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**DIRECTIONS OF SECURING SUSTAINABLE DEVELOPMENT
BASED ON INNOVATION PROCESSES
IN THE AGRO-INDUSTRY**

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Abstract

The article examines the key factors for ensuring sustainable development in the agro industry based on innovation processes so that today's agriculture can compete with other sectors. Innovation is defined as the application of something new or improved (whether technology or otherwise) in products (goods or services), processes, marketing, or organizational methods. Two main models of innovation policy have been studied: 1) model of innovation policy aimed at the implementation of scientific and technical programs and projects of national importance, 2) model of innovation policy aimed at the dissemination of scientific and technical knowledge. Research shows that the development of entrepreneurship in the agricultural sector, the transition to free and progressive agricultural methods, the development of land, machinery, water, etc. it is possible to increase the production of quality products through the efficient use of material resources. An analysis of innovations in Azerbaijan's agro industry was conducted. The main directions of the innovative development of Azerbaijan's agro - industry and the provision of a long and deepening value chain have been considered and recommendations have been made.

Keywords: *agrarian sector, innovation, sustainable development, agriculture, value chain.*

Introduction

The solution-requiring challenges of current world are imposing pressures on agriculture: growth of population, the impacts and consequences of climate change, growing limit on the usage of land and water, reducing of food loss and waste. Development of sustainable agriculture for securing food security requires new approach – innovation inclusive growth outline for agriculture.

Ensuring sustainable development based on innovative processes in the agro-industry of our country is and will be one of the decisive factors for today's agro-industry to be able competitive in world economy. We live and work in a time when the new generation of digital technologies have become an integral part of all areas of human life and activity. Big data, artificial intelligence, virtual and augmented reality, blockchain, cryptocurrency, adaptive systems, bio and nanotechnology have made it clear that we need to embrace these innovations in all areas.

For more clear understanding of “innovation” it must be compared with “invention”. It’s easy to see how complicated it can be to distinguish between these two concepts. First of all, “new” is the defining keyword for both innovation and invention. But the essential difference is that by invention is created something completely original or the process of creating something that has never been made before.

As for innovation it is introduction something new to the market, manipulation of existing inventions and turn them into a product or process that bring growing value in the real world. Invention could, for example, be a technical idea or a scientific process. Innovation is the introduction of new ideas or a scientific processes in real business world.

The purpose of the article is to analyze the state of the innovation process in the field of agro-industry in Azerbaijan and to make appropriate proposals to accelerate the innovation process. Although the lack of statistics for the agro-industrial sector makes it difficult to fully assess the situation, the analysis of the food and beverage sector allows us to make the necessary assessments.

Main determinants of innovation and Innovation policy

The innovation process takes place mainly within "Innovation Systems", which consists of private and public partners from organizations that are interconnected in various ways and have the technical, commercial and financial skills and resources necessary for innovation.

According to Oslo Manual (which provides guidelines for collecting and interpreting data on innovation) the general definition of an innovation is as follows: “An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)”.

The term “unit” used to describe the actor responsible for innovations.

Four types of innovations (product, process, organisational and marketing) defined in the third edition of Oslo Manual were reduced in 2018 to two main types: product innovations and business process innovations.

According to the new manual the basic definitions of a product and business process innovation are as follows:

A **product innovation** is a new or improved good or service that differs significantly from the firm's previous goods or services and that has been introduced on the market.

A **business process innovation** is a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and that has been brought into use by the firm (10).

It must be stated that Oslo Manual focus on the manufacturing and services sectors, thus excluding agriculture for the most part (7).

Innovation as an outcome and process needs suitable economic and legal environment.

The main criteria for evaluating innovations at the stage of creation are: the development of innovation as innovation in itself, the degree of novelty and compliance with the modern world requirement levels; calculated growth of total product and improvement of quality indicators; maximum resource savings and cost reduction per unit of production.

In its simplest form, an innovation system has three elements: organizations and individuals involved in the creation, dissemination, adaptation, and use of new knowledge; interactive learning that occurs when organizations join these processes and the way it leads to new products and processes (innovation); and the rules, norms, and conventions that govern both formal and informal institutions that govern how these interactions and processes take place (Horton 1990; North 1995). Innovation systems conceptually explore how societies create, share, and use knowledge (Spielman 2006).

