Acta Scientific AGRICULTURE (ISSN: 2581-365X)

Volume 8 Issue 2 January 2024

Review Article

Entrepreneurship Development in Specialty Agriculture: Opportunities and Scope

Shivani Singh[1]*, Manisha Saini[2] and Prachi[3]

[1]PhD, Department of Business Management, Dr. Yashwant Singh Parmar University of Horticulture and Forestry Nauni, Solan, H.P, India

[2]PhD, Department of Plant Pathology, Dr. Yashwant Singh Parmar University of Horticulture and Forestry Nauni, Solan, H.P, India

[3]Msc, Department of Agronomy, Dolphine (Pg) College of Life Sciences and Agriculture, Punjab, India

***Corresponding Author:** Shivani Singh, PhD, Department of Business Management, Dr. Yashwant Singh Parmar University of Horticulture and Forestry Nauni, Solan, H.P, India.

DOI: 10.31080/ASAG.2024.08.1347

Received: January 05, 2024

Published: January 23, 2024

Abstract

Specialty crops are new and emerging crops that include many vegetables and fruit. These crops are becoming increasingly important relative to other categories of agricultural production globally. However, these crops carry a higher risk yet because they yield a greater payoff than conventional crops. The introduction of specialty crops has several inherited benefits which include economic benefits to farmers in several ways, such as crop diversification with value-added crops, improved resilience to climate variability, maintaining yields with fewer resources, and increased crop resistance to pests and diseases. Moreover, growing and selling specialty crops or developing value-added products can bring out new customers and potentially increase revenues for a farm business. Obtaining and retaining customers and learning how to best in market niche agricultural products is the key to apprehending that extra money. Understanding consumer preferences or creating a market for a novel product, while profitably satisfying a demographic need is essential for successfully marketing a specialty crop. However, there are many challenges associated with the introduction and establishment of a new crop or new business which include lack of information for the entrepreneur, cultural practice and marketing as well as policy and institutional barriers. An entrepreneur may face the risk of poor economic returns and their business may rest to fail if proper management and marketing information is not available. While considering a specialty crop and initiating a marketing strategy it is important to fully educate the industry partners to ensure successful market development. Hopefully, entrepreneurial development will keep up as specialty crops with developed initiatives and provide more income and also promote the expansion of the alternative specialty crop market, significant research and extension initiatives are required in addition to close collaborations between the government, academic institutions, and industry.

Keywords: Specialty Crops; New Business; Developed Initiatives; Institutional Barriers

Introduction

Amid the rapid speed of global change and in a highly competitive and risky business situation, the knowledgeable consumer gains power, and the market shifts towards quick product creation. Innovation has emerged as a crucial component of success, particularly for new businesses, involving the development of economic productivity and operational and working producers [1]. The systematic and planned transformation of a person into an entrepreneur is known as entrepreneurial development. The process of making an entrepreneur involves teaching everyday people how to be business owners, as well as imparting the necessary information, management, technical, financial, and marketing abilities. The definition of the entrepreneurial development program is a course created to assist a person in enhancing their entrepreneurial drive and obtaining the knowledge and talents required to carry out their position as an entrepreneur successfully [2].

The growth of a nation's economy depends in large part on its agricultural sector. Both wealthy and underdeveloped countries, economies have benefited greatly from it. Particularly in industrial countries, agricultural development has contributed more to the path of their industrialization. Similar to this, many underdeveloped nations throughout the world are currently developing their economies with the aid of the agricultural sector. It implies that the output and production of agriculture contribute to the general economic growth of the countries that are mostly agricultural [3,4].

Specialty crops are defined as fruits and vegetables, tree nuts, dried fruits, horticulture, and nursery crops including floriculture [5]. The 2014 farm bill shows how specialty crops are attracting more and more attention with an increased number of sections addressing specialty crop challenges and their expanding position in the global economy [6]. In general, specialty crops need more intensive management than row. A crucial element is both the amount and quality of the product, enabling technologies, entrepreneurial initiatives, and the threshold of profitability for an increasing number of specialty crops in locations with seasonal climates that have elevated local, year-round indoor crop production to the fore of public awareness [7]. They might, however, be more lucrative for farmers. Unfortunately, specialty crops are more vulnerable to climatic stresses (such as temperature and precipitation levels and frequency than row crops) [8].

