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MANAGEMENT ISSUES OF INNOVATION DEVELOPMENT FOR PLANT GROWING

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Abstract: The process of innovative development of crop production is manifested in several directions, such as sustainable development, digitalization of management, adaptation to climate change, the final results of which are awaiting their evaluation. The research interprets the goals of innovative crop production management and, based on this, proposes approaches to rating their actual implementation. The results of the proposed method for rating the innovative process of crop production provide an opportunity to implement effective management decisions aimed at improving the competitiveness of the crop production sector.

Keywords: innovative crop production, digitalization of management, sustainable crop production, evaluation of management results, rating.

JEl codes: O3, Q5

Research aims: the goal of the research is to develop a system for evaluating and rating the final results of innovative crop production management.

Research novelty: The novelty of the research is to develop of a system for evaluating and rating the final results of innovative plant breeding development management, as a result of which a universal indicator of the development of innovative plant breeding was proposed.

Introduction

Innovative development of crop production poses challenges for governments. The scarcity of land cultivated for agricultural purposes, limitations of crop production resources, the sharp increase in the world population in recent decades, risks threatening food security, agribusiness ensuring sustainable development place ambitious demands on crop production (Yunbi, Xu, Jiayang, Li, Jianmin, Wan. 2017).

Key among them are not only the intensive use of agricultural lands, increasing productivity, but also the timely implementation of restoration work on used land resources, the production of ecologically clean crop products, and the use of flexible mechanisms for adaptation to climate change.

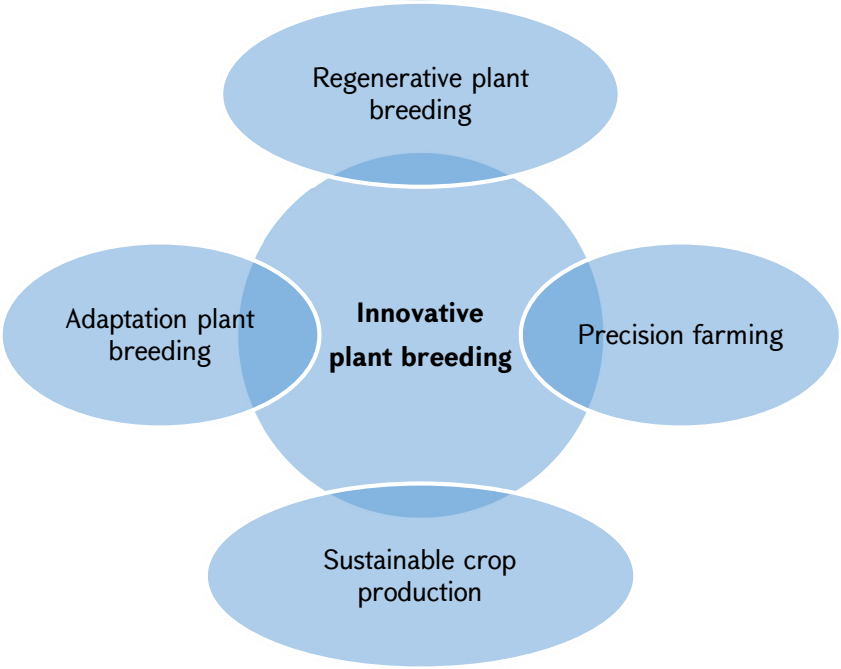


Figure 1. Specific components of innovative plant breeding system management
Source: *Authors' own work.*

Overcoming the listed challenges requires specific components of innovative plant breeding system management (see Figure 1) and measurements of the final results of their application.

Finally, a research problem arises on how to assess the process of innovative development of plant breeding and with what approaches to evaluate the final results of innovative functions in the field of management (Tshughuryan, A., Savastano, M. 2024).

Research results

The development of innovative plant breeding, unlike traditional agribusiness, requires not only a sharp increase in the productivity of agricultural products in resource-saving conditions, but also the maintenance of sustainable economic development so that the consumption of today's plant breeding resources takes into account the possibilities of organizing plant breeding by future generations (Pirimkulov J.P. (2025).

And if the results of traditional plant breeding development can be measured in monetary terms, then a significant part of the results of innovative plant breeding development take on non-financial forms of expression, such as the formation of human capital in agribusiness, gender equality, electronic mapping of locations, etc. Therefore, the problem of a comprehensive assessment of the results of innovative plant breeding development arises, since in this process there is a need to consolidate financial and non-financial indicators. And the assessment of the innovative development of plant breeding is important when making strategic management decisions, when it is required to ensure constant monitoring in the directions of digitalization and sustainable development of the sector. In this regard, we propose a universal indicator of the development of innovative plant breeding (B), for the calculation of which we consider it necessary to perform the following steps (see Figure 2).

