Revista Mexicana de Ciencias Agrícolas

DOI: https://doi.org/10.29312/remexca.v16i2.3541

Article

Socioeconomic and productive characterization of native bean producers in Guerrero

Mariana Espinosa-Rodríguez[1]
Juan Elías Sabino-López[1,§]
Oscar Martín Antúnez-Ocampo[2]
Rafael Pérez-Pacheco[3]
María de los Ángeles Maldonado-Peralta[4]

1 Facultad de Ciencias Agropecuarias y Ambientales-Universidad Autónoma de Guerrero. Periférico poniente s/n, Col. Villa de Guadalupe, Iguala de la independencia, Guerrero. CP. 40040. (maresprodriguez@gmail.com).

2 Campo Experimental Iguala-INIFAP. Carretera Iguala-Tuxpan km 2.5, Tuxpan, Iguala de la Independencia, Guerrero. CP. 4000. (antunez.oscar@inifap.gob.mx). antunez.oscar@inifap.gob.mx

3 Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional-Unidad Oaxaca. Hornos Núm. 1003, Col. Noche Buena, Santa Cruz Xoxocotlán, Oaxaca. CP. 71230. (rafaelperezpacheco@yahoo.com.mx).

4 Facultad de Medicina Veterinaria y Zootecnia Núm. 2-Universidad Autónoma de Guerrero. Carretera federal Acapulco-Pinotepa Nacional 131, San Francisco, Cuajinicuilapa, Guerrero. CP. 41949. (mmaldonado@uagro.mx).

Autor para correspondencia: juanelias-sab@hotmail.com

Abstract

Beans (*Phaseolus vulgaris* L.) are important in the Mexican diet; they are grown in all regions of Mexico in 1 690 000 ha, with a production of 1 289 000 t and per capita consumption of 11 kg. Guerrero is the sixth largest bean producing state nationwide with 27 014 producers and a production of 11 155 t. The objective was the socioeconomic and productive characterization of native bean producers from nine localities in three regions of Guerrero, Mexico. An interview with questions about social, economic, and production variables was applied to 117 bean producers from nine communities in three regions (North, Central, and Mountain) of Guerrero, Mexico. A cluster analysis was applied to the data collected, using factor analysis for the selection of variables and defining the hierarchical cluster with Ward's method and the Euclidean distance, resulting in seven groups of producers. Sixty-three point two percent of producers are men, 62.4% have an elementary level of education, 17% speak an indigenous language, the average age was 48 years, and 59.8% use family labor for bean cultivation. Agriculture is their main economic activity, with 22 years of experience in this crop, planted on 0.8 ha with an average yield of 250 kg ha^{-1}. The results contribute to identifying the problems regarding the production process, postharvest management, and sales, as well as the actors that limit bean productivity, putting at risk its long-term conservation in some communities of Guerrero, Mexico.

Keywords:

commercialization, communities, conservation, production..

DOI: https://doi.org/10.29312/remexca.v16i2.3541

Introduction

Crops are essential in rural areas because of their contribution to food, environmental conservation, the local economy, and the social linkage of communities to promote their sustainable development (Ayala and García, 2009). Among these crops are beans (*Phaseolus vulgaris* L.) as they are a source of proteins, carbohydrates, copper, nickel, manganese, nitrogen, phosphorus, calcium, iron, fiber, folic acid, thiamine, magnesium, potassium and zinc (USDA, 2000).

In the world, beans are one of the most important foods for human consumption, with a growth rate in production of 3.3% (2012-2018); India is the world's leading producer with 17.3% (4.9 million tons), followed by Myanmar (16%, with 4.6 million tons), and Mexico ranks seventh with 4% (1.2 million tons) (FAO, 2017).

The average world yield of beans is 1.5 t ha^{-1}, with the United States of America, China, Myanmar, and Ethiopia standing out with the highest yields (2, 1.7, 1.6, and 1.6 t ha^{-1}, respectively), whereas in Mexico, the yield is lower (0.7 t ha^{-1}). In 2017, global annual consumption was 3.6 kg per person and in Mexico, the consumption of this legume was higher in 2021 (11 kg per person) as it is basic in the Mexican diet, mainly in rural areas (CEDRSSA, 2020).

In Mexico, bean production is insufficient since it imports 10.8% of total consumption and 70% of bean production in Mexico comes from small and medium-sized producers, who grow around 20 improved varieties and 50 landrace varieties, with the highest production in the spring-summer cycle due to the fact that 86% of the area cultivated with this species is rainfed (SIAP, 2022).