Another study on innovation notes that although innovation has become a common term, many businesses still find difficult to materialise it. One reason for this may be that much of what is written about innovation is misunderstood. In order for innovation to truly manifest itself and reap its benefits, it must be acknowledged that innovation is a three different combination: innovation is an outcome, innovation is a process, and innovation is a thought.

As a result, it emphasizes what product is in demand or can be turned into demandable, including innovation of product, process, marketing, business model, supply chain, and organization. Innovation as a process involves how innovation is organized so that outcomes can be realized. This includes a general innovation process and a new product development process. Innovation as a mindset involves the adoption of innovations by individual members of the organization in which innovation is instilled and rooted, along with the creation of a supportive organizational culture that allows innovation to flourish (1).

The 5 key stages of successful innovation are:

Formation and mobilization of ideas

Judgment of the idea

Practicing the idea

Commercialization of the idea

Application of the idea

Table 1. Factors affecting the innovation process

Group of factors	Factors impeding innovation activity	Factors promoting innovation activity
Economic, technological	Insufficient funds to finance innovation projects, weak material and scientific-technical base, lack of reserve forces, dominance of current production interests	Availability of financial and logistical resources, advanced technologies, important economic and scientific-technical infrastructure
Political, legal	Restrictions by antitrust, tax, patent-license legislation	Legislative measures to support innovation (especially incentives), state support for innovation
Social, psychological, cultural	Resisting changes such as altering the status of employees, the importance of finding new jobs, restructuring jobs, restructuring outdated practices, changing existing stereotypes, fear of uncertainty, fear of punishment for failure	Moral support of the participants of the innovation process, public popularity, creation of opportunities for self-realization, normal psychological environment in the labor collective
Organizational management	The company's old management structure, excessive centralization, authoritarian management style, the dominance of vertical information flow, organizational closedness, difficulty of intersectoral and inter-organizational relations, rigid planning, focus on existing markets, difficulty in coordinating the interests of innovation participants	Moral support of the participants of the innovation process, public popularity, creation of opportunities for self-realization, normal psychological environment in the labor collective

Source: The table was prepared by the author.

The most important matter in the formation of innovation policy is the choice of its main vector of action, which allows to distinguish two main models of innovation policy:

- *Model of innovation policy aimed at the implementation of scientific and technical programs and projects of national importance. The main goal is to encourage the development of positive opportunities in areas that are a priority for the country.*
- *Model of innovation policy aimed at dissemination of scientific and technical knowledge. The main purpose of such policy is to increase the ability to master new technologies.*

Depending on the implemented innovation policy, the countries of the world may be divided into three groups:

1. Countries with a large share of scientific and innovative potential in the military sphere and covering all stages of the innovation cycle, preferring to implement large-scale targeted projects (USA, UK, France);
2. Countries (Germany, Sweden, Switzerland) aimed at optimizing the entire economy, creating a favorable innovation environment.
3. Countries that stimulate innovation through the development of innovation infrastructure, ensure the sensitivity of scientific and technological progress to world achievements, coordinate the actions of various sectors of science and technology (Japan, South Korea) (6).

There are three mutually interdependent ways of innovative development of agriculture in modern conditions:

Investment in human capital - priority development of agrarian education, fundamental and applied research organizations, creation of a database on innovations, as well as creation of an information and consulting system serving agricultural producers;

Investment in biological resources - increasing soil fertility and productivity of agricultural production through the application of innovative methods;

Investment in new technology - investment in the development of technologies that improve the technical and technological potential of agriculture through the use of energy and resource-saving equipment and high technology, which can dramatically increase labor productivity and efficiency of agricultural activities (5).

Research shows that it is possible to increase the production of quality products through the development of entrepreneurship in the agricultural sector, the formation of entrepreneurship on the means of production and land, the transition to free and progressive agricultural methods, new property relations, efficient use of land, machinery, water and other material resources.

