Colegio de Postgraduados

Profitability of Pitahaya as an Alternative Crop in the Southern Region of the State of Mexico

Guadalupe-Garcia, Manuel[1*]; Barrios-Puente, Gerónimo[1]; Pérez-Soto, Francisco[1]; García-Sánchez, Roberto C.[2]; Velázquez-Juárez, Yolanda[3]

[1] Universidad Autónoma Chapingo. Texcoco, Estado de México, México. C. P. 56230.
[2] Colegio de postgraduados. Texcoco, Estado de México, México. C. P. 56264.
[3] Benemérita Universidad Autónoma de Puebla. Puebla, Puebla, México. C. P. 72570.
* Correspondence: manuelgpe790@gmail.com

ABSTRACT

Objective: The objective of this study was to evaluate the economic profitability of pitahaya (*Hylocereus* spp.) production in southern State of Mexico through a financial analysis of representative production units, under the hypothesis that this crop represents a viable regional agricultural alternative by generating positive and sustainable financial indicators.

Design/methodology/approach: We utilized a financial analysis approach focusing on 0.25-hectare units, which is the average area managed by producers in the region. This scale was chosen to avoid distortions caused by economies of scale and to provide a more accurate reflection of local conditions. The analysis focused on the third year after crop establishment, when production stabilizes, and income and expense flows become clearer. Costs, revenues, and key profitability indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), Break-even Point, and Benefit-Cost Ratio (B/C) were integrated.

Results: The study yielded a Net Present Value (NPV) of $127,850 pesos, an Internal Rate of Return (IRR) of 27.1%, and a Benefit-Cost Ratio (B/C) of 2.175, indicating solid profitability. The break-even point was reached with the sale of 1.17 tons per cycle. The sensitivity analysis showed that the project remains viable even with a 27% reduction in income or a 38% increase in costs.

Limitations on study/implications: The analysis is based on data collected from a specific region, which may limit its applicability to other contexts.

Findings/conclusions: Pitahaya cultivation represents a profitable, resilient, and sustainable alternative for diversifying agricultural production in the southern region of the State of Mexico.

Keywords: viability, production, financial analysis.

Citation: Guadalupe-Garcia, M., Barrios-Puente, G., Pérez-Soto, F., García-Sánchez, R. C., & Velázquez-Juárez, Y. (2026). Profitability of Pitahaya as an Alternative Crop in the Southern Region of the State of Mexico. *Agro Productividad*. https://doi.org/10.32854/7z48tm20

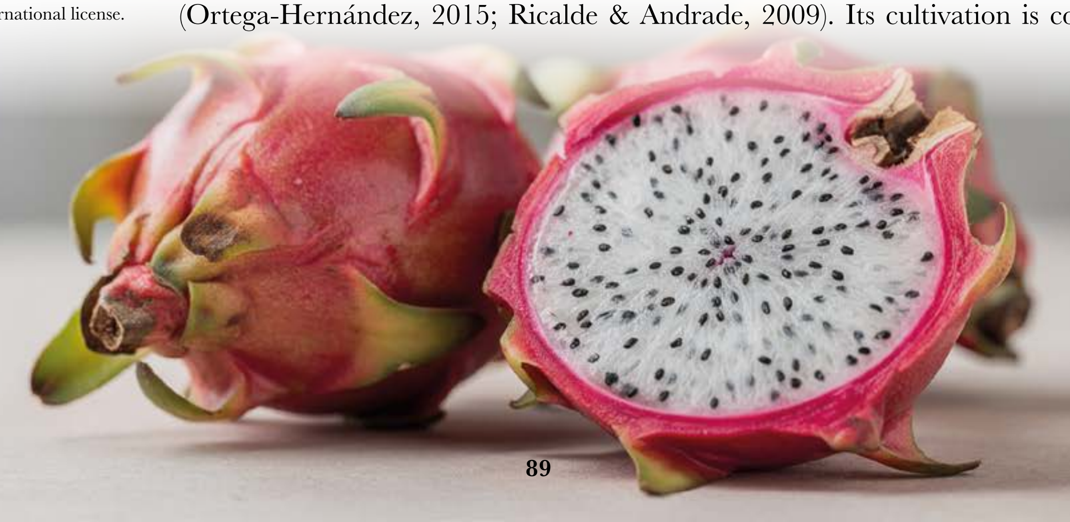
Academic Editor: Jorge Cadena Iñiguez
Associate Editor: Dra. Lucero del Mar Ruiz Posadas
Guest Editor: Juan Francisco Aguirre Medina

Received: May 28, 2025.
Accepted: December 4, 2025.
Published on-line: March 31, 2026.