At the national level, Guerrero ranks sixth with 11 155 tonnes of beans per year in 15 421 ha (SIAP, 2017). Production units are heterogeneous systems defined by agroecological, economic, social, and productive aspects of each producer, associated with problems in their crops, the supply of inputs, sales, credit and financing, market information, high transaction costs, communication routes, lack of productive infrastructure and storage systems, lack of technical assistance and phytosanitary support (Ayala *et al*., 2011; INIFAP, 2015; CEDRSSA, 2020); in addition, the continuity of the agricultural cycle has been affected by problems of liquidity, transportation, and lower demand as a result of the Covid-19 pandemic (Salazar *et al*., 2021).

In this context, it is necessary to have an in-depth knowledge of the needs and resources of producers in order to implement comprehensive, specialized, sustainable, and socially just care policies for rural areas to guarantee food security (Altieri and Nicholls, 2013). In view of this, categorization is a tool that allows us to know the characteristics of producers through the study of economic, social, and productive variables.

This is a tool to identify common variables among producers and improve their living conditions, as has been reported in low-income corn producers in transition in Campeche (Uzcanga *et al*., 2015), with self-subsistence rainfed corn producers in Veracruz (Jaramillo *et al*., 2018), corn producers in Chiapas (Martínez *et al*., 2020), and non-specialized organic coffee producers in the conversion process in Cuetzalan, Puebla (Benitez-García *et al*., 2015).

The characterization and classification of producers shows the importance of pluriactivity as an advantage for economic development (Corona-Minjarez *et al*., 2019); that is, it analyzes the current activities under which the producers obtains their income and proposes potential activities that allow them to compensate for it. Therefore, the objective of the research was the socioeconomic and productive characterization of native bean producers from nine communities in three regions of Guerrero, Mexico.

Materials and methods

A questionnaire with social, economic, and productive variables was developed and applied to 117 bean producers in nine communities (Table 1) in the Northern, Central, and Mountain regions of Guerrero, Mexico.

DOI: https://doi.org/10.29312/remexca.v16i2.3541

Table 1. Bean-producing localities in the Northern, Central and Mountain regions of Guerrero, Mexico.

Name of the locality	Location	Num. of producers interviewed
Acatlán	NL:16° 48' 25"; WL: 98° 43' 58"; altitude: 280 m	20
Apaxtla de Castrejón	NL:18° 08' 00"; WL: 99° 56' 05"; altitude: 1182 m	20
Apipilulco	NL: 18° 11' 18"; WL: 99° 40' 22"; altitude: 583 m	7
Cocula	NL: 18° 7' 41"; WL: 99° 45' 42"; altitude: 600 m	5
Ozomatlán	NL: 17° 55' 31"; WL: 99° 20' 21"; altitude: 522 m	4
Pata de Venado	NL: 18° 26' 31"; WL: 100° 8' 20"; altitude: 1186 m	13
Quechultenango	NL: 17° 24' 40"; WL: 99° 14' 33"; altitude: 860 m	15
Tepetitlán	NL: 17° 27' 47"; WL: 99° 1' 36"; altitude: 1341 m	16
Teticic	NL: 17° 52' 2"; WL: 98° 50' 53"; altitude: 1268 m	17