Statistical data about innovation

For the effective implementation of innovation policy the government has to have necessary statistical data. The need is provided for by statistical information gathered with annual statistical report "About the enterprise's innovation activity" presented by enterprises. The report consists of 7 sections:

Section I. Expenditures on technological innovations by types of activities and sources of funding

Section II. Volume of products (services)

Section III. Objectives of innovation activity

Section IV. Number of technologies (technical achievements) and software received and provided by the enterprise in the reporting year

Section V. Organization and marketing innovations

Section VI. Sources of information on innovations

Section VII. Factors hindering innovation

In the report expenditures on technological innovations by types of activities are detailed on application and development of new products, services and methods of their production (transmission), new production processes, purchase of machinery and equipment related to technological innovations, acquisition of new technologies, training of employees in connection with innovations, new marketing research, research and development (R&D).

The sources of financing are grouped by own funds of the enterprise (organization), state budget, local budgets, extra-budgetary funds, foreign investment and other sources.

The report also includes information about expenditures on product innovations and process innovations according Oslo manual's definition.

Statistical yearbooks of Azerbaijan do not include information about innovation activity in agriculture. Statistical information about innovation in industry do not detail on agro-industry innovations. There are information about food industry. Lack of such information makes it difficult to assess the level of innovation in agriculture. Therefore development level of the agriculture may be determined through other indicators, reflecting productivity and resource savings.

Brand-new innovations in agro-industry

Today in developed countries complex and constantly evolving agro-industry innovation systems are followed by application of robotics and biotechnological and digital technologies. This process results in entrance into the systems of qualitatively new players. Traditional farmers gradually are giving up their share of agriculture production to these new players.

Measuring agricultural innovation is challenging for several reasons: First, agriculture and food systems span many different sectors, products, and service groups that are not easily grasped and that go far beyond the agriculture sector or agricultural farms alone (10).

Innovations embrace the value chain involving 1. agricultural inputs such as fertilizers and seeds, at times coming from the chemical or the biotechnology sector; 2. product innovations coming from the capital goods sector; and 3 process or organizational innovations in the fields of payments, logistics, and distribution services coming from the banking, transport, and retail sectors (10).

Agro-industry systems are different across countries, and these differences depend on and reflect level of development of countries.

In developing countries, agricultural production take place at the farm or household level and small scale hinders innovations, which require investments in micro and macro level.

Innovations in agro-industry of Azerbaijan

As mentioned above statistical data about innovation in agriculture production are not given in statistical yearbooks. Therefore development tendency of the agriculture may be analysed through indicators, reflecting productivity and resource savings. The **Table 2** below reflects per capita agricultural production.

Table 2. Production of agricultural products, per capita, kg

	2003	2013	2014	2015	2016	2017	2018	2019	2020
Gross output of agriculture, AZN	177	564	555	591	584	676	714	791	845
Meat (in carcass weight), kg	23	31	31	98	31	33	33	34	35
Milk, liter	143	193	197	202	209	208	212	217	220
Egg, units	83	151	166	163	167	176	171	184	191
Fish, kg	2.8	5.5	5.3	5.4	6.6	6.6	6.3	6.4	6.1
Production of cereals and dried pulses	246	310	247	307	310	293	329	348	318
Potatoes	94	107	87	88	94	94	92	101	104
Vegetables	128	133	126	134	132	144	155	173	174
Watermelons and melons	44	46	47	51	48	45	41	45	45
Fruits and berries	70	92	90	93	92	98	103	111	114
Sugar beets	16	20	18	19	32	42	28	22	23

Source: The agriculture of Azerbaijan, Statistical publication, 2021

The numbers show growth of per capita agriculture production during 2003-2020 years.

As can be seen from the table, compared to 2003, in 2020 the gross agricultural output per capita increased 4.8 times. As for per capita agricultural product during this period is observed an increase in production of meat 1.5 times, milk 1.6 times, eggs 2.3 times, fish 2.2 times, grain and dried legumes 1.3 times, potatoes by 11 percent, vegetables by 36 percent, watermelons and berries by 2.3 percent, fruits and berries 1.6 times, and sugar beet by 44 percent. It should be noted that these achieved figures are the result of various types of support measures applied to the production process over a period of 17 years.

The growth of agricultural products of strategic types occurs along with a decrease in other types of agricultural products.

The growth reflects production potential of the agriculture and consistent implementation of innovation policy can reveal real opportunities for future sustainable development of the agro-industry sector of economy.

