Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 24, Issue 3, 2024
PRINT ISSN 2284-7995, E-ISSN 2285-3952

NEW CROPS: POTENTIAL AND OPPORTUNITIES FOR THE FUTURE OF AGRICULTURE

Petia BRANZOVA

Economic Research Institute, the Bulgarian Academy of Sciences, Aksakov 3, 1000, Sofia, Bulgaria, E-mail: petia.branzova@gmail.com

Corresponding author: petia.branzova@gmail.com

Abstract

The paper studies explores the potential and application of new crops in agriculture. New crops are defined as various plants that offer alternatives to traditional grain crops and legumes. They include oilseed crops, fiber crops, biomass crops, and plants with special applications in pharmaceuticals. The article discusses various potential applications of new crops, including fiber and textile production, nutritional supplements, biodegradable materials, pharmaceuticals, and energy resources. To achieve their full potential, innovative technologies and methods are presented, such as genetically modified organisms, precise selection and biotechnologies, smart agriculture, and vertical farming. The article also emphasizes the importance of socio-economic aspects and regulatory challenges associated with the introduction of new crops in agriculture. Overall, the article highlights the importance of new crops as a key element for the future of agriculture, offering solutions to the demands of growing populations and challenges facing the agricultural industry in the context of sustainable development.

Key words**:** *new crops, agriculture, sustainable farming, innovation*

INTRODUCTION

Agriculture plays a pivotal role in providing food, fiber, energy, and other essential resources for humanity. Despite significant progress in the agricultural sector over the past decades, there is a constant need for innovation and technological advancement to address the growing needs of the global population and to tackle challenges such as climate change, depletion of natural resources, and the necessity for sustainable production models.

In this context, new crops emerge as a potentially revolutionary tool for the future of agriculture. New crops encompass a diverse range of plants distinguished by their species, properties, and application possibilities. They offer a wide array of opportunities for food production, materials, and energy, while simultaneously contributing to the sustainable development of the agricultural sector and society as a whole.

The aim of this scientific article is to explore the potential and opportunities that new crops offer for the future of agriculture. Through an analysis of existing research, technologies, and innovations, the article aims to examine the various applications of new crops in agriculture, including their role in food production, fiber, construction materials, and energy. Additionally, the article will investigate the innovations and technologies that support the development and implementation of new crops, as well as the challenges faced by the agricultural sector in this process.

By analyzing and discussing these aspects, the article aims to provide a comprehensive perspective on the significance of new crops for the future of agriculture and to propose directions for future research and development in this field.

MATERIALS AND METHODS

The assessment of the potential and opportunities of new crops as the future of agriculture is based on a study of sources such as specialized and scientific publications on innovative technologies, reports, projects, and studies at both national and EU levels. Additionally, online resources and other available sources of information and data have been utilized.

During the research, a SWOT analysis was conducted to identify the strengths and weaknesses, opportunities, and threats of implementing innovative production technologies - new crops.

RESULTS AND DISCUSSIONS

Definitions and Innovative Opportunities

New crops are defined as "a set of unconventional crops such as oilseeds, fiber crops, and biomass crops that can be grown for specific end markets such as fiber production, nutritional supplements, plastics, pharmaceutical, and energy industries"[15]. These crops can be utilized for generating heat and electricity or for producing biofuels for transportation and various other products [13].

Examples of New Crops:

Quinoa (*Chenopodium quinoa*)

Quinoa has gained popularity worldwide due to its high nutritional value, adaptability to diverse climates, and resilience to environmental stress. It serves as an excellent alternative to traditional cereal grains, offering a complete protein profile and essential micronutrients.

Hemp (*Cannabis sativa*)

Hemp is experiencing a resurgence in interest for its versatile applications in textiles, construction materials, biofuels, and health products. With its fast growth rate, low water and pesticide requirements, and minimal environmental impact, hemp holds promise as a sustainable crop for various industries.

Kernza (*Thinopyrum intermedium*)

Kernza, a perennial grain crop, has garnered attention for its deep root system, which improves soil health and reduces erosion. As a perennial crop, kernza requires less water and fertilizer inputs than annual grains like wheat, making it a promising candidate for sustainable agriculture.