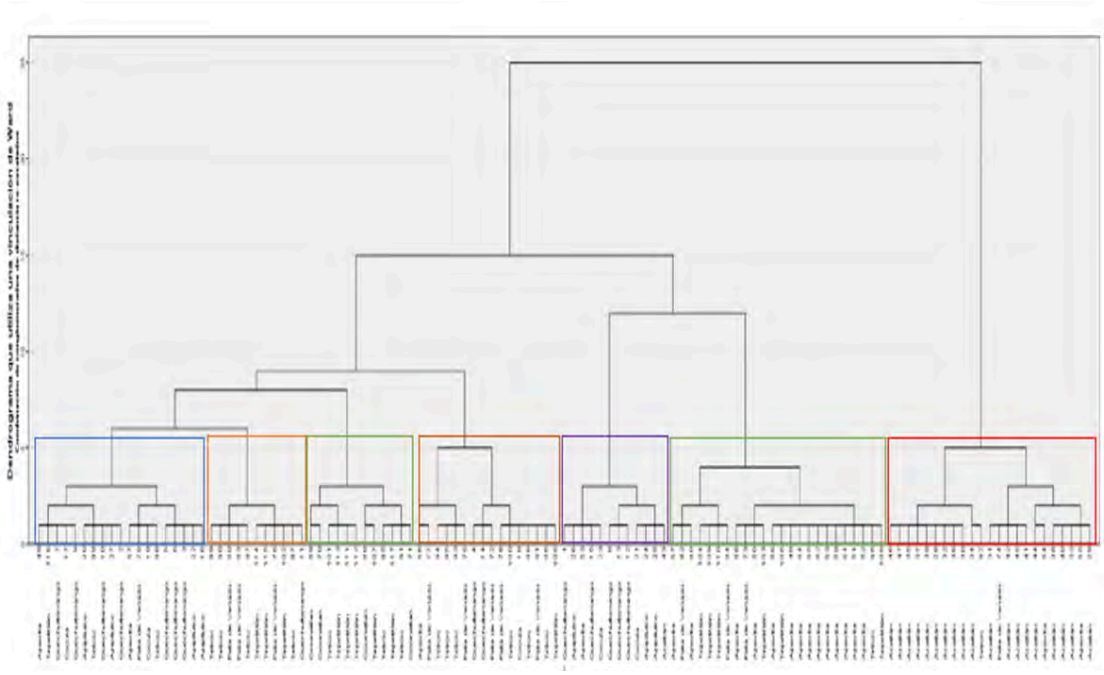
NL= north latitude; WL= west longitude.

The information was gathered in an Excel spreadsheet and a hierarchical cluster analysis was performed with the Statistical Package for the Social Sciences (SPSS) Version 21. First, the selection and reduction of variables was carried out through factor analysis by principal components.

The groups formed were validated by an analysis of variance (Anova) to verify the null hypothesis (Ho): equal means between the groups formed or the alternative hypothesis (Ha): at least one mean is different; the Ha was accepted. To indicate the proportion of variance in the variables caused by underlying factors, the Kaiser-Meyer-Olkin test was used, which mentions that when the values are close to 1.0, the groups are well formed; the value was 0.68; and Bartlett's sphericity test was highly significant (0.00), forming seven groups (Figure 1).

DOI: https://doi.org/10.29312/remexca.v16i2.3541

Figure 1. Groups of native bean producers in Guerrero, Mexico.



The variables resulting from the factor analysis for the formation of the groups were gender of the producer, indigenous language, social security, main source of labor, storage practices, and type of land (rainfed or irrigated).

Results and discussion

Tables 2, 3, and 4 show the social, economic, and productive characteristics of the interviewed producers. The age ranged from 42 to 56 years, being higher in group seven, which conditions the continuity of the crop by the acceptance of technology transfer and training or by the decrease in physical capacity for agricultural work, since 89.9% of Mexican agricultural producers are over 40 years old; that is, 44.1% are between 40 and 60 years old and 45.8% are over 60 years old (INEGI, 2019).

Table 2. Social aspects of bean producers in Guerrero, Mexico.

Variable		Group						
		1	2	3	4	5	6	7
Ages	Years	49.3	47.5	42.9	47.6	44.3	54.2	56.1
NC		4.3	4	6.7	3.3	3.5	4	4
ME	$ MXN	2500.00	2789.50	2750.00	2818.20	4087.00	2375.00	2708.30
					(%)			
SCH	No schooling	0	0	12.5	0	0	12.5	16.7
	Elementary school	25.0	84.2	50	81.8	78.3	50	58.3
	Junior high school	50	10.5	31.3	18.2	13	8.3	8.3
	High school	16.7	5.3	6.3	0	8.7	12.5	8.3
	University	8.3	0	0	0	0	16.7	8.3

DOI: https://doi.org/10.29312/remexca.v16i2.3541

Variable		Group						
		1	2	3	4	5	6	7
GEN	Man	100	100	56.3	0	52.2	66.7	50
	Woman	0	0	43	100	47.8	33.3	50
OH	Yes	100	84.2	75	90.9	95.7	100	100
	No	0	15.8	25	9.1	4.4	0	0
SIL	Yes	16.7	0	0	0	13	0	100
	No	83.3	100	100	100	87	100	0
AHS	Yes	50	52.6	87.5	18.2	13.1	70.8	58.3
	No	50	47.4	12.5	81.8	87	29.2	41.7
SG	Yes	75	63.2	43.8	63.6	26.1	58.3	75
	No	25	36.8	56.3	36.4	73.9	41.7	25

SCH= schooling; NC= number of children, ME= monthly expenses; OH= own home; GEN= gender; SIL= speaker of indigenous language; AHS= access to health services; SG= they receive support from state-federal government programs.