We use figures of official statistics about innovation in food and beverage industry.

According to the data, in 2016-2020, the production of significantly changed or newly introduced products in the food industry accounted for 2% of innovative products in the processing industry. This is lower than the share of the industry in total output. The main progress in the production of drinks in this direction fell on 2011-2016. In subsequent years, this process slowed down.

The **Table 3** below reflects expenditures on technological innovations by types of activities and directions of application.

Table 3. Expenditures on technological innovations by types of activities and directions of application, thousand AZN

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Food production	690,6	782,8	2706,0	997,4	1156,7	-	-	81,5	-
purchase of machinery and equipment related to technological innovations	42,5	782,8	2706,0	-	-	-	-	81,5	-
production design for the release of new products, other types of preparation for production or application of new services or methods for their production	-	-	-	997,3	1156,7	-	-	-	-
training of employees in connection with innovation	648,1	-	-	0,1	-	-	-	-	-
Beverage production	-	13800,0	2070,0	136,0	2089,0	12792,0	1911,0	151,0	338,0
introduction and development of new products, services, new processes	-	-	-	-	-	-	-	-	-
purchase of machinery and equipment related to technological innovations	-	13800,0	2070,0	136,0	2016,0	12708,0	1911,0	-	336,0
marketing research	-	-	-	-	-	-	-	-	-
purchase of machinery and equipment related to technological innovations	-	-	-	136,0	2016,0	12708,0	1911,0	-	-
acquisition of new technologies	-	-	-	-	38,0	16,0	-	-	-
purchase of software	-	-	-	-	35,0	68,0	-	-	2,0
new marketing research	-	-	-	-	-	-	-	151,0	-

Source: Prepared from figures of the State Statistical Committee of Azerbaijan. Figures for 2019-2020 are absent. https://stat.gov.az/source/industry/az/013_3.xls

The figures shows that expenditures on innovation in food and beverage industry are not consistent and cannot be explained in favor of innovation.

After growing purchase of machinery and equipment related to technological innovations in food industry in 2010-2012 years from 42,5 thousand AZN to 2706,0 thousand AZN followed years of zero figures (except year 2017 with 81.5 thousand AZN).

During years of 2010-2018 only years of 2013 and 2014 differs with expenditures the production design for the manufacture of new products, other types of preparation for production or application of new services or methods for their production accordingly 997.3 and 1156.7 thousand AZN.

In food industry expendires on training of employees in connection with innovation is observed only in 2010 year (648.1 thousand AZN) from period of 2010-2018 years.

In beverage production industry during years of 2010-2018 figures reflecting purchase of machinery and equipment related to technological innovations fluctuate between 13800 thousand AZN and 136 thousand AZN.

The acquisition of new technologies, the purchase of software and new marketing research expenditures were insignificant

Taking into account the above, it is expedient to take systematic measures to ensure the necessary sequences in the course of innovation processes in the main areas of the agro-processing industry.

Conclusion

For the innovative development of the Azerbaijan agricultural industry and ensuring long and deepening value-addition chain, it is necessary:

- ensure reliable statistical data collection about and for innovation activity of different subjects of the process;
- reform the education system for adaptation to the innovative development of the economy, including agricultural industry;
- facilitate creation of research and development sector in the field of agro-industry;
- equip with modern technical tools the agro-industry;
- build a system of agricultural advisory support for producers;
- improve legal environment for regulating innovation, research and development;
- improve payments, logistics, and distribution services coming from the banking, transport, and supply sectors.
- implement systematic measures to ensure the necessary consistency in the course of innovation processes in the main areas of the agro-processing industry.

Due organisation and realization of the measures will create favorable environment for creation of innovative agro-industry in Azerbaijan.