The computation of total costs for specialty crops depends on several additional elements. Most specialty crops are sold for direct human use and many of them required relatively more significant costs to grow orchards, vineyards, and bushes known as perennial crops. Therefore, a grower's capacity to benefit from scale economies is inherently more expensive as compared to row crops [9]. Alternative specialty crops often diversify a cropping system's crop production rather than replace established commodities. A new market for alternative food items has emerged [10] as a result of changes in consumer dietary habits, and increased knowledge of the value of fruits and vegetables in healthy diets is predicted to enhance the consumption of all fruits and vegetable varieties [11].

Methodology

The review paper was written with the help of reputed journal publications, papers from websites, newspapers, blogs, and projects. Research article selection was carried out manually. A systematic search was carried out on Google Scholar using a search on the body of research articles as well as an article abstract search. This strategy was adopted under the presumption that research papers, abstracts, and book text would contain the important specialty agriculture keywords that were utilized in the article search. Specialty agriculture, specialty crops, and entrepreneurship development are some of the important keywords based on the research papers that were selected. For the present study, the data was also gathered from these and a dissertation search on Google was undertaken to find further helpful practitioner whitepapers, working papers, and policy studies taken.

Opportunities

New market opportunities

Today's consumers are interested in trying new foods and are willing to pay more for flavors that they have never tried before [12] which makes alternative specialty crops appealing for their distinctive, mouthwatering flavors and alluring appearance. Understanding current supply chains, their needs, and consumer behavior is necessary to meet regional demand for alternative specialty crops.

Specialty crops can assist farmers in gaining access to local, national, and international markets with new goods. The majority of specialty crops are sold directly to consumers as fresh produce at places like farmers' markets, roadside stands, neighborhood eateries, and specialty ethnic markets, giving farmers new opportunities to market their goods. They are not particularly exotic and include crops that require a lot of attention to grow, making them outside the conventional wholesale loop). Crops that are raised specifically for ethnic markets or those with unique qualities, like vine-ripened tomatoes or lean meat, maybe these [13]. Alternative specialty crops have been identified for their pest resistance as well as their flavors, making them suitable for upscale and ethnic markets in addition to conventional and organic markets [14]. Even though a lot of alternative specialty crops might not be suitable for long-term storage and shipping, they may present opportunities to grow these crops close to major cities, which would serve both local consumers and tourists traveling through the area. Fruit and vegetable growers in the area can benefit greatly from their proximity to densely populated areas, especially given the ethnic populations' rapid expansion [15].

The improvement in income, higher standards of living, and altering lifestyles are causing significant changes in both the domestic and global demand for crop products. More opportunities have opened up for farmers, enabling better access to new and distant markets as a result of trade liberalization and the quick development of transportation and communication infrastructure [16] however, the ability of farmers to incorporate high-value specialty

crops aimed at particular niche markets for competitive advantages will be a key factor in their success in commercial farming [17].

Economic benefits

The foundation of economies of scope is the idea that materials (i.e., crops) can be changed out readily during production [18]. Specialty crop production and processing boost the economy in several ways. Each sector directly generates economic activity and jobs within its respective industry. For instance, growers pay farm workers, buy fertilizer and equipment from nearby vendors, and put their profits in nearby banks while also paying for housing, groceries, and other personal expenses, farm workers use their earnings [19].

Specialty crops often have less price volatility, even when prices for conventional crops decline as a result of overproduction and consequent oversupply whereas, by spawning locally based enterprises like processing and packaging, new crops can also promote long-term economic growth in the region [20]. Additionally, the introduction of new crops might promote consumer demand for foods grown nearby, which gives smallholder farmers a chance to increase the viability of their operations.

Promotion of human health

Simple alterations to the nutritional composition and environmental conditions can be used to develop specialty/functional foods [21]. Agricultural simplification, or the process of favoring some crops over others due to their simple growing requirements, faster processing, and storage, is the outcome of the limited number of plant species that have been produced as primary food crops for human use [22]. Ecological health depends on biodiversity, and ecological health creates a road to bettering human health and well-being, [23] so, to encourage biodiversity and the availability and sustainable use of plant genetic resources for both the present and the future, underutilized natural plant resources should be employed.