Moringa (*Moringa oleifera*)

Moringa is a fast-growing tree native to tropical and subtropical regions, known for its high nutritional value and medicinal properties. Its leaves, pods, and seeds are rich in protein, vitamins, and antioxidants, making it a valuable addition to diets in developing countries and a potential cash crop for smallholder farmers.

Camelina (*Camelina sativa*)

Camelina, also known as false flax, is an oilseed crop that thrives in marginal lands with low water availability. It produces oil rich in omega-3 fatty acids, making it suitable for human consumption, biofuels, and industrial applications. Camelina's resilience to drought and its potential for crop rotation make it an attractive option for sustainable agriculture.

Seaweed (Macroalgae)

Seaweed farming is gaining traction as a sustainable source of food, feed, and bioenergy. Various species of seaweed are cultivated for their nutritional value, bioactive compounds, and ecosystem benefits such as carbon sequestration and coastal protection. Seaweed aquaculture has the potential to alleviate pressure on terrestrial resources and mitigate climate change impacts on coastal communities.

Teff (*Eragrostis* tef)

Teff is an ancient grain native to Ethiopia, prized for its resilience to drought, heat, and waterlogging. It is gluten-free and rich in essential nutrients, making it suitable for individuals with celiac disease and other dietary restrictions. Teff's adaptability to diverse agroecological conditions and its potential for value-added products like flour and beer highlight its importance as a new crop for global food security.

Jatropha (*Jatropha curcas*)

Jatropha is a drought-resistant shrub cultivated for its oil-rich seeds, which can be converted into biodiesel. Despite initial enthusiasm for its potential as a biofuel feedstock, challenges related to yield variability, land use conflicts, and market viability have tempered its widespread adoption. Nevertheless, ongoing research and breeding efforts aim to improve jatropha's agronomic performance and commercial viability.

Fonio (*Digitaria exilis* and *Digitaria iburua*)

Fonio is a resilient, drought-tolerant cereal grain grown primarily in West Africa. It has a short growing season and high nutritional value, containing essential amino acids and micronutrients such as iron and zinc. Fonio's ability to thrive in poor soils and harsh climatic conditions makes it a valuable crop for smallholder farmers in regions prone to climate variability and food insecurity.

Bambara Groundnut (*Vigna subterranea*)
Bambara groundnut is an indigenous legume crop cultivated in sub-Saharan Africa for its edible seeds and nitrogen-fixing properties. It is well-adapted to semi-arid environments and can improve soil fertility while providing a nutritious source of protein, carbohydrates, and micronutrients. Bambara groundnut's resilience to climate extremes and its potential for intercropping systems contribute to its role in sustainable agriculture.

All the examples provided above for new crops for the future agriculture are visualized in Figure 1.

Fig. 1. New crops for the future agriculture
Source: Own design and conception.

These examples [2], [5], [14] showcase the diversity of new crops and their potential contributions to agricultural sustainability, food security, and economic development on a global scale. Continued research, investment, and collaboration are essential to unlock the full potential of these crops and integrate them effectively into agricultural systems worldwide [12].

Potential and Applications

Nutritional Security

New crops offer opportunities to address malnutrition and food insecurity by providing nutritious alternatives to traditional staple crops [10]. For example, crops like quinoa, moringa, and fonio are rich in protein, essential amino acids, vitamins, and minerals, contributing to balanced diets and improved health outcomes, especially in regions where micronutrient deficiencies are prevalent.

Environmental Sustainability

New crops can promote sustainable agricultural practices by reducing environmental impact and enhancing ecosystem services. Perennial crops like kernza and jatropha improve soil health, sequester carbon, and conserve water resources compared to annual crops, mitigating soil erosion, greenhouse gas emissions, and freshwater depletion. Additionally, crops like seaweed and camelina cultivated in marine and marginal lands can alleviate pressure on terrestrial ecosystems and contribute to coastal and biodiversity conservation.