Table 3. Economic aspects of bean producers in Guerrero, Mexico.

Variable	Category or unit	Group						
		1	2	3	4	5	6	7
Crop association (%)	Yes	66.7	52.6	37.5	81.8	8.7	29.2	16.7
	No	33.3	47.4	62.5	18.2	91.3	70.8	83.3
Land tenure (%)	Private	25	15.8	18.8	36.4	91.3	37.5	0
	Ejido	58.3	26.3	25	9.1	0	0	0
	Rented	16.7	52.6	50	54.6	8.7	37.5	25
	Communal	0	5.3	6.3	0	0	25	75
AFB	(ha)	1.3	0.8	0.5	0.6	0.7	0.5	1.3
Yield	(kg ha^{-1})	386.7	268.7	165.9	129.1	149.1	214.8	185.4

Table 4. Productive aspects of bean producers in Guerrero, Mexico.

Variable	Category or unit	Group						
		1	2	3	4	5	6	7
Crop association (%)	Yes	66.7	52.6	37.5	81.8	8.7	29.2	16.7
	No	33.3	47.4	62.5	18.2	91.3	70.8	83.3
Land tenure (%)	Private Ejido Rented Communal	25 58.3 16.7 0	15.8 26.3 52.6 5.3	18.8 25 50 6.3	36.4 9.1 54.6 0	91.3 0 8.7 0	37.5 0 37.5 25	0 0 25 75
AFB	(ha)	1.3	0.8	0.5	0.6	0.7	0.5	1.3
Yield	(kg ha^{-1})	386.7	268.7	165.9	129.1	149.1	214.8	185.4

AFB= area allocated for sowing beans.

In addition to the above, except for group five (13 years), producers mentioned more than 20 years of experience in bean cultivation, similar to producers in northern Mexico, where 65.2% have 20 to 60 years of experience in this crop (Borja *et al*., 2021). Group five is the only one that receives little government support (26.1%) and uses less family labor (30.4%), resorting to daily workers (69.6%) and in 2022, it had the lowest sales price per kg ($23.82) despite the fact that 95.7% of producers set it.

DOI: https://doi.org/10.29312/remexca.v16i2.3541

In terms of schooling, groups one, six and seven were made up of producers with a university level of education and elementary education predominated in the rest; in contrast, 47.8% of bean producers in northern Mexico have university studies, which is a determining factor in the adoption of technologies, which favors the reduction of poverty (Ordaz, 2009; Borja *et al*., 2021) by influencing income; in this sense, the average monthly income of producers is $2 000.00, with higher monthly expenses ($2 861.13 on average), they compensate for this deficit with complementary economic activities (Pérez and Galindo, 2003).

In six groups, men (70.9%) stood out in the cultivation of this legume and women did so in group four, a result of the migration of men in search for work (Rojas, 2017); in Mexico, 17% of the responsible for production units are women and 83% men (ENA, 2019); nevertheless, INEGI (2020) reported 1% participation of women in the field. All groups use family labor, mainly groups three (93.8%) and six (95.8%), while groups one and five hire more daily workers, with salaries ranging from $185.00 (group seven) to $227.08 (group six) per day; the participation of family relatives in this crop varies from 1 (partner) to 13 (children, cousins, and nephews), which decreases the cost of labor (Pérez and Galindo, 2003).

Other sources of labor in groups one, two, three, four, and seven are mutual help between producers or unpaid family members, which implies reciprocity in work with mutual benefit of the participants. With respect to indigenous language-speaking producers, groups two, three, and four speak Nahuatl, which can represent an obstacle to technology transfer (ENA, 2019).

Ninety-two point three percent of the producers have their own home, guaranteeing their patrimonial security and their focus on working to cover basic needs. They have an average of 4.3 children, higher than the national average (2.2 children) (INEGI, 2020). Fifty percent of them have basic health services, except for groups four and five, who are limited to this service due to a lack of quality and inclusive public health policies, coupled with a lack of hospitals, qualified personnel, and basic equipment (Amaro, 2010).

Group five receives less support from government programs, 57.9% of producers benefit from programs such as fertilizer supply, production for well-being, and sowing life. In the same context, 57.4% of the producers interviewed prefer in-kind support (inputs), 17.8% in cash, and 24.8% choose training and assistance, although cash support achieves a greater impact and increases household income (Davis, 2004).