By ensuring a variety of food options in the neighborhood, the promotion of agricultural biodiversity can have a substantial positive impact on human health. The security of future food and nutrition, as well as human health and sustainable livelihoods, can all be seriously threatened by biodiversity loss [24], therefore increasing food diversity can help people eat healthier diets and meet their nutrient needs phytochemicals, vitamins, minerals, and fiber, many alternative crops are recognized to have health advantages [25,26].

Challenges

Importing goods for the development of specialized crops has become extremely challenging, expensive, and time-consuming due to shipping issues around the world. Growers and retailers are looking for a trustworthy partner while there are still substantial chemical shortages and delivery delays.

Issues related to research and policies.

Decision-makers and institutions have paid close attention to conventional crops, which has impeded the development of new funding programs for alternative crops. Lack of focus has delayed the development of alternative crops, preventing the advancement of these priorities [23].

The promise and potential of crop diversification are receiving attention at various government levels as a result of the changes and difficulties that have occurred in the agricultural industry over the past few years, and as a result, additional funding possibilities are now accessible. However, the complexity and high risk involved in developing new crops are frequent obstacles to generating interest from the private sector [27], therefore the activities should be carried out through robust, long-term, and coordinated national frameworks.

Issues while marketing and handling

As the growing season got underway, COVID-19's economic and health difficulties compelled producers of specialty crops who sell to regional consumers, like establishments like restaurants, to change their marketing strategies [28] while local food systems can become more resilient overall as a result of small-scale producers' flexibility, individual producers are also more susceptible to costly economic losses as a result of COVID-19 [29]. Limited understanding of market expectations, the significant risks involved in developing a sustainable supply chain for a new crop product, and the long period before profits are quantified are the main barriers to a successful crop diversification venture [30]. Without gathering data on their products or conducting a thorough analysis of the market's potential and needs, farmers may not be successful.

For alternative specialty crops to be accepted, a market's accessibility and location are essential. Before beginning new crop production, which is seen to be crucial for both internal and external markets, it is necessary to study marketing potential, product standards, price changes, and competitiveness. Every new specialized crop has a certain amount of danger and lack of security, and this

should be acknowledged. Few farmers feel at ease with the ambiguity of not being fully aware of the market position.

Varieties of exotic and uncommon fruits and vegetables could fetch a higher price than conventional goods. However, a lot of them are perishable and need specific treatment, storage, and transportation. They also need to be transferred rapidly from the field to the customer to avoid spoilage or loss of aesthetic appeal. In most nations, the yearly postharvest losses in horticulture crops range from 20% to 40% [31].

Specialty crops might be challenging to handle after harvest and difficult to supply consumers with fresh produce due to the absence of postharvest and handling information. For the growth of many specialized crops, strict quality control criteria must be created.

Limited information on cultural practices

Assessing the effects of climate variability has primarily focused on decreased specialty crop yields. However, in adverse weather circumstances, specialised crops can endure changes in nutrients and attributes like colour, aesthetic appeal, scent, taste, and texture [30]. One of the main obstacles to the effective commercialization of alternative crop production may be the absence of trustworthy information on cultural practices.

For instance, due to their particular growing requirements, cultivars that thrive in one area may not thrive in another, such as those related to temperature, planting time and location, sun radiation, and water. The temperature may be one of the key elements influencing the production of alternative crops as a result of the global implications of climate change on food production. However, this can result in certain favorable effects and opportunities, such as the capacity to grow some specialist crops in new places [32]. Alternative specialty crops have better potential returns per unit area than traditional crops, but they are typically only suitable for small tracts of land because of their high labor and management demands. Without a significant investment to benefit from scale economies, scaling up the operation might be challenging [33].

Risks and its management in specialty crop production

Diversification's effect on the risk of diversification is widely established. First, risk should be reduced as long as an additional enterprise is not perfectly positively connected with the returns of another enterprise on the farm [34]. Second, as [35], and at this rate of fall in diversifiable risk, individual crops' inherent riskiness may be impacted.