Climate Resilience

New crops with inherent tolerance to climate extremes, such as drought, heat, and salinity, offer resilience to changing environmental conditions. These crops help farmers adapt to climate variability and mitigate production risks associated with erratic weather patterns. By diversifying crop portfolios and introducing resilient species like teff and camelina, agricultural systems become more robust and less vulnerable to climate-induced disruptions, safeguarding livelihoods and food security.

Economic Development

The cultivation and commercialization of new crops present economic opportunities for farmers, agribusinesses, and rural communities. Value-added products derived from new crops, such as quinoa-based snacks, moringa supplements, and camelina biofuels, create market niches and generate income streams along the value chain. Moreover, the adoption of new crops diversifies revenue sources, reduces market dependence on commodity crops, and enhances the competitiveness of smallholder farmers in global markets.

Industrial Applications

New crops have diverse industrial applications beyond food and feed, including biofuels, bioplastics, pharmaceuticals, and cosmetics. For instance, hemp fibers are used in textiles, construction materials, and biocomposites, offering sustainable alternatives to conventional materials with lower environmental footprint.

Genetic Resources and Biodiversity Conservation

New crops represent valuable genetic resources that contribute to crop diversity and resilience. By conserving and utilizing genetic diversity within new crop species, researchers can breed improved varieties with desirable traits, such as yield, nutritional quality, and stress tolerance. Furthermore, integrating new crops into agroecosystems diversifies habitats, supports beneficial organisms, and enhances biodiversity conservation efforts, promoting ecological balance and ecosystem resilience.

Soil Health and Regeneration

New crops can play a crucial role in soil health and regeneration by improving soil structure, fertility, and microbial diversity. Perennial crops like kernza and moringa develop extensive root systems that help prevent soil erosion, enhance water infiltration, and sequester carbon in the soil, contributing to carbon farming and climate change mitigation efforts. Additionally, leguminous crops such as Bambara groundnut and lupin fix atmospheric nitrogen, enriching soil fertility and reducing the need for synthetic fertilizers, thereby mitigating nitrogen pollution and greenhouse gas emissions associated with conventional agriculture.

Water Efficiency and Conservation

New crops with low water requirements and efficient water-use strategies offer sustainable solutions for water-stressed regions and mitigate the impacts of water scarcity on agricultural productivity. Crops like quinoa, teff, and sorghum are inherently drought-tolerant and thrive in arid and semi-arid environments, where water availability is limited. By promoting the cultivation of these water-efficient crops, farmers can optimize water resources, reduce irrigation demand, and adapt to changing precipitation patterns induced by climate change, thus enhancing agricultural resilience and water security.

Pest and Disease Management

New crops with natural resistance to pests and diseases offer alternatives to chemical pesticides and reduce reliance on agrochemical inputs, promoting ecological pest management and sustainable crop protection strategies. For example, certain varieties of quinoa and amaranth exhibit resistance to common pests like aphids and thrips, reducing the need for insecticide applications. Moreover, intercropping diverse crop species, such as legumes with cereals or aromatic plants with vegetables, can disrupt pest cycles, enhance biodiversity, and improve overall crop health through natural pest control mechanisms.

Cultural and Social Significance

New crops often have cultural and social significance, especially in indigenous communities, where they are deeply rooted in traditional agricultural practices, culinary heritage, and cultural identity. By revitalizing indigenous crops like amaranth, millets, and taro, communities can preserve cultural knowledge, promote food sovereignty, and strengthen social cohesion.

Economic significance

Market Diversification: New crops offer farmers and agricultural industries opportunities to diversify their product portfolios and access niche markets with higher value-added products. By introducing new crops into cultivation, farmers can reduce dependence on traditional commodity crops, which often face price volatility and market saturation. Diversification enhances market resilience, mitigates risks associated with monoculture cropping systems, and provides avenues for farmers to capture premium prices for unique and specialty crops.