Nonetheless, it is important to encourage producers to increase production and sown area (Guzmán *et al*., 2019). When producers have problems in their crops, they turn to another producer (47%), suppliers (37.6%) of inputs, technicians (13.7%), and agricultural research or education centers (1.7%). However, group six (91.7%) solve problems of their crop from producer to producer; on the other hand, group five (91.3%) consult their input supplier.

The main economic activity (88.9%) of bean producers is agriculture, complemented by livestock farming, domestic work, daily wages, sale of firewood, commerce, making and sale of handicrafts. Bean production is for self-consumption and sale (93.2%) in local markets (FAO, 2003); in Mexico, 75% of the production units use their products for self-consumption without or with minimal link to the market (FIRA, 2015).

Thirty point eight percent of the land used for this crop is ejido due to the fact that the territory of Guerrero exceeds 1 000 ejidos and about 200 agrarian communities (Gobierno del estado de Guerrero, 2016); nevertheless, all groups also rent the land (33.3%), with annual payments of $1 200.00 to $8 000.00 ha^{-1} in cash or in kind, as agreed; a similar situation is found with bean producers in Zacatecas, where 72.7% are ejidatarios and 4% tenants, whose form of organization is mediero or terciador, which consists of an agreement between the ejidatario or owner of the land with a producer, sharing the costs of production after the harvest, the tenant receives half (mediero) of the harvest or, where applicable, a third of it (terciador) (Pérez y Galindo, 2003).

Producers (64.1%) have pack animals, vehicles, carts, and some agricultural machinery for the cultivation tasks of bean and others; ENA (2019) mentioned that 60.2% of agricultural producers use hoes, 25.3% use pack animals, 29.2% and 15.1% use seeder and harvester, respectively.

DOI: https://doi.org/10.29312/remexca.v16i2.3541

The lands used for beans are rainfed (76.9%) and irrigated (16.2%), concentrated in groups one to four, and 6.9% are rainfed and irrigated, exclusive to group one; in Mexico, 79% of the agricultural area is rainfed (ENA, 2019) and 76.1% of this area is used for beans (INIFAP, 2015a).

The largest cultivated area of beans is 1.3 ha per producer in groups one and seven, respectively, an area lower than that of producers in Zacatecas, with 17.9 ha for this crop per producer (Pérez and Galindo, 2003). The average yield in the communities of Guerrero is 0.2 t ha^{-1}, a value far from the regional (0.8 t ha^{-1}) (INIFAP, 2015b), national (0.7 t ha^{-1}) and world averages (1.5 t ha^{-1}) (CEDRSSA, 2020).

Producers (89%) sow one cycle of beans per year, with landrace, American, black, May flower, costeño, montañero, chaparro, matón, cane, jamapa, apalete, Peruvian, Chinese, climbing, and white varieties, with black beans predominating (38.5%) due to their higher consumption (CEDRSSA, 2020); 82.9% use seeds from the previous harvest; in Mexico, it represents 7% of production, allowing the conservation of native seeds; they are sown by broadcasting, staggering, 2-3 seeds per hole, or at a steady flow, with 10 000 to 18 000 plants ha^{-1} depending on the variety; 150 000 plants ha^{-1} are suggested for black beans and from 80 000 to 90 000 plants ha^{-1} for pinto, sulfur, and May flower (INIFAP, 2015b). This species is sown in association (37.6%) with corn, corn-squash, chili, tomato, roselle or in rotation with corn, watermelon and peanuts; the bean crop is fertilized with sources of chemical synthesis but with inadequate doses and in an excessive manner (INIFAP, 2021), whereas 48.7% apply livestock manure or leave the residues of the previous harvest in the field and incorporate them when preparing the land for sowing.

ENA (2019) mentions that 67.4% of producers use chemical fertilizers and 24.4% use natural fertilizers in their crops, using 1 to 2 t of manure and compost (INIFAP, 2015a). In the present study, 12.8% of the interviewees fertilize during sowing, 71.8% in the vegetative stage, 6% in flowering, and the rest in other stages. Sixty-nine point two percent fertilize twice during the cycle, 23% once and the rest (7.8%) three times; Osuna *et al*. (2013) suggests fertilization before flowering and pod filling. Seventy point nine percent of the producers fertilize the soil, 12% the leaves and the rest both, without considering the requirements of the crop, contributions from the soil and the fertilizer sources used, climatic conditions, variety and management (INIFAP, 2021).