Agro Productividad, 19(1). January. 2026. pp: 89-99.

INTRODUCTION

Pitahaya (*Hylocereus* spp.), commonly known as dragon fruit, is a cactus species native to the Americas that has gained relevance in Mexican agriculture due to its adaptability to adverse climatic conditions and the growing demand in national and international markets (Ortega-Hernández, 2015; Ricalde & Andrade, 2009). Its cultivation is concentrated in



arid and semi-arid regions of the country, including Quintana Roo, Yucatán, Puebla, Aguascalientes, Tabasco, Guerrero, Nuevo León, and Sinaloa, where agroclimatic conditions favor its development and have consolidated these states as the main national producers (SIAP, 2023). The species is characterized by low water requirements, tolerance to soils of limited quality, and resistance to both drought and high temperatures, making it a strategic option for agricultural diversification (Wu, 2005). In addition, its nutritional value and antioxidant properties have increased its market acceptance and strengthened its economic potential (Montesinos-Cruz, 2015).

At the international level, interest in crops of the genus *Hylocereus* has increased steadily. Currently, production takes place in countries such as Vietnam, Mexico, Colombia, Nicaragua, Ecuador, the United States, Israel, Thailand, Japan, and Australia (Tel-Zur, 2015). Vietnam has consolidated its position as the main exporter of fresh fruit, while China, Indonesia, Taiwan, and Malaysia have increased their participation in production (Chen & Paull, 2019; Mercado-Silva, 2018). Global production is concentrated in tropical regions of the Americas and Asia, with an estimated output exceeding 2.1 million tonnes cultivated on approximately 116,836 hectares (MIDAGRI, 2021). Market dynamism has been enhanced by the approval, in 2012, of an irradiation protocol in the United States that facilitated compliance with phytosanitary import requirements (Chen & Paull, 2019). Although the fruit is often considered exotic, its flavor has sometimes been described as bland. This perception has led to the importation of sweeter varieties from Ecuador and Colombia into North America and Europe. In this context, Vietnam plays a significant role in Asian and European markets, as well as at times in the United States, where larger red pitahayas have gained strong consumer preference (Wakchaure *et al.*, 2020).

Profitability analyses of this crop have also been the subject of research in different countries. In Ecuador, it is recognized as a driver of development in producing areas, despite existing structural challenges (Farez-Jaramillo *et al.*, 2025). In Nepal, a benefit-cost ratio of 1.87 has been documented, while in regions of India values of 2.04 have been reported, along with an Internal Rate of Return (IRR) of 11.78% or benefit-cost ratios ranging between 1.75 and 1.86 (Mehta *et al.*, 2024; Sharma *et al.*, 2021; Kikon *et al.*, 2021). In Mexico, Michel-Lara *et al.* (2022) reported a benefit-cost ratio of 2.6 in Tolimán, Jalisco. Additional studies in Campeche and Puebla have also shown favorable results, with positive indicators of Net Present Value (NPV), IRR, and Benefit-Cost Ratio (BCR), supporting the viability of the crop under appropriate management and marketing conditions (Ku-Caamal, 2019; Trejo-López, 2012; Flores-Miranda, 2011; Méndez-Ku, 2003). These findings highlight the usefulness of financial indicators, such as total costs, revenues, BCR, and IRR, for assessing economic viability.

Although comprehensive profitability studies are not available for traditional crops such as maize and beans in the southern region of State of Mexico, approximate gross income and expenditure per hectare allow comparisons with commercial crops for which economic analyses are available, such as cucumber and tomato, and subsequently with pitahaya, which represents the emerging crop under consideration. For example, in recent years maize, cucumber, and tomato have shown benefit-cost ratios of 1.6, 1.27, and 1.6, respectively (Amaya-Pérez *et al.*, 2025; Rebollar-Rebollar *et al.*, 2022; Morales-Hernández *et al.*, 2018). These values suggest that pitahaya, given its economic potential, represents an attractive alternative to traditional and commercial crops in the study area.

Despite these advantages, the expansion of the crop faces constraints, including limited access to technical information, the absence of historical cost and yield records, and reliance on intermediaries for marketing. These conditions reduce profitability and compromise the sustainability of production, particularly in the southern region of the State of Mexico and in certain areas of Puebla. In this context, it is essential to generate techno-financial evaluations that integrate these factors and provide evidence of profitability to strengthen regional agricultural development.

MATERIALS AND METHODS

The research was conducted in the southern and central regions of State of Mexico, as well as in selected producing areas of the state of Puebla, where a representative number of small-scale pitahaya producers are concentrated. These regions were selected due to their similar production systems and scales, their growing interest in the crop, and the presence of conditions comparable to those of southern State of Mexico.