Risks in production

The uncertainties influencing the crop growth process naturally are referred to as production risk. Within the production process, common hazards include crop loss, bad weather, disease, weed competition, pest infestations, and the introduction of new technologies (biotech, robots, processing, etc) [36].

In comparison to the production of commodity crops, growing specialty crops may necessitate labor- and money-intensive techniques like drip irrigation, diversification, high tunnels, and plasticulture. Most specialty crops are also vulnerable to weather risks like extreme changes in temperature and precipitation [37]. As a result, specialty crops frequently have average production costs that are greater than those of commodity crops. The possibility for profit is impacted by the increased year-to-year fluctuation in harvest amounts brought on by production risk. Growers can lower risk in this area in one of three ways: [1] reduce production variability by diversifying farm enterprises, being adaptable to changing economic conditions, integrating multiple enterprises, advancing technology, and/or creating contingency plans; [2] control or minimize risk through irrigation practices, regular machinery maintenance, and close monitoring for pests and disease; and [3] transfer the risk to another party through contracting or insurance [38].

Risks in finance

The fact that all other categories of risk are closely tied to farm finances makes financial risk the most frequently mentioned type of risk. When a farm business takes out a loan or, more broadly, creates a commitment to pay back debt, financial risk predominantly arises. To meet the farm's daily operational needs and the capital-intensive nature of the industry, this sort of risk is mostly dependent on the timing of cash flows [39]. There is a lot of risk and uncertainty involved in the decisions made by producers, including those about crop insurance, contract agreements, and technology adoption. Particularly, compared to commodity crop production, specialty crop production is more risk-vulnerable and demands more intense management, while the specialty crop industry's risk-mitigation instruments are comparatively scarce [40].

Growers of specialty crops balance the costs of capital and labor since both are crucial to the production and harvest of their products. The level of financial risk that farms confront is also significantly influenced by regional and global factors. For instance, the cost of capital (the interest rate on loans), the availability of finances, land rents, and leasing agreements are primarily local issues. The level of financial risks faced by the farm sector depends on factors such as global supply and demand, trade circumstances,

and agricultural subsidies across all nations. An organized, well-documented financial tracking system is necessary for the most effective management of financial risks to time cash demands, expenses, and income [41].

Risks in market

Producers of specialty crops should give careful thought to risk management. In addition to dealing with variable yields, governmental regulations, and international markets, producers must also deal with significant market risk related to prices, sales volume, required product quality, and other non-price consideration.

The degree to which a producer is exposed to market risk varies on the type of agricultural product that is produced, but the uncertainty around the prices of inputs and/or finished goods is the primary concern. Prices are determined by local, regional, or international market trends for the majority of agricultural commodities. As a "price-taker," a particular grower accepts the price determined by the market on that particular day rather than setting the prices for their products. Many employees hedge or store to offset low prices to reduce grower exposure to relatively lower market pricing for homogeneous products [38]; [42]. Growers may choose to sell their products directly to consumers or through retail establishments, which allows them control over the market pricing by differentiating their product offerings [43]. These "price-setters" control pricing risks resulting from constantly shifting market demand by getting in touch with specific clients. Direct customer interests and preferences determine the relationships created with certain producers and products, but they are dynamic throughout time. Growers devote time and money to a marketing plan, which includes a review of sales and market data, to reduce the pricing risk that is specific to direct market outlets. They also work to raise consumer awareness of their distinctive product offerings. By establishing their prices higher than their overall operating costs, growers who set prices can reduce their exposure to financial risk [44].

Risks in labour

Compared to regular row crops, specialty crop growers are exposed to a disproportionately higher level of labour risk because the finished product is highly dependent on manual picking within a constrained timeframe. Seasonal labour inputs play a significant role in the production of specialty crops. The nation's food supply, particularly its fresh produce, could be in jeopardy if there is insufficient labor to meet the demands of livestock and crop production. There is no shortage of farm labor in the United States, according to several studies that look at data that have been compiled at the national level [45]. But farmers still complain about a lack of workers, and some studies support this and show that it can be expensive for farmers [46].