Value Chain Development: The cultivation and commercialization of new crops stimulate the development of value chains encompassing production, processing, distribution, and marketing activities. Value chain development creates employment opportunities across various sectors, including farming, agribusiness, food processing, logistics, and retail, thereby contributing to rural livelihoods, economic growth, and poverty alleviation. Moreover, value-added processing of new crops into food products, beverages, cosmetics, pharmaceuticals, and biofuels generates additional revenue streams and enhances competitiveness in domestic and international markets.

Export Potential: New crops with unique characteristics, nutritional profiles, and market appeal have significant export potential, particularly in high-income countries with discerning consumers and strong demand for health-conscious and sustainably produced products. Export-oriented cultivation of new crops generates foreign exchange earnings, supports agricultural trade balances, and strengthens the competitiveness of agricultural sectors in global markets. Export promotion initiatives, market access agreements, and branding strategies enhance the visibility and competitiveness of new crop exports, positioning them as premium products with superior quality and sustainability credentials.

Smallholder Empowerment: New crops present opportunities for smallholder farmers and marginalized communities to improve their economic status, enhance food security, and reduce poverty through inclusive value chain participation and income diversification. Many new crops, such as indigenous species and underutilized crops, thrive in agroecological conditions where conventional crops may struggle, enabling resource-poor farmers to cultivate resilient crops and access niche markets with higher returns. Empowering smallholder farmers through capacity building, access to finance, technology transfer, and market linkages strengthens their resilience to economic shocks and fosters sustainable rural development.

Rural Development: The adoption of new crops contributes to rural development by revitalizing local economies, revitalizing agricultural landscapes, and creating vibrant agri-food clusters that attract investment, tourism, and infrastructure development. New crop cultivation generates multiplier effects in rural economies, stimulating demand for inputs, services, and infrastructure, and creating non-farm employment opportunities in ancillary sectors such as hospitality, tourism, and agro-tourism. Rural development initiatives that support new crop production, processing, and marketing enhance livelihoods, reduce rural-urban migration, and promote inclusive growth in rural communities.

Innovation and Entrepreneurship: The emergence of new crops fuels innovation and entrepreneurship in the agricultural sector, fostering a culture of experimentation, adaptation, and collaboration among farmers, researchers, agribusinesses, and start-ups. Innovation hubs, incubators, and accelerators focused on new crop development provide platforms for knowledge exchange, technology transfer, and business incubation, nurturing a vibrant ecosystem of agripreneurship and agtech innovation. Entrepreneurs leverage technological advancements, market insights, and funding opportunities to develop novel products, services, and business models that capitalize on the economic potential of new crops and address emerging market needs.

Urban Agriculture and Vertical Farming

New crops offer opportunities for urban agriculture and vertical farming systems, where space constraints and resource limitations necessitate innovative approaches to food production [16]. Leafy greens, herbs, and microgreens like kale, basil, and watercress can be efficiently grown in controlled indoor environments using hydroponic or aeroponic systems, minimizing land use, water consumption, and pesticide use while maximizing crop yield and quality.

Genetic Engineering and Biotechnology

Advancements in genetic engineering and biotechnology enable the development of novel traits and applications in new crops, including enhanced nutritional profiles, stress tolerance, and disease resistance. Genetic modification techniques such as genome editing and RNA interference offer precise tools for trait manipulation without introducing foreign DNA, facilitating the development of crop varieties with improved agronomic performance and consumer traits. Biotechnological innovations also enable the production of biofortified crops with elevated levels of vitamins, minerals, and antioxidants, addressing nutrient deficiencies and improving public health outcomes, particularly in resource-limited settings.

All the examples provided above for new crops potential and applications are visualized in Figure 2.

Fig.2. New crops potential and applications
Source: Own design and conception.

In summary, the multifaceted potential and applications of new crops encompass a wide range of agricultural, environmental, social, and technological dimensions, offering transformative solutions to pressing challenges facing global food systems [6]. Harnessing the benefits of these crops requires holistic approaches that integrate scientific innovation, policy support, community engagement, and market development to ensure sustainable and equitable outcomes for present and future generations.