Structured surveys and semi-structured interviews were applied to active pitahaya producers. In State of Mexico, two producers from the southern region and three from the eastern region were included, given that this is an emerging crop and the number of producers in these areas remains limited. To complement the information, five producers from the Mixteca region of Puebla were considered, an area that hosts more than 100 production units dedicated to this crop. The sampling was classified as non-probabilistic and purposive, as priority was given to including units with production conditions, levels of technological adoption, and scales similar to those observed in southern State of Mexico. The study design was cross-sectional, with data collected at a single point in time. It also included a five-year financial projection to assess the economic viability of the crop.

The questionnaires made it possible to estimate production costs, revenues, sale prices, inputs used, harvest volumes, and technological practices. Considering that producers primarily manage 0.25-hectare plots, the economic analysis was conducted at this scale in order to accurately represent real production conditions and avoid biases derived from scale-related variations. Based on the information obtained, a five-year financial projection was developed and key financial indicators were calculated: Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (BCR), and the producer break-even point (BEP). Data processing and the development of the financial projection were carried out using Microsoft Excel, with annual cash flows recorded and both operating expenses and residual value at the end of the evaluation horizon taken into account.

The use of Microsoft Excel was justified by its versatility in constructing financial cash flows and estimating economic indicators. To ensure the validity of the results, the formulas were verified through manual calculations and were based on the *Guidelines for Traditional Quantitative Techno-Financial Evaluation* of the FIRA Evaluation Procedure- Bank of Mexico (n.d.). This methodological framework enabled consistent indicators and mitigated the limitations of the exclusive use of spreadsheets, in accordance with technical standards commonly applied to the evaluation of agricultural projects in Mexico.

A Minimum Acceptable Rate of Return (MARR) of 18% was considered, supported by three components: (i) a risk-free rate of approximately 8%, based on the historical yields of CETES and the Interbank Equilibrium Interest Rate (TIIE) reported by the Bank of Mexico; (ii) a country risk premium of around 6%, derived from the EMBI+ indicator for Mexico; and (iii) a sectoral premium of 4%, reflecting the emerging nature of the crop, the small scale of production units, and uncertainty in marketing channels. This value is consistent with methodological recommendations from international organizations, which suggest using discount rates between 12% and 20% for agricultural and rural projects in Latin America (FAO, 2015; IDB, 2019).

The break-even point was estimated as the level of sales at which total revenues equal total costs. Finally, a sensitivity analysis was conducted to simulate the impact of revenue and cost variations on project profitability.

RESULTS AND DISCUSSION

Pitahaya cultivation in the southern region of the State of Mexico exhibits variable productivity, determined by technical and environmental factors such as plant age, agronomic management, access to irrigation, planting density, and local agroecological conditions.

The area managed by pitahaya producers ranges from 300 m^2 to 3,120 m^2, with a median of 2,500 m^2. Most producers operate on a small scale, using their own land and combining pitahaya cultivation with other agricultural or non-agricultural activities. The average age of the plantations evaluated was 3 years, suggesting that most are in the commercial development stage.

Regarding production, the estimated average yield in the study area was 10 tonnes per hectare per cycle, with a range from 6 to 12 tonnes depending on agricultural management conditions. This value falls within the parameters reported for other regions of the country, such as Sinaloa, where, according to the study by Osuna-Enciso *et al.* (2016), yields in the third, fourth, and fifth years of the orchard ranged between 10 and 13.4 tonnes per hectare, depending on crop age.

Harvesting is concentrated mainly between June and October, with slight variations among municipalities. Producers indicated that production becomes significant from the second year onward, reaching peak productivity between the fourth and fifth years.

In this context, Figure 1 presents a comparative analysis of pitahaya's relative profitability compared with other crops and regions. In the left panel, the benefit-cost ratio of pitahaya (2.2) is contrasted with traditional crops in the region, such as maize (1.6) and black beans (1.7), as well as with predominant commercial crops such as tomato (1.6) and cucumber (1.3). In the right panel, pitahaya produced in the southern region of the State of Mexico (2.2) is compared with that reported for Jalisco (2.44), Guanajuato (3.0), and Campeche (2.35), evidencing favorable regional competitiveness. These results show that pitahaya not only exceeds traditional and well-established commercial crops in terms of profitability in the study area, but also exhibits economic performance comparable to that of regions with greater productive experience. The evidence suggests that adopting pitahaya represents an economically attractive alternative and a viable diversification strategy for producers in the southern region of the State of Mexico.