Concerns with people's physical well-being, interpersonal relationships, and labour availability are also referred to as labour risk and have an immediate impact on the farm business [47]. Labor risk management necessitates the creation and implementation of a plan to provide access to a healthy and productive workforce, taking into account everything from interpersonal connections to people management to health and communication. The availability of migrant workers, who are dependent on the specialty crop growers' access to them, is influenced by the complex regulatory and legal framework, which is constantly changing, and the constantly shifting political climate [48].

Conclusion and Suggestion

Sr. No.	Authors Name	Title of Research paper	Journal name	Year	Finding
1	Markowitz H	Portfolio selection	Journal of Finance	1952	Risk should be reduced as long as an additional enterprise is not perfectly positively connected with the returns of another enterprise on the farm.
2.	Holdren B R	Competition in food retailing	Journal of Farm Economy	1965	The nature of the competition for food retailers in the local market were found.
3.	Weisenel W P and Schoney R A	An analysis of yield of the price risk associated with specialty crop.	Canadian Journal of Agricultural Economics	1989	New crop enterprises are added to a crop rotation, overall farm risk exposure decreases as a result of shifting prices and yield at a lowering rate.
4.	Fernandez-Cornejo J, Gempesaw C M, Elterich J G, and Stefanou S E	Dynamic measures of scope and scale economies: an application to German agriculture	American Journal Agricultural Economonics	1992	Empirical estimates of dynamic measures of scope and scale, as well as shadow costs, are made for multiple-output, multiple-input German dairy farms operating under production quotas.

5.	Kay R D and Edwards W M	Farm Management	McGraw-Hill	1994	The farm's daily operational needs and the capital-intensive nature of the industry, this sort of risk is mostly dependent on the timing of cash flows.
6.	Traxler G, Falck-Zepeda J, Ortiz-Monasterio R J I and Sayre K	Production risk and the evolution of varietal technology	American Journal of Agricultural Economics	1995	The uncertainties influencing the crop growth process naturally are referred to as production risk.
7.	Chu Y H, Chang C L and Hsu H F	Flavonoid content of several vegetables and their antioxidant activity	Journal of Science and Food Agriculture	2000	Increasing food diversity can help people eat healthier diets and meet their nutrient needs phytochemicals, vitamins, minerals, and fiber, many alternative crops are recognized to have health advantages.
8.	Fletcher R J	International new crop development incentives, barriers, processes and progress: An Australian perspective	ASHS Press	2002	One of the main obstacles to the effective commercialization of alternative crop production may be the absence of trustworthy information on cultural practices.
10.	Lobell D B, Field C B, Cahill K N and Bonfils C	Impacts of future climate change on California perennial crop yields: Model projections with climate and crop uncertainties	Agricultural and Forest Meteorology	2006	Specialty perennial crops are semi-permanent, they may be more susceptible to the effects of climate change than annual crops.
11.	Popkin B M	Global nutrition dynamics: The world is shifting rapidly towards a diet linked with non-communicable disease.	American Journal of Clinical Nutrition	2006	Alternative specialty crops often diversify a cropping system's crop production rather than totally replace established commodities.
12.	Díaz S, Fargione J, Chapin, F S I I I and Tilman D	Biodiversity loss threatens human well-being	PLOS Biology	2006	Ecological health depends on biodiversity, and ecological health creates a road to bettering human health and well-being.
13.	Reich L	Uncommon fruits with market potential	ASHS Press	2007	Alternative specialty crops have been identified for their pest resistance as well as their flavors.
14.	Collier R, Fellow J R, Adams S R, Semenev M and Thomas B.	Vulnerability of Horticulture crop production and extreme weather condition	The aspect of applied biology	2008	Most specialty crops are also vulnerable to weather risks like extreme changes in temperature and precipitation.
15.	Baron RA and Tang J	The role of entrepreneurs in firm-level innovation: Joint effects of positive affect, creativity, and environmental dynamism	Journal of Business Venturing	2011	Innovation has emerged as a crucial component of success, particularly for new businesses, involving the development of economic productivity and operational and working producers.
16.	Govindasamy R, Puduri V S and Simon J E	Willingness to buy new ethnic produce items: A study of Latino consumers form Mexico and Puerto Rico in the Eastern United States	HortTechnology	2011	Fruit and vegetable growers in the area can benefit greatly from their proximity to densely populated areas, especially given the ethnic populations' rapid expansion.
18.	Brollet U, Welzel P, Wong K and Kit P	Price risk and risk management in agriculture	Contemporary Economic	2013	Many employees hedge or store to offset low prices in order to reduce grower exposure to relatively lower market pricing for homogeneous products.