Another problem of the bean crops in the studied communities of Guerrero is damage by pests, mainly by whitefly (*Bemisia tabaci*) (71.8%), the rest is caused by red spider mites (*Tetranychus urticae*), grasshopper (*Brachystola magna*), Mexican bean beetle (*Epilachna varivestis*), and aphid (*Aphis fabae*); the diseases that stand out are wilt (*Fusarium* sp., *Rhizoctonia* sp., *Pythium* sp.), black spot and blight (*Phytophthora* sp.), among others. For their control, 47.3% of the producers apply chemical synthesis products monthly (group six), 38.7% weekly, 7% biweekly and the rest do not apply; for its part, weed control is manual (Pérez and Galindo, 2003).

The harvesting and shelling of beans is also manual and 95.7% of the producers store them in ixtle sacks, tanks, and plastic bags for subsequent selling (62.3%), self-consumption (28.2%), or storage (9.5%); however, their storage in airtight plastic boxes is suggested due to their durability and easy cleaning (FAO, 2003); nevertheless, their acquisition depends on the producer's economy. The beans are stored for periods of one week to one year, 61.5% of producers add aluminum phosphide to control pests, such as the weevil (*Acanthoscelides obtectus*), and others place ash, lime, and dry epazote to avoid losses (1 to 8 kg) since pests in storage can cause losses of 20% (INIFAP, 2015a).

Beans are sold in bulk at the producer's home and in regional markets, with local measures, per L (19.5%), almud (3.8%), cuartillo (12.1%), kg (14.6%), and maquila (50%), at different prices: one L from $18.00 to $40.00, one kg from $35.00 to $45.00, one cuartillo from $25.00 to $80.00, one almud from $200.00 to $250.00, and one maquila from $100.00 to $150.00, prices that are generally set by the producer (74.4%); nonetheless, these do not reflect all the implicit costs from production to the final consumer.

In addition, consumers increasingly demand more marketing services according to their needs, causing less participation of the producer and more intermediaries in the price (Santillán *et al*., 2019); the lack of competitiveness of the producers in the price affects their food self-sufficiency

DOI: https://doi.org/10.29312/remexca.v16i2.3541

(SIAP, 2019); in addition, the growth of imports (10.1%) also impacts the price, which decreased by 4.9% from 2017 to 2018, from $13 484.20 to $12 264.50 t^{-1} (CEDRSSA, 2020); of these imports, 81.1% corresponds to black beans (FIRA, 2015), causing a conflict between the prices of what is produced and what is imported, especially in the months (April and May) of greater entry of beans into the domestic market (SIAP, 2019).

The problems that bean crops also face are climate (CEDRSSA, 2020; INIFAP, 2015), lack of technological packages according to the characteristics of the communities, high production costs, especially in inputs (fertilizers, agrochemicals, etc.), sales (low sales price, deficiencies in storage, and marketing channels, etc.) (INIFAP, 2015b), lack of financing, security, training, technology transfer, and timely support from the government (Ayala *et al*., 2011).

ENA (2019) indicated that, in Mexico, 73.8% of the production units reported high costs in inputs and services and 33.1% difficulties in selling due to low prices of the product, whereas 8.4% of the production units had access to financing, with government support of $2 000.00 MXN in 2021 for small-scale grain producers (less than 5 ha of rainfed land), insufficient to cover production costs per ha of beans, with an average investment of $5 041.66 MXN ha^{-1}, similar to what was reported ($6 600.00 MXN ha^{-1}) for bean crops in Chihuahua (INIFAP, 2015a).

Conclusions

The bean producers in the communities of Guerrero, Mexico, studied showed heterogeneity in productive, social, and economic aspects, which causes a low productivity and competitiveness in the local and national market of this legume. However, they presented similarities in age, monthly expenses, schooling, and years of experience in this crop. In the bean production process, there is a predominance of family labor and the cultivation of local varieties on rainfed land, with low yields compared to the national average.

The identification of problems in the bean production system in the studied communities of Guerrero, Mexico, suggests the creation of public policies to support the entire production chain of this legume, from assistance and training in the productive aspects, postharvest and storage, to selling. Services and support from the government and agricultural organizations are also needed to ensure the food sovereignty of this basic grain in the diet of the Mexican population.