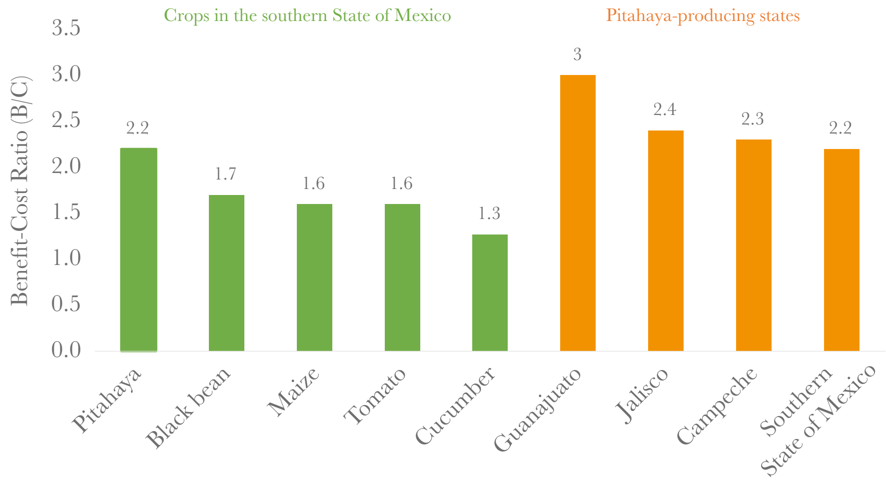


Figure 1. Benchmarking of the benefit-cost ratio (B/C) of pitahaya in the southern region of the State of Mexico.
Source: Authors' own elaboration based on data from Amaya-Pérez *et al.* (2025); ICAMEX (2024); SIAP (2024); López-Chávez (2024); Rebollar-Rebollar *et al.* (2022); Michel-Lara *et al.* (2022); Ku-Caamal (2019); Carrillo-Martínez *et al.* (2019); Morales-Hernández *et al.* (2018).

Costs and revenues

Important note: All costs and revenues presented in this section correspond to an area of 0.25 hectares, in order to accurately reflect the local production scale and avoid distortions associated with economies of scale.

The most representative variable costs include labor (planting, pruning, fertilization, harvesting), organic and/or chemical fertilizers, irrigation water, pest control, and fruit transportation. On average, the estimated variable cost for 0.25 ha was MXN 60,018 per production cycle, while annualized fixed costs (including depreciation) amounted to MXN 30,326 for the same area.

Based on an average yield of 2.5 tonnes on 0.25 hectares and an average farm-gate selling price of MXN 50 per kilogram, gross revenues amounted to MXN 125,000 per production cycle. This income varies depending on the marketing channel used. Some producers sell to local intermediaries, while others can access specialized markets or engage in direct sales (as in the case of the producers interviewed in Puebla), where prices may increase.

When revenues were compared with total costs, a net profit of MXN 34,655 per quarter hectare per cycle was estimated, reflecting positive margins even under traditional management scenarios. This profit represents a 28% return on total costs, positioning the crop as a viable alternative to other crops in the region with lower margins. It is worth noting that revenues show strong correlations with price and crop age, with coefficients of r=0.99 and r=0.73, respectively, based on the data. Producers with more mature plantations (≥4 years) reported higher net profits due to greater production and lower per-plant expenditures associated with establishment activities.

The summary table of average costs and revenues per production cycle is presented in Table 1.

Table 1. Average costs and revenues per 0.25 hectares of pitahaya.

Concepts	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Annualized fixed costs ($)	30,326	30,326	30,326	30,326	30,326	30,326
Variable costs ($)	47,893	46,144	60,018	74,740	95,116	117,748
Total cost per cycle ($)	78,219	76,470	90,345	105,066	125,442	148,075
Gross yield (t)	0	0.432	2.5	4	6	8
Average farm-gate price ($)	-	45,000	50,000	55,000	60,000	65,000
Estimated net profit ($)	−78,219	−57,030	34,655	114,934	234,558	371,925

This economic analysis establishes the basis for projecting the crop's financial performance in the medium term, which is developed in the following section.

Financial analysis of the project

To assess profitability, a financial projection was prepared based on an estimated cash flow for a quarter of a hectare. The analysis considered:

1. Initial investment
2. Annual operating costs
3. Expected revenues from fruit sales
4. A residual value at the end of the time horizon

The initial investment (Table 2) includes expenses for the water pump, brush cutter, land preparation, installation of the irrigation system, the PTR structure (metal tubing), and cuttings, with a total estimated cost of MXN 271,631. This investment was depreciated over six years using the straight-line method, recognizing that, from an accounting perspective, some fixed assets are not fully exhausted within that period.