19.	Walthal C L, Hatfield J, Buckland P., *et al*.	Climatic change and agriculture in the United States; effects and adaptation	USDA Technician Bulletin	2013	Specialty crops are more vulnerable to climatic stresses (such as temperature and precipitation levels and frequency than row crops).
21.	Kumari I	A study on the entrepreneurship development process in India	Indian Journal of Research	2014	Entrepreneurial development programme is a course created to assist a person in enhancing their entrepreneurial drive and obtaining the knowledge and talents required to carry out their position as an entrepreneur successfully.
24.	Salgotra A K, Manhas A S and Singh P D	Agriculture growth and productivity in India.	International Journal of Applied Social Science	2018	The number of people working in agriculture is decreasing, and so is its contribution to GDP, but productivity in the foodgrain sector is rising, and trading in agricultural commodities is getting better.
25.	Hobbs J E	Food supply chain during the COVID-19 pandemic	Canadian Journal of Agriculture Economics	2020	Local food systems can become more resilient overall as a result of small-scale producers' flexibility, individual producers are also more susceptible to costly economic losses as a result of COVID-19.
26.	Zhao S and Yue C	Risk preference of community crop producers and specialty crop producer: An application of prospect theory	The Journal of the International Association of Agriculture Economics	2020	The specialty crop industry's risk-mitigation instruments are comparatively scarce.
28.	Dankbar H *et al.*	Market challenges for local specialty crop producers during the early phase of COVID-19 in North Carolina	Journal of Agriculture, Food System and Community Development	2021	COVID-19's economic and health difficulties compelled producers of specialty crops who sell to regional consumers, like establishments like restaurants, to change their marketing strategies.
29.	Mitchell C A	History of controlled environment horticulture: Indoor farming and its key technology	HortScience	2022	The threshold of profitability for an increasing number of specialty crops in locations with seasonal climates has elevated local, year-round indoor crop production to the fore of public awareness.

Table 1

Specialty crops provide possibilities for both economic and environmental sustainability, however, there have been a variety of obstacles to the effective commercialization of alternative specialty crops, from a lack of information and market development efforts to governmental and institutional hurdles. Each new crop may face a protracted and difficult road to success due to the intricate process involved in the production of new crops.

Specialty crops have a variety of advantages. Due to the numerous drawbacks of current intensive agriculture, specialty crops present a chance for crop diversification, enhancing human health by supplying a variety of food crops. In order to ensure the best possible use of local resources, diversification through high-value specialty crops also pays off in terms of climatic resilience. It is possible to cultivate leafy greens and other specialty crops to have higher concentrations of biologically active ingredients like vitamins and minerals. These substances can increase the nutritional value of food while also affecting other aspects of quality like colour and flavor.

Before cultivating a specialty crop or creating a value-added product, it can be time-consuming and potentially expensive to conduct background research on consumer preferences and identify a market. However, your chances of success with a specialty crop will increase if you have a strong marketing strategy in place and confirm customers before entering the field. Always keep in mind to "sell before you sow". It is difficult to sell any crop, so it is essential to create a well-defined marketing plan that outlines all the steps leading to final sales. The process of planning and implementing pricing, as well as promoting and distributing products in a way that satisfies specific organizational and customer needs, is referred to as marketing.

Recognize the options if the crop fails. Consider diversifying

the crop portfolio because specialty or small-acreage crops might not be covered by crop insurance. The negative effects of losing a single crop can be lessened by growing a variety of crops to meet target markets. The longer a crop takes to mature, the higher the financial risk of crop failure. For instance, losing one of five plantings of a culinary herb would have less of an effect than losing a plantation of tree nuts that takes 12 years to reach full production.