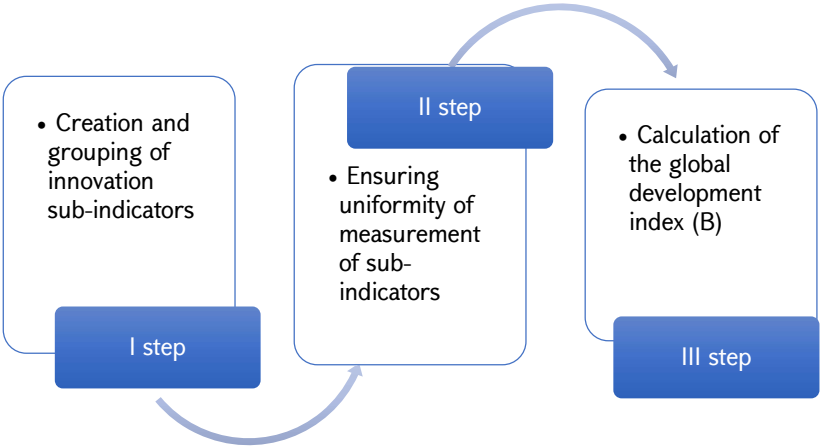


Figure 2. Steps for rating the results of innovative development of crop production

Source: *Authors' own work.*

Digitalization currently plays a decisive role in the field of innovative development of crop production, as it creates the basis for the organization of "smart agriculture". Electronic mapping of crop fields, then downloading various types of information into it using various technical devices and its systematic processing by artificial intelligence leads to management instructions on:

- ✓ How to distribute fertilizers, pesticides by location;
- ✓ In which areas to carry out soil moistening with drip irrigation;
- ✓ How to increase the yield of individual plots of land, and especially with which crops;
- ✓ How to adapt to climate change resistance.

However, the developments of innovative plant breeding are not limited to the listed factors, since currently the key indicator is also the development of plant breeding with sustainable development

approaches so that the exploitation of natural resources, the direction of investments, the orientation of scientific and technological development, and the development of the individual are coordinated with each other and form a future-oriented potential for meeting human needs. Therefore, the sustainable development process is aimed at ensuring the following key components (Martirosyan, T., Tshughuryan, A., Khachatryan, N., & Harutyunyan, A. (2025).

- ✓ economic growth,
- ✓ social progress,
- ✓ environmental protection.

Based on the above-described development targets, we propose to rank the indicators of innovative plant breeding in two enlarged groups: digitalization (D) and sustainable development (S), which will present the definitions of innovation indicators (see Table 1).

The next step in rating the results of innovative development in crop production is to ensure the uniformity of the measurement of the sub-indicators (see Figure 1).

Since innovation factors act in different dimensions, we consider it appropriate to measure them using a point system (from 1 to 100 points). Moreover, with the growth of innovative progress, the point assessments also increase. Such point assessments can be given by the Department of Plant Breeding of the Ministry of Economy of the Republic of Armenia.

Table 1. Indicators of the results of innovative development of crop production (100-score system)

Source: *Authors' own work.*

Innovation factor		2024	2026
Digitization (average score)	**D**	18,25	19,25
Electronic location mapping and management guidance development	D1	4	7
Digitization of fertilizer location	D2	9	11
Optimization of pesticide distribution through digital information processing	D3	35	32
Precision agriculture based on resource efficiency	D4	25	27
Sustainable development (average score)	S	35,2	52,4
Increasing productivity with minimal environmental impact	S1	31	65
Gender equality in the crop production system	S2	45	62
Regenerative crop production	S3	35	38
Use of renewable energy	S4	22	29
Production of environmentally friendly products	S5	43	68

For the purpose of rating, we propose four levels (see Figure 3), which are:

I level of innovative start

II level of developing digitalization

III level of developing sustainability

IV level of innovative development

In addition, the management constantly monitors the process of development of innovative crop production and determines at what

level it is currently. For this purpose, a general indicator of the development of innovative plant breeding is calculated using the harmonic mean.

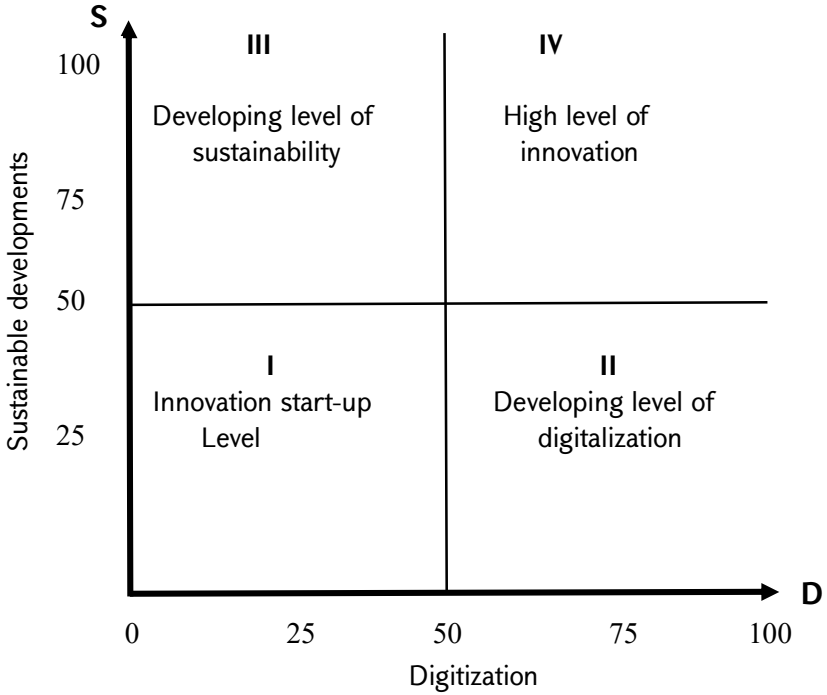


Figure 3. Plant breeding innovation development rating
Source: *Authors' own work.*