Innovations and Technologies

Precision Agriculture

Precision agriculture utilizes advanced technologies such as remote sensing, Geographic Information Systems (GIS), Global Positioning Systems (GPS), and unmanned aerial vehicles (UAVs) to optimize crop management practices, resource allocation, and decision-making processes [3]. For new crops, precision agriculture enables farmers to tailor cultivation practices to specific environmental conditions, monitor crop health and growth parameters, and identify areas for improvement or intervention, thereby enhancing productivity, efficiency, and sustainability.

Molecular Breeding and Marker-Assisted Selection

Molecular breeding techniques, including marker-assisted selection (MAS), genomic selection, and quantitative trait locus (QTL) mapping, accelerate the breeding process by identifying and selecting desirable traits at the molecular level. These techniques enable breeders to develop new crop varieties with improved yield, quality, disease resistance, and stress tolerance more rapidly and efficiently, thereby expanding the genetic diversity and resilience of agricultural systems.

Biotechnology and Genetic Engineering

Biotechnology and genetic engineering offer powerful tools for trait manipulation, gene editing, and genetic modification in new crops. Techniques such as CRISPR-Cas9 genome editing, RNA interference (RNAi), and gene stacking enable targeted modifications of crop genomes to introduce desirable traits, enhance nutritional content, improve agronomic performance, and confer resistance to pests, diseases, and environmental stresses. Biotechnological innovations also facilitate the development of biofortified crops with enhanced micronutrient content, addressing nutritional deficiencies and improving human health outcomes.

High-Throughput Phenotyping and Genotyping

High-throughput phenotyping and genotyping platforms leverage automation, robotics, sensors, and imaging technologies to rapidly and accurately assess plant phenotypic and genotypic traits on a large scale. These platforms enable researchers and breeders to phenotype plant populations for complex traits such as yield, drought tolerance, nutrient efficiency, and disease resistance, facilitating trait discovery, trait mapping, and genotype-phenotype associations in new crop species. High-throughput phenotyping and genotyping accelerate breeding efforts, enable genotype-based selection, and enhance the efficiency of crop improvement programs.

Vertical Farming and Controlled Environment Agriculture (CEA)

Vertical farming and controlled environment agriculture (CEA) utilize indoor farming techniques, hydroponics, aeroponics, and vertical stacking systems to cultivate crops in controlled environments with optimized growing conditions. These technologies enable year-round production, efficient resource utilization, and space-efficient cultivation of new crops, including leafy greens, herbs, and microgreens, in urban and peri-urban settings. Vertical farming and CEA systems offer opportunities to diversify crop production, increase local food resilience, and reduce environmental impact while maximizing productivity and quality.

Blockchain and Digital Traceability

Blockchain technology and digital traceability systems provide transparent and immutable records of crop production, supply chain transactions, and quality assurance processes, enhancing transparency, accountability, and trust throughout the agricultural value chain [7]. For new crops, blockchain and digital traceability enable farmers to track the origin, cultivation practices, and sustainability credentials of their products, verify compliance with certification standards, and access premium markets with higher consumer trust and willingness to pay.

Agroecological Approaches and Regenerative Agriculture

Agroecological approaches and regenerative agriculture principles integrate ecological principles, biodiversity conservation, and sustainable farming practices to enhance ecosystem services, soil health, and resilience in agricultural systems. For new crops, agroecological practices such as intercropping, agroforestry, cover cropping, and crop rotation promote biodiversity, improve soil fertility, suppress pests and diseases, and enhance ecosystem resilience, contributing to long-term sustainability, climate change mitigation, and food security.

Smart Sensors and Internet of Things (IoT)

Smart sensors and Internet of Things (IoT) devices enable real-time monitoring, data collection, and decision support in agricultural systems, facilitating precision farming, resource management, and automation of tasks. For new crops, smart sensors measure environmental parameters such as temperature, humidity, soil moisture, and nutrient levels, providing farmers with actionable insights to optimize growing conditions, irrigation scheduling, and fertilizer application, thereby improving crop performance, resource efficiency, and yield consistency.

