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Protocol status: Working
 We use this protocol and it's working

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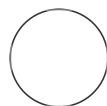
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Methodology for Inputs-Oriented VRS DEA in dairy farms

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ABSTRACT

The methodology protocol for Inputs-Oriented VRS DEA in dairy farms describes the steps and procedures for data collection with the verbal consent of the producers according to the declaration included in the questionnaire, based on the producers' academic relationship of 50 years. at the Mexico Postgraduate College. In the same way, the software and the method used in the investigation are described.

GUIDELINES

For this protocol, we adhere to the international regulations of COPE guidelines relating to ethical oversight.

MATERIALS

The materials used in this type of socioeconomic protocol are of an operational and administrative nature, such as:

- a) questionnaire
- b) DEAP 2.0 software
- c) SSPSS
- d) Mobilization and food resources
- c) Computer resources

SAFETY WARNINGS



The use of the same database was used for different purposes in both studies according to the DEA and SFA approaches, which implies a different ordering and processing of data according to the objectives pursued in each type of investigation.

ETHICS STATEMENT

We declare that no animals were used experimentally in the research, however, we

Keywords: Slack, Technical Efficiency, Scale Efficiency, Peers, Lambda

point out that the same database of the first article entitled Frontier Model of the Environmental Inefficiency Effects on Livestock Bioeconomy was used, in such a way that this protocol explains the procedures for the Complementary research to measure technical efficiency. For these reasons, we do not require an ethics statement. However, this research is known to the ethics committee of the Colegio de Postgraduados de México.

Regarding the declaration of ethics and consent elements that contribute

Variable	Published Article 128071	Submission 132421
Methods or approach	Stochastic Frontier Analysis SFA	Data Envelopment Analysis DEA
Software	The FRONTIER (RRID:SCR_022958) Version 4.1 computer program	DEAP 2.0 (RRID:SCR_023002)
Description step by step methodology	The full protocol can be found on protocols.io.	
Available data	Figshare: DataSFA.csv. figshare. Dataset. https://doi.org/10.6084/m9.figshare.21434343.v2 (Zúniga-González & Jaramillo-Villanueva, 2022).	Figshare: DataforDEA.csv. figshare. Journal contribution. https://doi.org/10.6084/m9.figshare.21836133.v1 (Zuniga-Gonzalez & Jaramillo-Villanueva, 2023)

Variable considered, the order in the each approach is different	<p>(TVAi) represents the total annual sale of products obtained on the farm, such as the amount of milk produced per cow per year and by secondary products. The unit of measure is in dollars. (CIGij) represents the annual value of the investment quantified in dollars. (CTij) represents the total annual cost for fuel, feeding, reproduction, illness and treatment, milking, mortality, and preventive medicine, measured in annual dollars. (MOij) represents the annual cost of family and hired labor, measured in dollars. (SG) surface destined for livestock (Ha) (NDij) represents the number of dependents measured in people. (EPij) represents the age of the producer measured in years of age. (NEPij) represents educational level of the producer. (CAEij) represents the amount of water used per animal unit, measured in liters. (CH4ij) represents greenhouse gas emission of methane from enteric fermentation measured in Gg CH4/year.</p>	<p>Output (TVAi) signifies the total annual sale of products obtained on the farm, such as the amount of milk produced per cow per year and by secondary products. The unit of measure is in dollars [42]. Input 1 (CIGij) Signifies the annual value of the cattle investment quantified in dollars. Input 2 (CTij) Signifies the total annual cost for fuel, feeding, reproduction, illness and treatment, milking, mortality, and preventive medicine, measured in annual dollars [42]. Input 3 (MOij) Signifies the annual cost of family and hired labor, measured in dollars.</p>
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Objective or purpose	Focused on measuring environmental inefficiency in Mexican dairy farms, considering climate change variables related to the emission of greenhouse gases (GHG) and planetary geomagnetic activity.	The efficiency of Mexico's dairy farms within its four regions of Tlaxcala Stated.
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BEFORE START INSTRUCTIONS

Before starting the investigation, the available database and considered in the publication of previous articles were considered, and the methodological procedures and the reorganization of the data were reviewed according to the selected approaches and tools.

Protocol for the collection and processing of data with the ...

- 1 The data collection procedure was as follows: a) identification of the regions of the republic with the highest volume of milk production. A questionnaire was designed to collect information from the selected producers. During the visit to each producer, the following statement was read: The Campus Puebla Postgraduate College is a recognized institution in teaching and research to serve the agri-food needs of society in a context of sustainable development. My name is (pollster) and On this occasion, a study is being carried out regarding economic and environmental sustainability in the production of bovine cattle in the Tlaxcala region, the objective of the interview is to carry out an analysis of the economic factors, and technical productive, environmental and social, which determine the operation of the production system with the purpose to identify opportunities to improve economic efficiency, productivity, profitability, and competitiveness sustainable activity. The information you provide will remain strictly confidential. The data will not be used in no case individually, but the results of this investigation will always be published jointly by all respondents. I thank you in advance for your kind attention and the time to answer this interview. Thank you
- 2 b) identification of the production units in the investigated regions,
- 3 c) Communication to producers of the objective, communities randomly selected, and

- 4 d) preparation and application of questionnaires
- 5 e) analysis of the received data, organizing with the approach DEA. The sample number N was 102 dairy farms in six communities across the state of Tlaxcala. The production units selected were randomly, and distributed among the four regions of the state of Tlaxcala that are important for milk production. The questionnaires include technical, commercial, and economic information.
- 6 For this data is very important to consider that The state of Tlaxcala is a region where the Colegio de Postgraduados in Ciencias Agrícolas has carried out agricultural research and extension work for 50 years. Researchers have a cooperative working relationship with producers, research, extension, and training activities are carried out every year. The milk production profitability and efficiency project were carried out in order to update technological practices and production costs to calculate production profitability. A survey was carried out, carried out by postgraduate students, previously trained, who regularly participate in agricultural and livestock training actions in Tlaxcala. The interviewer visited each of the randomly selected producers in the production unit, verbally explained the objective of the interview, which is noted in the header of the questionnaire.
- 7 The Envelope Data Analysis (DEA) applied to the variable returns to a scale model (VRS) for the year 2020. Also, the results reveal that Tlaxcala's dairy farm efficiency, on the other hand, was adversely influenced by three inputs (costs): cost of investment in livestock, the full yearly fetched for nourishing, propagation, illnesses and medicines, preventive pharmaceutical, sanitation, draining, fuel, and total labor. The parameters were estimated using the [IBM SPSS Statistics](#) (RRID:SCR_016479) v.22 programs and the software program DEAP 2.0 (RRID:SCR_023002). Data Development Analysis running DEAP 2.0, implies organizing the information in figures and tables according to the purpose of the research.