The four-level rating system creates an opportunity to make management decisions so that the process of plant breeding development regularly improves its indicators in the rating environment, reaching from the first level to the fourth level. At the same time, the sub-indicators of plant breeding innovation digitalization (D) and sustainable development (S) are evaluated separately in order to identify the weaknesses and strengths of

innovative functions in plant breeding.

$$D = \sqrt{D1 \times D2 \times D3 \times D4} \qquad S = \sqrt{S1 \times S2 \times S3 \times S4 \times S5}$$

And we propose to present the overall indicator of the development of innovative plant breeding (B) with the average number of sub-indicators of digitalization (D) and sustainable development (S):

$$B = (D + S)/2$$

Thus, using Table 1, we can present the indicators of innovative development of plant breeding for 2024 and 2026 (see Table 2). The estimates show that although in 2026, compared to 2024, progress was recorded in the overall indicator in the plant breeding sector (from 23.6 to 32.83), in the two years under analysis, plant breeding did not overcome the threshold of the first level of innovation and moved to the second level.

Table 2. Calculation of indicators of innovative development of plant breeding

Source: *Authors' own work.*

Factors	2024		2026	
Digitali-zation	$\sqrt{4 \times 9 \times 35 \times 25}$	13,2	$\sqrt{7 \times 11 \times 32 \times 27}$	16,06
Sustaina-ble deve-lopment	$\sqrt{31x45x\ 35x22x43}$	34,1	$\sqrt{65x62x\ 38x29x68}$	49,6
Innovation in general	$(D + S)/2$	23,6	$(D + S)/2$	32,83

Conclusion

The method proposed by us for the management of the rating of innovative development of crop production allows:

First, to consolidate the components of innovative crop production into a single system and group them according to the directions of digitalization and sustainable development, thereby creating a platform for making the innovation process in the crop production sector measurable with an integrated approach.

Second, to reformulate the results of innovation processes into separate sub-indicators, thereby creating the opportunity to conduct comparative analyses according to individual directions of development (Khachatryan, N., Mirzoyan, N., Tshughuryan, A., Avanesova, I., Hakobjanyan, A. 2026).

Third, to rate the results of innovative development of crop production with a common indicator, thanks to which it will not only be possible to assess the innovation progress, but also to identify the strengths and weaknesses of this sector, making appropriate management decisions on improvements.

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Արմեն Ճուղուրյան
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տնտեսագիտության դոկտոր, պրոֆեսոր

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ինստիտուտ, ասպիրանտ

Բանալի բառեր - ինովացիոն բուսաբուծություն, կառավարման թվայնացում, կայուն զարգացող բուսաբուծություն, կառավարման արդյունքների գնահատում, վարկանիշավորում:

Բուսաբուծության ինովացիոն զարգացման ընթացքը մի քանի ուղղություններով է դրսևորվում, ինչպիսիք են կայուն զարգացումը, կառավարման թվայնացումը, կլիմայի փոփոխություններին հարմարվողականությունը, որոնց կառավարման վերջնարդյունքները իրենց գնահատումներին են սպասում:

Հետազոտությունում մեկնաբանվում են ինովացիոն բուսաբուծության կառավարման նպատակադրումները և դրանից ելնելով՝ առաջարկվում դրանց փաստացի իրագործման վարկանիշավորման մոտեցումներ: Բուսաբուծության ինովացիոն ընթացքի վարկանիշավորման առաջարկվող մեթոդի արդյունքներով հնարավորություն է ստեղծվում իրակա-

նացնելու բուսաբության ճյուղի մրցունակության բարելավմանը ուղղված արդյունավետ կառավարչական որոշումներ:

Բուսաբուծության ինովացիոն զարգացման վարկանիշավորման կառավարման գծով առաջարկվող մեթոդը հնարավորություն է տալիս համախմբել ինովացիոն բուսաբուծության բաղադրիչների մեկ համակարգում և դրանք խմբավորել ըստ թվայնացման և կայուն զարգացման ուղղություններով, դրանով իսկ հարթակ ստեղծելով համակցված մոտեցմամբ չափելի դարձնելու ինովացիոն գործընթացը բուսաբուծության ոլորտում:

Բացի այդ, վարկանիշավորման առաջարկվող մոտեցումը հնարավորություն է ընձեռնում ինովացիոն գործընթացների արդյունքները վերաձևակաերպելու առանձին ենթացուցիչներով, որով իրականացվում են համեմատական վերլուծություններ՝ ըստ զարգացման առանձին նորարարական ուղղությունների:

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Conflicts of Interest:
The authors declare no ethical issues or conflicts of interest in this research.