Synthetic Biology and Metabolic Engineering

Synthetic biology and metabolic engineering technologies enable the design, construction, and optimization of biological systems for novel functions and applications in agriculture. For new crops, synthetic biology approaches enable the engineering of metabolic pathways to produce valuable compounds, such as pharmaceuticals, industrial chemicals, and biofuels, in plant-based production systems. Metabolic engineering techniques also facilitate the development of bioengineered crops with enhanced nutritional profiles, biofortified traits, and value-added products, addressing societal needs and market demands.

Robotics and Automation

Robotics and automation technologies are revolutionizing agricultural operations, including planting, harvesting, weeding, and crop monitoring. Autonomous vehicles, drones, and robotic systems equipped with cameras, sensors, and AI algorithms enable precise and efficient management of new crop cultivation, reducing labor costs, increasing productivity, and minimizing environmental impact [1]. For example, robotic weeders can selectively remove unwanted plants while sparing new crops, reducing the need for herbicides and manual labor.

Advanced Plant Breeding Techniques

In addition to traditional breeding methods, advanced plant breeding techniques such as speed breeding, haploid induction, and genomic selection accelerate the breeding process and improve the efficiency of trait introgression in new crop development. Speed breeding techniques involve controlled environments with optimized lighting, temperature, and nutrient conditions to shorten generation times and enable rapid selection of desired traits. Haploid induction techniques produce haploid plants for accelerated breeding cycles and efficient trait fixation, while genomic selection utilizes genomic information to predict breeding values and select superior genotypes for breeding programs.

Nanotechnology and Nanosensors

Nanotechnology and nanosensors offer novel solutions for crop protection, nutrient delivery, and disease diagnostics in new crop cultivation. Nanomaterials such as nanoparticles, nanofertilizers, and nanopesticides enable targeted delivery of nutrients and agrochemicals to plants, improving nutrient uptake efficiency and reducing environmental losses. Nanosensors embedded in soil or plant tissues provide real-time monitoring of nutrient status, water availability, and disease incidence, enabling proactive management strategies and precision agriculture interventions to optimize crop performance and resource use efficiency.

Climate-Resilient Crop Varieties

Climate-resilient crop varieties developed through conventional breeding, molecular breeding, and genomic selection techniques offer solutions to mitigate the impacts of climate change on agriculture. New crop varieties with enhanced heat tolerance, drought tolerance, flood tolerance, and disease resistance enable farmers to adapt to changing environmental conditions and maintain productivity under adverse weather events. For example, heat-tolerant rice varieties exhibit improved photosynthetic efficiency and yield stability under high-temperature conditions, ensuring food security in regions vulnerable to heat stress.

Mobile Applications and Decision Support Tools

Mobile applications and decision support tools provide farmers with access to real-time weather forecasts, agronomic recommendations, pest alerts, and market information, facilitating informed decision-making and risk management in new crop production. These digital tools empower farmers to optimize input use, plan planting schedules, implement integrated pest management practices, and access markets with higher price premiums for sustainably produced crops [17]. Mobile applications also enable data collection, farm record-keeping, and traceability documentation, enhancing transparency and accountability across the agricultural value chain.

Biostimulants and Microbial Inoculants

Biostimulants and microbial inoculants derived from beneficial microorganisms, plant extracts, and organic compounds enhance plant growth, nutrient uptake, and stress tolerance in new crop cultivation. Biostimulants stimulate physiological processes in plants, such as seed germination, root development, and nutrient assimilation, improving overall plant health and resilience to abiotic and biotic stresses. Microbial inoculants contain beneficial bacteria, fungi, or algae that form symbiotic relationships with plants, promoting nutrient cycling, disease suppression, and soil fertility enhancement, leading to improved crop productivity and sustainability.

Climate-Smart Farming Practices

Climate-smart farming practices integrate climate adaptation, mitigation, and resilience strategies into agricultural systems to minimize environmental impact and maximize productivity in the face of climate change. For new crops, climate-smart farming practices include agroforestry, conservation agriculture, water harvesting, and integrated crop-livestock systems, which enhance soil carbon sequestration, water use efficiency, and biodiversity conservation while improving farm profitability and resilience to climate variability. These practices contribute to sustainable intensification of agriculture and climate-resilient food systems.