Table 2. Initial investment.

Fixed assets	Quantity	Amount ($)	Depreciation rate (%)	Residual value ($)
Water pump	1	5,500	10	2,200
Brush cutter	1	3,000	10	1,200
Land preparation and irrigation installation	1	40,631	20	32,505
PTR structure	1	135,000	5	94,500
Cuttings	2500	87,500	10	35,000
Total		271,631		165,405

Note: Rates according to the Income Tax Law (LISR), Ministry of Finance and Public Credit (SHCP, 2024).

Annual revenues were calculated based on average production by crop age and on prices reported by producers, depending on fruit quality and origin, resulting in increasing gross cash flows as the plants reach their full productive capacity (Table 3).

Table 3. Net cash flow, NPV, and IRR.

Concepts	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Sales ($)	-	19,440	125,000	220,000	360,000	520,000
Costs ($)	53,743	51,994	65,868	80,590	100,966	123,598
Operating profit ($)	−53,743	−32,554	59,132	139,410	259,034	396,402
Fixed and deferred assets ($)	271,631					40,631
Change in working capital ($)	11,733	−262	2,081	2,208	3,056	
Total investment ($)	283,364	−262	2,081	2,208	3,056	40,631
Residual values ($)						165,405
Recovery of working capital ($)						18,816
Net cash flow ($)	−337,106	−32,554	57,050	137,202	255,978	539,992
Minimum acceptable rate of return (MARR)			18.0%			
Internal Rate of Return (IRR)			27.1%			
Net Present Value (NPV)			$128,072.22			

Under these conditions, the project showed a positive Net Present Value (NPV) of MXN 128,072.22 at a 18% discount rate, indicating that the present value of benefits exceeds the present value of costs. Likewise, an Internal Rate of Return (IRR) of 27.1% was obtained, which exceeds the opportunity cost of capital, thereby confirming the project's financial viability (Table 3). For this study, a Minimum Acceptable Rate of Return (MARR) of 18% was used, reflecting the opportunity cost of capital in the Mexican agricultural sector, along with an additional risk margin associated with the productive and commercial conditions of pitahaya cultivation.

Benefit-cost ratio (B/C)

The benefit-cost ratio (B/C) obtained was 2.175, indicating that for every peso invested in the project, MXN 2.175 in net benefits is generated at present value. This result reflects strong economic efficiency, as the present value of benefits (MXN 653,127) far exceeds that of costs (MXN 300,263) (Table 4).

Table 4. B/C ratio.

Concepts	Value
Present value of benefits ($)	653,127
Present value of costs ($)	300,263
Benefit-cost ratio (B/C)	2.175

Producers' break-even point

The break-even point was reached in the third year, when total costs were fully covered by revenues, a period in which the plantation began to stabilize its yields.

Figure 2 shows that the break-even point is approximately 1.17 tonnes or MXN 58,336.15, implying that an average producer in the study area must sell at least this amount to cover both fixed costs (MXN 30,326.20) and variable costs associated with crop management. Beyond this level, the yellow-shaded area indicates the profit margin, while the blue area indicates an operating loss.

This visualization provides a clear understanding of the relationship between production and income, helping producers make strategic decisions regarding minimum sales volume, target prices, and profitability levels. It also highlights the importance of optimizing costs and securing marketing channels that allow this threshold to be exceeded with confidence.

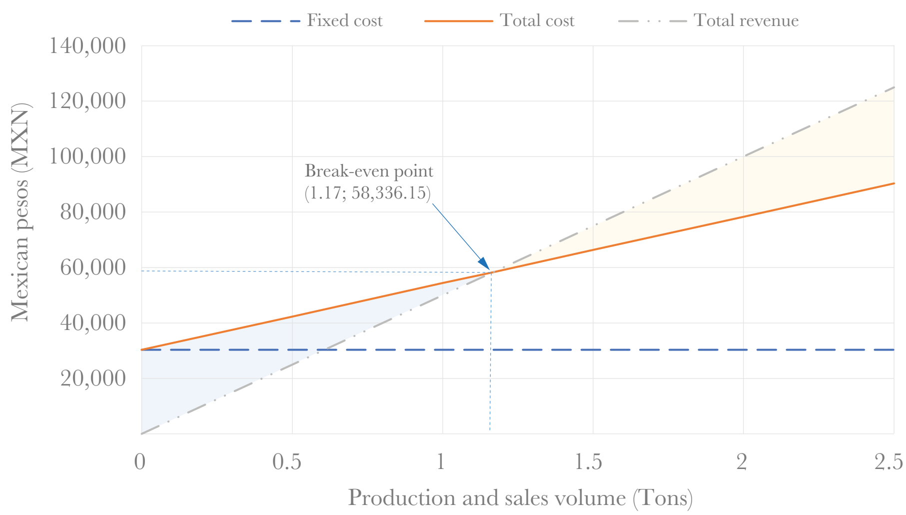


Figure 2. Break-even point of pitahaya production.