Bibliography

1. Baron R A and Tang J. "The role of entrepreneurs in firm-level innovation: Joint effects of positive affect, creativity, and environmental dynamism". *Journal of Business Venturing* 26 (2011): 49-60.

2. Kumari I. "A study on the entrepreneurship development process in India". *Indian Journal of Research* 3 (2014): 51-53.

3. Desai RG. "Agricultural Economics: Models, Problems and Policy Issues. 1st 2 edition. Himalayan Publishing House, Mumbai, Maharashtra (2017): 324.

4. Salgotra AK., *et al.* "Agriculture growth and productivity in India". *International Journal of Applied Social Science* 5 (2018): 192-99.

5. U.S Department of Agriculture. Farm income and wealth statistics. Annual cash receipts by commodity (2015).

6. Johnson R. "Specialty Crop Provisions in the 2014 Farm Bill (P.L. 113-79). Congressional Research Service (2014).

7. Mitchell CA. "History of controlled environment horticulture: Indoor farming and its key technology". *HortScience* 57 (2022): 247-256.

8. Walthal CL., *et al.* "Climatic change and agriculture in the United States; effects and adaptation". USDA Technician Bulletin, Washington DC (2013): 186.

9. Sutton J. "Sunk cost and market structure: Price competition advertising and the evolution of concentration". MIT press (1991).

10. Popkin BM. "Global nutrition dynamics: The world is shifting rapidly towards a diet linked with non-communicable disease". *American Journal of Clinical Nutrition* 84 (2006): 289-298.

11. Buzby JC., *et al.* "Canned fruits and vegetable consumption in the United States: An updated report to congress". *Economic Research Service* (2010): 40.

12. Barcellos MD., *et al.* "Willingness to try innovative food products: a comparison between British and Brazilian consumers". *Brazilian Administration Review* 6 (2009): 50-61.

13. Adam R., *et al.* "Direct marketing- Business Management Series". *Attra- Appropriate Technology Transfer for Rural Areas* (1999).

14. Reich L. "Uncommon fruits with market potential". In: J. Janick and A. Whipkey (eds.). Issues in new crops and new uses. ASHS Press, Alexandria, VA (2007): 210-215.

15. Govindasamy R., *et al.* "A Market Driven Approach to Ethnic Crop Production for the US East Coast". Reprinted from: Issues in new crops and new uses. J. Janickand A. Whipkey (eds.). ASHS Press, Alexandria, VA (2007).

16. https://researchgate.net/publication/242220849_A_Market_Driven_Approach_to_Ethnic_Crop_Production_for_the_US_East_Coast

17. Rola-Rubzen MF and Hardaker JB. "Improving market access for smallholders: Challenges and opportunities". Paper presented to the 50th Annual Conference of the Australian Agricultural and Resource Economics Society (2006): 8-10.

18. Govindasamy R., *et al.* "Willingness to Buy New Ethnic Produce Items: A study of Latino Consumers form Mexico and Puerto Rico in the Eastern United States". *HortTechnology* 21 (2011): 202-207.

19. Fernandez-Cornejo J., *et al.* "Dynamic Measures of Scope and Scale Economies: An Application to German Agriculture". *American Journal Agricultural Economonics* 74 (1992): 329-342.

20. Keene AA and Mitchell PD. "Economic impact of specialty crop production and processing in Wisconsin". The University of Wisconsin Madison (2010).

21. Janick J., *et al.* "Diversifying U.S. crop production". In: Janick J (ed.), Progress in new crops. ASHS Press, Alexandria, VA (1996): 109.

22. Padulosi S., *et al.* "Underutilized crops: Trends challenges and opportunities in the 21st century, p. 323-338. In: J.M.M. Engels, V.R. Rao, A.H.D. Brown, and M.T. Jackson (eds.). Managing plant genetic diversity. CABI International, Wallingford, UK (2002).

23. Díaz S., *et al.* "Biodiversity Loss Threatens Human well-being". *PLOS Biology* (2006): 4.

24. Vietmeyer N. "New crops: Solutions for global problems, p. 2–8. In: J. Janick (ed.). Progress in new crops. ASHS Press, Alexandria, VA (1996).