All the examples provided above for new innovations and technologies for the future agriculture are visualized in Figure 3.

Fig. 3. New innovations and technologies for the future agriculture
Source: Own design and conception.

These examples illustrate the diverse range of innovations and technologies that are driving advancements in new crop cultivation, enabling sustainable, efficient, and resilient agricultural systems to meet the challenges of the 21st century.

The current situation

At present, some of the applications of non-food crops in fiber/textile production are well known, while others, such as plastics made from starch-based polymers, are less familiar. In the long run, innovation in agriculture is encouraged to improve biodiversity, reduce greenhouse gas emissions and waste, and slow down the loss of natural resources [9]. This can be achieved through collaboration between science, industry, and agriculture.

The innovative use of new non-food crops and their by-products can significantly contribute to diversifying agricultural production, enhancing industrial sustainability, and creating new jobs [11]. This includes accessing new markets and opportunities to increase income. The future use of new non-food crops largely depends on environmental concerns and government sustainability goals [4].

An example of this is the biofuel and biomass market, which is expected to grow significantly in the future, especially due to legislative changes related to environmental conservation and renewable energy production goals [8].

SWOT analysis

During the study, a SWOT analysis was conducted to identify the strengths and weaknesses, opportunities, and threats of applying innovative production technologies - new crops, as presented in Figure 4.

Fig.4. SWOT New crop
Source: Own design and conception.

From the proposed SWOT analysis, several strengths can be derived. Overall, sales of products manufactured from new crops tend to yield higher profits compared to those from traditional production. Additionally, innovative products derived from new crops carry higher added value. For example, cultivating energy crops for biofuel and biomass production diversifies farmers' production and provides access to various markets. It also enhances competition among agricultural producers, reduces energy consumption, environmental pollution, and waste generation. To improve financial opportunities and competitiveness in the sector, new markets must be secured, and opportunities to stimulate the production of products from farmers specializing in new crops must be found.

As for weaknesses, the analysis highlights that producing products from new crops requires more precise specifications, which poses risks in terms of business. Additionally, limited scientific research and a lack of communication between business and science regarding the exact impact of investing in and producing new crops on productivity, competitiveness, and business profitability are identified as weaknesses. Another weakness noted in the analysis is that a significant portion of new crop markets have low volumes, which cannot offset the high value of the product itself.

Opportunities derived from the analysis are related to new business opportunities in rural areas, contributing to their development and prosperity. It will also enhance producers' competitiveness and provide access to new markets and the production of new products.

Threats identified in the analysis are related to the unstable final price for crops, limited production potential for the global market due to global supply regulation to prevent oversupply and market saturation for pharmaceutical and cosmetic companies. Another threat is the high risk associated with producing new crops due to their specific production requirements.

CONCLUSIONS

In conclusion, new crops play a pivotal role in the future of agriculture, offering inevitable potential for innovation, sustainability, and diversity in food, materials, and energy production. Integrating new technologies and methods for plant cultivation and processing can transform agriculture into a more efficient and sustainable industry capable of meeting the growing needs of our society.

With their diverse functionality and flexibility, new crops provide tools for adaptation to various climatic and ecological conditions, which is crucial for global food security. Moreover, they can help preserve the environment by reducing ecological waste, harnessing biological resources, and decreasing greenhouse gas emissions.

The effective use of new crops is the key to achieving sustainable development in agriculture. They provide opportunities for innovation in all aspects of the production process - from variety selection and yield improvement to the development of new processing technologies. Thus, agriculture can become more resource-efficient, effective, and sustainable, contributing to the well-being of our society and the preservation of the planet.

Ultimately, new crops are not just an opportunity for the agricultural sector; they are rather an essential element for its future. Their role in creating sustainable and environmentally friendly production models is undoubtedly crucial for our planet and future generations.

REFERENCES

[1]Aleksiev, G., Doncheva, D., 2022, AI shaping agriculture: smart technologies for smart production in Bulgaria. In Economic and Social Development (Book of Proceedings), 86th International Scientific Conference on Economic and Social, p. 191.