Sensitivity analysis

A sensitivity analysis is presented under a first combined scenario that considers progressive reductions in revenues (−5%, −10%, and −15%) together with increases in production costs (between +5% and +35%). The results show that crop profitability remains positive only when revenue reductions are below 10% and cost increases are below 20%. Beyond a 20% increase in costs and a 10% decrease in revenues, profitability becomes negative, revealing the production system's vulnerability to simultaneous market shocks. More adverse scenarios, such as a 15% reduction in revenues and cost increases above 30%, result in significant losses, highlighting the importance of strategies aimed at stabilizing prices and controlling production costs (Table 5).

In the second scenario (decline in sales), the results show that the project remains profitable with reductions of up to 27%, although costs are barely covered and margins become much tighter. In contrast, under scenario 3 (cost increase), the project withstands cost increases of up to 38% without incurring losses. Beyond 39%, costs exceed revenues, resulting in an operating loss (Table 6).

Table 5. Combined effect of variations in revenues and costs.

Adjusted NPV		**Reduction in sales**			
	80,402.68	**−5.00%**	**−10.00%**	**−15.00%**	**−20.00%**
Cost increase	5.00%	80402.679	47746.3186	15089.9581	−17566.402
	10.00%	65389.533	32733.1725	76.8120455	−32579.548
	15.00%	50376.387	17720.0265	−14936.334	−47592.694
	20.00%	35363.2409	2706.88046	−29949.48	−62605.84
	25.00%	20350.0949	−12306.266	−44962.626	−77618.987
	30.00%	5336.94887	−27319.412	−59975.772	−92632.133
	35.00%	−9676.1972	−42332.558	−74988.918	−107645.28

Table 6. Analysis of sales decline and cost increase.

Scenarios	**Reduction in sales**			**Increase in costs**		
Variation en %	0	27	28	0	38	39
Sales ($)	125,000	91,250	90,000	125,000	125,000	125,000
Costs ($)	90,345	90,345	90,345	90,345	124,676	125,579
Difference ($)	34,655	905	−345	34,655	324	−579

CONCLUSIONS

The present study confirms that pitahaya (*Hylocereus* spp.) constitutes a profitable and viable productive alternative for small-scale producers in the southern region of the State of Mexico from the third year after establishment onward. The financial analysis showed a positive Net Present Value, an Internal Rate of Return exceeding the opportunity cost of capital, and a Benefit-Cost Ratio of 2.175, indicating the economic soundness of the evaluated system. The break-even point was located at 1.17 tonnes, which is attainable under appropriate management conditions. The sensitivity analysis indicated that, under adverse scenarios —such as a 15% decrease in revenues combined with cost increases above 30%— the project may incur significant losses, underscoring the need for strategies to stabilize prices and control production costs.

The results suggest that the evaluated model could be replicated in areas with similar agroecological conditions, such as the Rural Development Districts of Tejupilco, Valle de Bravo, and Coatepec Harinas. According to Sotelo-Ruiz *et al.* (2006), these districts were identified through climate and soil requirement modeling using a Geographic Information System (GIS), showing very high agroclimatic potential for pitahaya. Consistently, observations from the present study indicate that certain areas of the Mixteca region of Puebla exhibit comparable conditions and production experience, allowing the application of the same model. This reinforces the crop's viability in these regions and its potential as an alternative for agricultural diversification, capable of generating sustainable income in the medium and long term.

The findings provide relevant information for decision-making in public policy and productive planning. The design of accessible financing schemes that promote an agricultural credit culture is recommended, along with support programs for technological upgrading and financial education strategies that enable producers and investors to make informed decisions regarding costs, revenues, and risks. Complementarily, integrating market studies would improve production planning and price control, thereby reducing vulnerability to volatility. These actions would not only consolidate the economic viability of pitahaya cultivation but also strengthen regional agricultural diversification and producers' economic security.

ACKNOWLEDGEMENTS

First and foremost, I am deeply grateful to the producers from the State of Mexico and the Mixteca region of Puebla for their generous support during the interviews and throughout the development of this research. I also thank my advisory committee for their valuable contributions. Likewise, I acknowledge the Universidad Autónoma Chapingo and SECIHTI for providing high-quality academic training and the financial support that made this work possible.