References

1. Kahn K.B., 2018. Understanding innovation. *Business Horizons*, 61(3), pp. 453-460.
2. Spielman D.J., 2006. A critique of innovation systems perspectives on agricultural research in developing countries.
3. Mariello A., 2007. The five stages of successful innovation. MIT Sloan management review, 48(3), p. 8.
4. Böyük İqtisadi Ensiklopediya. 3-cü cild (İJKQLM). Bakı, 2012. səh. 9-10.
5. Babayeva V.M. Aqrar sahənin innovasiyalı inkişafının prioritet istiqamətləri, “Kənd Təsərrüfatının İqtisadiyyatı” elmi-praktik jurnalı - 2020, №4 (34) səh. 77-82.
<https://agroeconomics.az/az/release/34/4-34>
6. Tağıyev A.H., İ.A. Aslanzadə. İnnovasiya menecmenti. Dərs vəsaiti, I hissə. Bakı, 2017, 368 səh.
7. The Global Innovation Index 2017.
<https://www.wipo.int/publications/en/details.jsp?id=4193>
8. The agriculture of Azerbaijan, Statistical publication, 2021.
9. https://stat.gov.az/source/industry/az/013_3.xls
10. The Measurement of Scientific, Technological and Innovation Activities, Oslo Manual 2018.
https://www.oecd-ilibrary.org/science-and-technology/the-measurement-of-scientific-technological-and-innovation-activities_24132764

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Aqrar-sənaye sahəsində innovasiya proseslərinə əsaslanan dayanıqlı inkişafın təmin edilməsi istiqamətləri

Xülasə

Məqalədə müasir şəraitdə kənd təsərrüfatının digər sektorlarla rəqabət apara bilməsi üçün bu sahədə innovasiya prosesləri əsasında dayanıqlı inkişafı təmin edən əsas amillər araşdırılır. İnnovasiya məhsullarda (mallarda və ya xidmətlərdə), proseslərdə, marketinqdə və ya təşkilati metodlarda yeni və ya təkmilləşdirilmiş (texniki və ya başqa şəkildə) bir şeyin tətbiqi kimi müəyyən edilir. Bu məqalədə innovasiya siyasətinin iki əsas modeli tədqiq edilmişdir: 1) elmi-texniki proqramların və dövlət əhəmiyyətli layihələrin həyata keçirilməsinə yönəlmiş innovasiya siyasəti modeli, 2) elmi-texniki biliklərin yayılmasına yönəlmiş innovasiya siyasəti modeli.

Tədqiqatlar göstərir ki, aqrar sahədə sahibkarlığın inkişafı, mütərəqqi kənd təsərrüfatı üsullarına keçid, torpaq, texnika, su və s. maddi ehtiyatlardan səmərəli istifadə etməklə keyfiyyətli məhsul istehsalını artırmaq mümkündür. Məqalədə Azərbaycanın kənd təsərrüfatı məhsullarının emalı sənayesində innovasiyaların təhlili aparılmış, bu sahənin innovativ inkişafının, uzun və dərinləşən dəyər zəncirinin təmin edilməsinin əsas istiqamətlərinə baxılmış və tövsiyələr verilmişdir.

Açar sözlər: aqrar sektor, innovasiya, dayanıqlı inkişaf, kənd təsərrüfatı, dəyər zənciri.

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Направления обеспечения устойчивого развития на основе инновационных процессов в агропромышленной сфере

Резюме

В статье исследуются ключевые факторы обеспечения устойчивого развития агропромышленного комплекса на основе инновационных процессов, с тем чтобы современное сельское хозяйство могло конкурировать с другими секторами. Инновация определяется как применение чего-то нового или улучшенного (будь то технология или что-то еще) в продуктах (товарах или услугах), процессах, маркетинге или организационных методах. Были изучены две основные модели инновационной политики: 1) модель инновационной политики, направленной на реализацию научно-технических программ и проектов государственного значения, 2) модель инновационной политики, направленной на распространение научно-технических знаний.

Исследования показывают, что развитие предпринимательства в аграрном секторе, переход к свободным и прогрессивным методам ведения сельского хозяйства, освоение земель, техники, воды и т. д. позволяют увеличить производство качественной продукции за счет эффективного использования материальных ресурсов. Проведен анализ инноваций в агропромышленном комплексе Азербайджана. Рассмотрены основные направления инновационного развития промышленности перерабатывающей сельскохозяйственного сырья, обеспечения длинной и углубляющейся цепочки добавленной стоимости и даны рекомендации.

Ключевые слова: аграрный сектор, инновации, устойчивое развитие, сельское хозяйство, цепочка добавленной стоимости.