25. Burlingame B and Dernini S. "Sustainable Diets and Biodiversity: Directions and Solutions for Policy, Research and Action". Edited from the presentations made at the International Scientific Symposium: Biodiversity and sustainable diets united against hunger. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy (2010).

26. https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/PB2011104881.xhtml

27. Janick J. "Perspectives on new crops and new uses". In: Proceedings of the Fourth National Symposium New Crops and New Uses: Biodiversity and Agricultural Sustainability ASHS Press, Alexandria, VA (1999): 528.

28. Chu YH., *et al.* "Flavonoid content of several vegetables and their antioxidant activity". *Journal of Science and Food Agriculture* 80 (2000): 561-656.

29. Jolliff GD. "Policy Consideration in New Crops Development". 84-103. In: Kim H J. Opportunities and challenges of Alternative Specialty Crops: The Global Picture". *HortScience* (1999).

30. Dankar H., *et al.* "Market Challenges for Local Specialty Crop Producers during the Early Phase of COVID-19 in North Carolina". *Journal of Agriculture, Food system and Community Development* 10 (2021): 229-239.

31. Hobbs JE. "Food supply chain during the COVID-19 pandemic". *Canadian Journal of Agriculture Economics* 68 (2020): 171-176.

32. Fletcher RJ. "International new crop development incentives, barriers, processes and progress: An Australian perspective". In: Janick and A. Whipkey (eds.) (2002).

33. Papademetriou M and Dent F. "Crops Diversification in the Asia-Pacific Region. FAO, Rome, Italy (2001).

34. Lobell DB., *et al.* "Impacts of future climate change on California perennial crop yields: Model projections with climate and crop uncertainties". *Agricultural and Forest Meteorology* 141 (2006): 208-218.

35. Ackerman F and Stanton E. "Climate impacts on agriculture: A challenge to complacency 13–01. Global Development and Environment Institute Working Paper. Tufts University, Medford, MA (2013).

36. Markowitz H. "Portfolio selection". *Journal of Finance* 7 (1952): 77-91.

37. Weisenel WP and Schoney RA. "An analysis of yield of the price risk associated with specialty crop". *Canadian Journal of Agricultural Economics* 14.2 (1989): 293-299

38. Traxler G., *et al.* "Production risk and the evolution of varietal technology". *American Journal of Agricultural Economics* 77 (1995): 1-7.

39. Collier R., *et al.* "Vulnerability of Horticulture Crop Production and Extreme Weather Condition". *The Aspect of Applied Biology* 88 (2008): 3-14.

40. Drollette S. "Managing Marketing Risk in Agriculture". Department of Applied Economics Utah State University, Logan (2009): 4.

41. Kay RD and Edwards WM. "Farm Management. 3rd edition". New York, NY: McGraw-Hill (1994).

42. Zhao S and Yue C. "Risk preference of community crop producers and specialty crop producer: An application of prospect theory". *The Journal of the International Association of Agriculture Economics* 51 (2020): 359-372.

43. Morgan KL., *et al.* "Farm Financial Risk Management Series. Part I, Overview of Financial Systems for New and Beginning Farmers". Virginia Cooperative Extension AAEC (2016): 114.

44. Brollet U., *et al.* "Price risk and risk management in agriculture". *Contemporary Economic* 7 (2013): 17-20.

45. Nartea TJ and Morgan KL. "Selling Directly to Buyers: How to Price Your Product (2015).

46. Holdren BR. "Competition in Food Retailing". *Journal of Farm Economy* 47 (2015): 1323-1331.

47. Levine L. "Farm Labor Shortages and Immigration Policy". Congressional Research Service RL30395, Washington, DC (2009).

48. Horner C. "Testimony. Hearing on America's Agricultural Labor Crisis: Enacting a Practical Solution. Subcommittee on Immigration, Refugees, and Border Security, U.S. Congress, Senate Committee on Judiciary (2011).

49. Billikopf GE. "Labor Management in Agriculture: Cultivating Personnel Productivity". University of California, Division of Agriculture and Natural Resources, Agricultural Issues Center (2003): 10.

50. Mapes K. "Sweet Tyranny: Migrant Labor, Industrial Agriculture, and Imperial Politics". Urbana, IL: University of Illinois Press (2010).