REFERENCES

Ortega-Hernández, A., León Andrade, M., & Rosas Vargas, R. (2015). Producción de pitahaya para promover el desarrollo regional y sustentable. https://ru.iiec.unam.mx/4299/1/2-Vol3_Parte1_Eje5_Cap2-123-Ortega-Leon-Rosas.pdf

Ricalde, M. F., & Andrade, J. L. (2009). La pitahaya, una delicia tropical. *Ciencia, 60*(3), 36-42. https://www.amc.edu.mx/revistaciencia/images/revista/60_3/PDF/05-488-La-pitahaya.pdf

SIAP. (2023). Producción agrícola por cultivo. Secretaría de Agricultura y Desarrollo Rural.

Wu, J.C.S. (2005). Manual del cultivo de la pitaya. Instituto de Ciencia y Tecnología Agrícola (ICTA). MAGA. Mision de Taiwan.

Montesinos-Cruz, J. A., Rodríguez-Larramendi, L., Ortiz-Pérez, R., Fonseca-Flores, M. D. L. Á., Ruíz-Herrera, G., & Guevara-Hernández, F. (2015). Pitahaya (*Hylocereus* spp.) Un recurso fitogenético con historia y futuro para el trópico seco mexicano. *Cultivos Tropicales, 36*(),67-76. https://www.redalyc.org/articulo.oa?id=193243640007

Tel-Zur, N. (2015). Research and development of pitahayas dragonfruit - vine cacti: limitations and challenges and the current global market. *Acta Hortic*. 1067, 365-370. https://doi.org/10.17660/ActaHortic.2015.1067.50

Chen, N. J., & Paull, R. E. (2019). Overall dragon fruit production and global marketing. FFTC Agricultural Policy Platform. https://ap.fftc.org.tw/article/1596

Mercado-Silva, E.M. (2018). Pitaya—*Hylocereus undatus* (Haw). Exotic Fruits, *Academic Press*, p 339-349, https://doi.org/10.1016/B978-0-12-803138-4.00045-9.

Ministerio de Desarrollo Agrario y Riego (MIDAGRI). (2021). Análisis de mercado: Pitahaya 2015-2020. *Sierra y Selva Exportadora*. 51 p.

Wakchaure, G.C., Kumar, S., Meena, K.K., Rane, J., & Pathak, H. (2020). Dragon Fruit Cultivation in India: Scope, Marketing, Constraints and Policy Issues. Technical Bulletin No. 46. ICAR-National Institute of Abiotic Stress Management, Baramati, Pune, Maharashtra, India, p. 54. https://www.researchgate.net/publication/348844675_Dragon_Fruit_Cultivation_in_India_Scope_Marketing_Constraints_and_Policy_Issues

Farez-Jaramillo, H. A., Mitiap-Vargas, D. L., Cambisaca-Ortiz, C. E., & López-Jara, A. A. (2025). Impacto del Sistema de Costeo por Procesos en la Rentabilidad de la Producción de Pitahaya en Palora, Morona Santiago. Pacha. *Revista De Estudios Contemporáneos Del Sur Global, 6*(17), e250360. https://doi.org/10.46652/pacha.v6i17.360

Mehta, A. , Lamichhane, P. , Khatiwada, R. , Mandal, A. , Chaudhary, P. K., & Aryal, S. (2024). Dragon Fruit Cultivation, Profitability, and Production Efficiency in Southern Terai, Nepal. *International Journal of Horticultural Science and Technology, 11*(4), 469-480. https://doi.org/10.22059/ijhst.2024.366181.703

Sharma, S. C., Mittal, R., Sharma, A., & Verma, V. (2021). Dragon fruit: A promising crop with a growing food market that can provide profitable returns to farmers. *Int. J. Agric. Sci. Res.*, 11, 1-14.

Kikon, P., Kashyap, D., Choudhury, J., Devi, H., & Rameshori, R. (2021). Investment feasibility analysis of dragon fruit farming. *International Journal of Agricultural Sciences*. 17. 265-270. https://doi.org/10.15740/HAS/IJAS/17.2/265-270

Michel-Lara, R.S., Mancilla-Villa, O. R., Preciado-Ortiz, C., & Jardel-Peláez, E. J. (2022). Indicadores de rentabilidad en la producción y comercialización de pitaya en Huisichi, Tolimán, Jalisco. *Idesia (Arica), 40*(4), 125-135. https://dx.doi.org/10.4067/S0718-34292022000400125

Ku-Caamal, E. A. 2019. Evaluación técnico-financiero de producción de pitahaya (*Hylocereus undatus*) en la localidad Chunchintok, Hopelchen, Campeche. Chapingo, Edo. de México.