Bibliography

1 Altieri, M. y Nicholls, C. 2013. Agroecología: única esperanza para la soberanía alimentaria y la resiliencia. Socioecológica. 7(2):65-83.

2 Amaro, C. A. R. 2010. Diagnóstico en materia de salud pública en el estado de Guerrero. Encrucijada Revista electrónica del centro de estudio de administración pública. Universidad Nacional Autónoma de México (UNAM). Quinto número. 1-13 pp.

3 Ayala, D. A. y García, R. 2009. Contribuciones metodológicas para valorar la multifuncionalidad de la agricultura campesina en la Meseta Purépecha. Economía, Sociedad y Territorio. 31(4):759-801.

4 Ayala, G. A. V.; Schwentesius, R. R. y Gómez, C. M. A. 2011. Liberalización comercial del sector agropecuario de México: Competitividad del frijol. Revista Globalización, Competitividad y Gobernabilidad. Portal Universia S.A. 5(1):54-84.

5 Benítez-García, E.; Jaramillo-Villanueva, J. L.; Escobedo-Garrido, S. y Mora-Flores, S. 2015. Caracterización de la producción y del comercio de café en el Municipio de Cuetzalan, Puebla. Agricultura, Sociedad y Desarrollo. 12(2):181-198.

6 Borja, B. M.; Arellano, A. S.; Sánchez, T. B. I. y García H. R. V. 2021. El cultivo del frijol presente y futuro para México. Sistemas de producción de frijol en temporal en el centro norte de México: diferencias tecnológicas y económicas. Instituto Nacional de

DOI: https://doi.org/10.29312/remexca.v16i2.3541

Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP). Libro técnico núm. 1. 101-114 pp.

7 CEDRSSA. 2020. Centro de Estudios para el Desarrollo Rural Sustentable y la Soberanía Alimentaria. Mercado del frijol, situación y prospectiva. Palacio Legislativo de San Lázaro. México. 1-18 pp.

8 Coronado-Minjarez. M. A.; Figueroa-Rodríguez, K. A.; Figueroa-Sandoval, B.; García-Herrera, E. J. y Ramírez-López, A. 2019. Caracterización y clasificación de los productores del Altiplano Oeste Potosino, México: una propuesta de tipología multidimensional. Agricultura Sociedad y Desarrollo. 16:373-397.

9 Davis, B. 2004. Instrumentos políticos innovadores y evaluación en el desarrollo agrícola y rural en América Latina y el Caribe. Temas actuales y emergentes para el análisis económico y la investigación de políticas (CUREMIS II). 1-17 pp.

10 ENA. 2019. Encuesta Nacional Agropecuaria. Instituto Nacional de Estadística y Geografía. https://www.inegi.org.mx/contenidos/programas/ena/2019/doc/rrdpenapdf.

11 FIRA. 2015. Fideicomisos Instituidos en Relación con la Agricultura. Panorama Agroalimentario. Secretaria de Hacienda y Crédito Público. México, DF.

12 FAO. 2003. Organización de las Naciones Unidas para la Agricultura y la Alimentación. Manual para la preparación y venta de frutas y hortalizas del campo al mercado. Boletín de servicios agrícolas de la FAO. 151 p.

13 FAO. 2017. Organización de las Naciones Unidas para la Agricultura y la Alimentación. Estadísticas de la producción mundial. http://www.fao.org/fishery/statistics/e.

14 Gobierno del estado de Guerrero. 2015. Programa regional Centro. Secretaría de Planeación y Desarrollo Regional. http://i.guerrero.gob.mx/uploads/2016/10/CENTRO.pdf.

15 Guzmán, S. De la, G. C.; García, S.; Rebollar, R. y Hernández, M. 2019. Análisis económico del mercado de frijol grano en México. Agronomía Mesoamericana. 30(1):131-146.

16 INIFAP. 2015. Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias. Paquete tecnológico para frijol de temporal potencial alto. Secretaría de Agricultura y Desarrollo Rural (SADER).

17 INIFAP. 2015b. Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias. El cultivo del frijol presente y futuro para México. Secretaria de Agricultura y Desarrollo Rural. Libro técnico Núm. 1. México, DF.

18 INIFAP. 2021. Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias. Variedades de frijol (*Phaseolus vulgaris* L.) del INIFAP. Secretaría de Agricultura y Desarrollo Rural. Libro técnico No. 2. México.

19 INEGI. 2019. Instituto Nacional de Estadística y Geografía. Encuesta nacional agrícola. https://www.inegi.org.mx/contenidos/saladeprensa/boletines/2020/ENA/Ena.pdf.