[2]Das, S., Ray, M.K., Panday, D., Mishra, P.K., 2023, Role of biotechnology in creating sustainable agriculture. PLOS Sustain Transform 2(7): e0000069. https://doi.org/10.1371/journal.pstr.0000069

[3]Dimitrova, A., 2022, Tehnologichnite inovatsii v zemedelieto kato nachin za povishavane na prodovolstvenata sigurnost. (Technological Innovations in Agriculture as a Way to Increase Food Security). Economic Thought Journal, 67 (6), 692-704 (in Bulgarian). https://doi.org/10.56497/etj2267604

[4]Doitchinova, J., Miteva, A., Zaimova, D., 2019, Determinants and directions of the transition from traditional to sustainable agriculture the Bulgarian case. – In: CBU International Conference Proceedings, Vol. 7, pp. 75-80.

[5]FAO, IFAD, UNICEF, WFP & WHO, 2020, The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO. http://www.fao.org/3/ca9692en/online/ca9692en.html, Accessed on 15/10/2021.

[6]Food and Agriculture Organization of the United Nations, 2021, Microbiological risk assessment - Guidance for food. Guidance. Microbiological Risk Assessment Series No. 36. Rome.. https://www.fao.org/documents/card/en/c/cb5006en Accessed on 09/07/2021.

[7]Georgieva, S., 2020, The impact of blockchain technologies on the financial sector. Economic development and policies: realities and prospects. Prof. Marin Drinov Publishing House of BAS. pp. 827-837.

[8]Harizanova-Bartos, H., Stoyanova, Z., Harizanova-Metodieva, Ts., 2020, Rural development in Bulgaria: some factors and conditions for success. – Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 20(1), 237-244.

[9]Kirechev, D., 2023, Analysis of the common agricultural policy strategic documents for preventing climate change and protecting the environment Nauka I ikonomika, 415-428., DOI 10.36997/LBCS2022.41

[10]Kirova, A., 2023, Economic and Social Challenges, Risks and Consequences in Overlapping Crises Conditions. – Economic Studies (Ikonomicheski Izsledvania), 32(6), 182-201.

[11]Markov, N., 2019, Economic framework of the bio-based primary sector in Bulgaria. Trakia Journal of Sciences, 17(1), 94-98.

[12]Nestorov, N., 2019, Geographic Sustainability and Geographic Concentration of Bulgarian Export. – Economic Studies (Ikonomicheski Izsledvania), 28 (1), 50-55.

[13]Peneva, T., 2021, Green Deal’s Impact on Energy Poverty in Bulgaria. Economic Studies (Ikonomicheski Izsledvania), 30 (6), 90-105.

[14]Pethybridge, S.J., Brown, B.J., Kikkert, J.R., Ryan, M.R., 2020, Rolled–crimped cereal rye residue suppresses white mold in no-till soybean and dry bean. Renewable Agriculture and Food Systems, 35(6):599-607. doi:10.1017/S174217051900022X.

[15]Prouchvane I analiz na konkretni dobri praktiki ot Balgariya i drugi darzhavi-chlenki na ES za vnedryavane na inovatsii v sashtestvuvashti predpriyatiya na teritoriyata na MIG “KIRKOVO – ZLATOGRAD” v zemedelieto (Research and analysis of concrete good practices from Bulgaria and other EU member states fro introducing innovations and enterprises in the territory of the MIG “KIRKOVO – ZLATOGRAD” in teh land), 2019 http://mig-kirkovo-zlatograd.com/images/docs/protokoli/Innovatsii-v-

zemedelieto_Prouchvane-i-analizi.pdf Accessed on 30/04/2019.
[16]Stoyanova, Z., Koleva, G., 2020, Economic Aspects of Urban Agriculture. – Economic Studies (Ikonomicheski Izsledvania), 29 (6), 138-154.
[17]Zheleva, V., Mutafov, E., 2022, Digitalization level of rural areas in Bulgaria, innovative development of agricultural business and rural areas, UNWE, 202-206.