Trejo-López, M. P. (2012). Evaluar las posibilidades de inversión en una red de valor de pitahaya (*Hylocereus undatus*) como alimento funcional. Colegio de postgraduados, México.

Flores-Miranda, L. (2011). Indicadores de rentabilidad en la producción de pitahaya (*Hylocereus undatus*) en San Juan Ixcaquixtla, Puebla. Colegio de Postgraduados, México.

Méndez-Ku, P. 2003. Evaluación financiera de producción de pitahaya (*Hylocereus undatus*) orgánica en Sihochac, Champotón, Campeche. Universidad Autónoma Chapingo, México.

Amaya-Pérez, D. B., Martínez-Damián, M. Ángel, & Sangerman-Jarquín, D. M. . (2025). Análisis de paquetes tecnológicos para la producción de maíz en el Estado de México. *Revista Mexicana De Ciencias Agrícolas, 16*(4), e3583. https://doi.org/10.29312/remexca.v16i4.3583

Rebollar-Rebollar, S., Ramírez-Abarca, O., & Hernández-Martínez, J. (2022). Competitiveness and value added in Persian cucumber (*Cucumis sativus* L.) in contract farming: case study. *Revista Terra Latinoamericana*, 40. https://doi.org/10.28940/terra.v40i0.952

Morales-Hernandez, J. L., González-Razo, F. d. J., & Hernandez-Martinez, J. (2018). Análisis de rentabilidad del cultivo de jitomate bajo invernadero en San Simón de Guerrero, Estado de México. Universidad Autónoma del Estado de México.

FIRA. (s. f.). Instructivo para la Evaluación Técnico-Financiera Cuantitativa Tradicional del Procedimiento de Evaluación de FIRA – Banco de México.

Banco Interamericano de Desarrollo (BID). (2019). Evaluación de proyectos de inversión: Guía práctica para América Latina y el Caribe. Washington, D.C.: BID. https://publications.iadb.org/es

Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO). (2015). Manual para la evaluación de proyectos de inversión agrícola y rural. Roma: FAO. http://www.fao.org/documents

Osuna-Enciso, T., Valdez-Torres, J. B., Sañudo-Barajas, J. A., Muy-Rangel, M. D., Hernández-Verdugo, S., Villarreal-Romero, M., & Osuna-Rodríguez, J. M. (2016). Fenología reproductiva, rendimiento y calidad del fruto de pitahaya (*Hylocereus undatus* (How.) Britton and Rose) en el valle de Culiacán, Sinaloa, México. *Agrociencia, 50*(1), 61-78. Recuperado en 04 de abril de 2025, de http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-31952016000100061&lng=es&tlng=es.

SIAP. (2024). Producción agrícola por municipios. Secretaría de Agricultura y Desarrollo Rural.

López-Chávez, A., Alvarado-Raya, H.E., Estrada-Chavira, M.E., Altamirano-Cárdenas. J. 2019. Diseño y evaluación tecnico-financiera de módulos productivos de pitahaya adaptables en el estado de Guanajuato. Chapingo, México.

Carrillo-Martínez, C. J., Álvarez-Fuentes, G., Aguilar-Benítez, G., García-López, J. C., & Contreras-Servín, C. (2019). Rentabilidad de la producción de frijol (*Phaseolus vulgaris* L.), maíz (*Zea mays* L.) y chile (*Capsicum annuum*) en el municipio de Morelos, Zacatecas. *Acta universitaria,* 29, e1984. Epub 01 de diciembre de 2019.https://doi.org/10.15174/au.2019.1984

Instituto de Investigación y Capacitación Agropecuaria, Acuícola y Forestal (ICAMEX).2024. cultivo de frijol. Gobiernos de México. https://icamex.edomex.gob.mx/frijol

Secretaría de Hacienda y Crédito Público (SHCP). (2024). Ley del Impuesto sobre la Renta (LISR). Diario Oficial de la Federación. https://www.dof.gob.mx

Sotelo-Ruiz, E. D., Ortiz Trejo, C., & Rizo-arellano, M.I. (2006). Áreas potenciales para el cultivo de pitahaya (*Hylocereus undatus* (haw.) britt. & rose) en el sur del Estado de México. *Revista Mexicana de Ciencias Forestales, 30*(98), 11. https://cienciasforestales.inifap.gob.mx/index.php/forestales/article/view/850/2125