each hybrid form are required in accordance with the requirements of the State Variety Testing Methodology of agricultural plants, as well as standard seedlings of control varieties in this amount [6,8]. Usually, 2 varieties (zoned and widespread) are used as control varieties. If 2 varieties are taken as control, the number of required seedlings will increase slightly. Thus, in the nursery: 12 varieties / hybrids x 30 standard seedlings = 360 units should be grown. Taking into account that the standard seedling yield is 70% of the grafted shoot in the planted rootstock material and the planting scheme of seedlings to be cultivated based on the "Knip Baum" technology is 90x30 cm [13], the total area of the nursery will be as follows:

360 seedlings x 100% = 514 plants;

70% standard seedling yield

514 plants x (0.9 mx 0.3 m)=139 m2

Seedlings are being cultivated in this area for three years.

6. The grown seedlings are used in the establishment of a variety test garden based on intensive technology together with zoned control varieties. The main goal is to compare the yield frequency of selected hybrid forms in intensive garden conditions, the level of crop growth, as well as the average productivity of trees for a period of not less than 3 years with widespread zoned varieties. This stage is considered the last in the selection of hybrid forms. As a rule, 6....8 years can be spent on this stage. If we take into account that the breeder plants an intensive garden in a 3.5 x1.0 m planting scheme, the land area required for this garden is: 360 seedlings (3.5x1.0 m) = 1260 m2 = 0.12 ha. At the end of the observations, one of the 10 hybrid forms involved in the test is selected. This selected variety is submitted to the State Service for Registration of Plant Varieties and Seed Control for inclusion in the State Register of Selection Achievements, which is allowed for use by agricultural producers in the future in the territory of the Republic of Azerbaijan.

7. The final process of including a new variety in the Register of Selection Achievements Allowed for Use in the Republic of Azerbaijan is the submission of planting material to the State Service for Registration of Plant Varieties and Seed Control for study at the variety testing stations of each specific zoning region. Each variety testing station should be provided with 36 seedlings of the created variety. The experiment should be conducted in four replicates, with 8 seedlings in each replicate. To grow this amount of seedlings, a further field of seedlings is required on an area of not less than (40 seedlings x (0.9x0.3)10.8 m2 based on the "knip-baym" technology.

If, after the hybrid garden, the areas of the structural units for gardens and nurseries have been calculated by us, then in order to determine the areas of the previous stages, a backward calculation must be made based on the required yield, taking into account the nutritional area of the plants and the level of selection of hybrids.

Thus, after the 80% selection level, no less than 50 plants from the nursery should be planted in the hybrid garden. The planting pattern of plants in the nursery area is 0.7x0.3m. In this case, the calculation is made:

1) The amount of tubers needed to plant in a hybrid nursery:

500 seedlings in the garden x 100% = 2500 hammerheads

100-80% selection level

2) Hybrid seedling area (m2)

2500 units x (0.7x0.3m)=2500 m2 =0.053 ha

To obtain ramets in the nursery, it is possible to calculate the seed sowing area accordingly. If the seed sowing pattern is 0.7x0.02m, the seed germination rate is 80%, and the selection level is 90%, the ramet area in the nursery will be as follows:

a) Quantity of finished hammers for selection selection:

2500 pieces (hammers obtained from the hammer nursery) x100%=25000 pieces of hammers;

100-90% selection level

b) The amount of seeds planted, taking into account germination capacity:

25,000 pieces of hammers x 100% = 31,250 pieces of seeds;

80% germination rate

c) Area of hybrid persimmons nursery:

31250 seeds x (0.7x0.02m)=437.5 m2=0.044 ha

Using the available information on the structure and areas of the selection process, it is possible to calculate the total cost of the process. For this, it is necessary to use technological maps developed for all structural units.

All costs incurred to conduct the selection process can be divided as follows:

- Expenses incurred on the salary of a breeding scientist. The average monthly salary of a breeding scientist in Azerbaijan is 779.0 manat. Considering that a breeding scientist should receive a salary of 9348 manat (779 manat x 12 months) in a year. Accordingly, the expenses to be paid to the breeding scientist during the entire production cycle of the variety creation will amount to 233.7

thousand manat (9348 manat x 25 years).

- Costs of implementing agrotechnical processes. This item is somewhat complicated in terms of calculating costs. For this, calculations based on technological maps are used, since these costs include all agrotechnical processes - planting the garden and caring for trees, payroll costs with supplements, fuel and lubricants, plant protection costs, water for irrigation of gardens, etc. Other costs. The total cost indicators used in the selection process and taking into account the land area of each structural unit are given in Table No. 1.

Table 1

Costs of performing technological work in the selection process

s/s	Names of structural units	Area, Yes	Expiration date, year	Costs for the entire period, manat
1	Sowing seedlings of hybrid seeds	0.044	1	2198.76
2	Hybrid persimmons nursery	0.053	2	805.71
3	Hybrid garden	0.10	8	2989.00
4	Nursery for growing selected hybrid forms	0.014	3	863.44
5	Variety test garden of selected forms	0.12	8	4856.85
6	Nursery for the registration of variety certificates of selected hybrid forms and their reproduction for submission to the State Variety Test	0.0011	3	70.28
7	Total:		25	11784.04

Thus, 245.5 thousand manats of financial resources are required to carry out the selection process aimed at creating a variety and registering it in the State Register, which is considered the minimum liquid value of the variety.

In the event that each applied scientific process should have a commercially profitable output and, by exercising copyright, the newly created variety should cover the costs incurred. The reality of exercising copyright is the receipt of royalties (payments) from the income of nursery enterprises from the sale of seedlings [7]. In accordance with Azerbaijani legislation, the amount of royalties (payments) is determined at 4% of the value of the commodity product, currently the seedling. The average selling price of one apple seedling grown using the "Knip-baym" technology is 10.0 manat. As a result, the author of the variety receives for each seedling of the variety sold:

The fee will be 10 manat (price of the coin) x 4% royalty = 0.4 manat.

100% seed

Thus, in order to fully cover the costs incurred by the breeder, the production volume of planting material of the created variety should not be less than the amount specified below:

245500 manats of variety creation costs = 613750 seedlings

Payment from the sale of one seedling of 0.4 manat

If we take into account that the produced seedlings will be used to establish an intensive orchard with a planting scheme of 4.0x1.25 m, with 2,000 trees per hectare, then the area under the orchards of this variety should not be less than 613,750 seedlings: 2,000 trees/ha = 306.9 hectares.

Results

1. Taking into account all the production costs and labor costs listed above, the creation of one new pear variety requires financial resources of at least 245.5 thousand manat.
2. If a newly created variety successfully passes the State Variety Test and a patent-copyright is granted for that variety, it is possible to cover the costs incurred through royalties from the sale of seedlings of that variety. However, there is an opportunity not only to cover the costs, but also to earn additional income.
3. As the selection of fruit plants, including pears, is a complex and expensive process, it is necessary to calculate in advance the amount of funds to be allocated for variety creation. An accurate calculation will allow both to determine the cost and to calculate the cost recovery.

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