20 INEGI. 2020. Instituto Nacional de Estadística y Geografía. Comunicado de prensa núm. 251/22. https://www.inegi.org.mx/contenidos/saladeprensa/aproposito/2022/EAPMamas22.pdf.

21 Jaramillo, A. J. G.; Valeriano, P. O. B.; Hernández, S. J. H.; Díaz, R. R. y Espinosa, C. A. 2018. Caracterización de productores de maíz de temporal en Tierra Blanca, Veracruz. Revista Mexicana de Ciencias Agrícolas. 9(5):911-923.

22 Martínez, A. F. B.; Guevara, H. F.; La O, A. M. A.; Rodríguez, L. L. A.; Pinto, R. R. y Aguilar, J. C. E. 2020. Caracterización de productores de maíz e indicadores de sustentabilidad en Chiapas. Revista Mexicana de Ciencias Agrícolas. 11(5):1031-1042.

23 Ordaz, D. J. L. 2009. México: impacto de la educación en la pobreza rural. CEPAL-Serie Estudios y Perspectivas Núm. 105. México. 3-40 pp.

24 Osuna, C. E. S.; Reyes, M. L.; Martínez, G. M. A.; Acosta, G. J. A. y Arellano, A. S. 2013. Fertilización foliar, un complemento de bajo costo para aumentar el rendimiento de frijol.

DOI: https://doi.org/10.29312/remexca.v16i2.3541

Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP)-Campo Experimental Pabellón Aguascalientes, México. Desplegable para productores núm. 45.

25 Pérez, T. H. y Galindo, G. G. 2003. Situación socioeconómica de los productores de frijol de temporal en Zacatecas. Terra Latinoamericana. 21(1):137-147.

26 Rojas, R. T. J. 2017. Migración rural jornalera en México: la circularidad de la pobreza. Revista de Ciencias Sociales de la Universidad Iberoamericana. 7(23):1-35.

27 Salazar, L.; Schling, M.; Palacios, A. C. y Pazos, N. 2021. Retos para la agricultura familiar en el contexto del COVID-19: Seguimiento tras seis meses de crisis. Banco Interamericano de Desarrollo. 1-22 pp.

28 Santillán, J.; Oble, E. y Chauvet, M. 2019. Efectos de las políticas públicas en la conformación de organizaciones de productores de frijol en Zacatecas. Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA). Planeación Agrícola Nacional 2017-2030. Frijol Mexicano.

29 SIAP. 2017. Servicio de Información Agroalimentaria y Pesquera. Producción Agrícola. https://www.gob.mx/siap/acciones-yprogramas/produccion-agricola-33119.

30 SIAP. 2019. Servicio de Información Agroalimentaria y Pesquera. Boletín mensual. Balanza disponibilidad-consumo. Secretaría de Agricultura y Desarrollo Rural (SADER). México, DF.

31 SIAP. 2022. Servicio de Información Agroalimentaria y Pesquera. Panorama agroalimentario. Secretaría de Agricultura y Desarrollo Rural (SADER). México, DF.

32 USDA. 2000. United States Department of Agriculture. Base de datos sobre composición de alimentos. http://www.nal.usda/fnic.

33 Uzcanga, P. N. G.; Cano, G. A. J.; Medina, M. J. y Espinoza, A. J. J. 2015. Caracterización de los productores de maíz de temporal en el estado de Campeche, México. Revista Mexicana de Agronegocios. 36:1295-1305.

Revista Mexicana de Ciencias Agrícolas

DOI: https://doi.org/10.29312/remexca.v16i2.3541

Socioeconomic and productive characterization of native bean producers in Guerrero

Journal Information
Journal ID (publisher-id): remexca
Title: Revista mexicana de ciencias agrícolas
Abbreviated Title: Rev. Mex. Cienc. Agríc
ISSN (print): 2007-0934
Publisher: Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias

Article/Issue Information
Date received: 01 November 2024
Date accepted: 01 February 2025
Publication date: 13 April 2025
Publication date: Feb-Mar 2025
Volume: 16
Issue: 2
Electronic Location Identifier: e3541
DOI: 10.29312/remexca.v16i2.3541

Categories

Subject: Articles

Keywords:

Keywords:

commercialization
communities
conservation
production.

Counts

Figures: 1
Tables: 4
Equations: 0
References: 33
Pages: 0