

Full Length Research Paper

Family agriculture in mesoregions of the state of Alagoas, Brazil: Analysis from the production of rural settlements

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This study aimed to analyze food production and verify the purpose of production in rural settlements, in different mesoregions of the state of Alagoas. Semi-structured interviews were used, with 245 families from six settlements distributed in the three mesoregions: East, Agreste, and Sertão, resulting in a diversity of crops in regions with water availability, and the main crops, such as corn and beans, occurring only during the rainy season. Livestock farming stood out in semi-arid regions, and it was discovered that production is intended for sale and consumption. Livestock farming is uncommon in the eastern region, and the focus is on self-sufficiency. It is concluded that plant and animal production in the six settlements is primarily for self-sufficiency. Low productivity was prevalent in the families of the three mesoregions studied. Obstacles included edaphoclimatic conditions and the absence of public policies that allow for increased production.

Key words: Agriculture, production for self-consumption, public policy.

INTRODUCTION

Only by producing food from another living being, whether plant or animal, can the human meet his basic

needs. Growing vegetables and raising livestock are both ancient methods of obtaining food resources. As a result,

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food production strategies are required, which will serve as the foundation for the social reproduction of the entire family body, autonomy, and interrelationships with other units (Gazolla and Schneider, 2004).

Agricultural production has been the economic foundation of some countries, with family farming at the edge of this economy, responsible for an increase in Brazil's domestic economic indices and remaining as a coefficient with the support of programs and public policies, reformulating each political change introduced. In a country where monoculture is increasing due to synthetic inputs, mechanization excesses, exploitation, and natural resource scarcity, the agricultural production family has been moving the population's income (Aquino et al., 2018).

Taking into account the previously mentioned issues, the current work aimed at analyzing food production and verifying the purpose of production in rural settlements (communities) across the state of Alagoas.

MATERIALS AND METHODS

The state of Alagoas is geographically divided into three mesoregions: East (Coast and Zona da Mata), Agreste (North), and Sertão (South). It stands out economically among the mesoregions of the state of Alagoas to the east, thanks to its soil and climate characteristics, with fertile soils and average annual precipitation ranging from 1,500 to 2,200 mm, with a tropical climate, winter/autumn (Ams') to the Köppen classification. The Agreste and Sertão mesoregions have similar climates corresponding to the western half of the state, and have semi-arid conditions, with a dry and hot climate (BSh), with average annual rainfall in the Sertão between 400 and 600 mm and in the Agreste between 600 and 900 mm (Barros et al., 2018).

Two rural settlements were chosen for this work based on mesoregion: Zumbi dos Palmares and Dom Hélder Câmara (East); Santa Maria and Pau Santo (Agreste); and Genivaldo Moura and Olga Benário (Sertão).

Zumbi dos Palmares

Zumbi dos Palmares is located in the municipality of Branquinha - AL, which is part of the eastern mesoregion and has a population of 10,583 people, according to the last 2019 census. The HDI is below average, with a value of 0.513 (UNDP, 2010). The climate is rainy tropical with dry summers. The Zumbi dos Palmares settlement was officially created in 1997. It covers a total area of 691.7 ha (INCRA, 2021). There are currently 110 families. The average arable area is 70.03%, 25.13% of the native area is occupied, and 4.5% is exposed soil.

Dom Hélder Câmara

Dom Hélder Câmara is located in the municipality of Murici - AL; it is part of the East mesoregion, which has 26,710 inhabitants, according to the last 2019 census, and has one of the lowest HDI in the country: 0.527, according to data from the United Nations Development Program (PUND, 2010). The Dom Helder settlement was officially created in 2000. It covers a total area of 303.3 ha

(INCRA, 2021). There are currently 24 families. The average arable area is 41.89%, 39.01% is native forest area, and 19.11% is exposed soil. By not using pesticides, some farmers joined the OCS and began to benefit from the Organic Food Certificate granted by the Ministry of Agriculture, Livestock and Supply (Mapa). The settlement also has an Environmental Protection Area (APA), with more than 116 thousand hectares and shelters from the Murici Ecological Station (Escec), according to Embrapa (2017).

Santa Maria and Pau Santo

Santa Maria Pau Santo is located in the municipality of Cacimbinhas - AL; it is part of the Agreste mesoregion, which has a population of 10,195 inhabitants, according to the last 2019 census, with the HDI below average, 0.531 (PUND, 2010). The Santa Maria settlement was created around 1997 (INCRA, 2021), and covers a total area of 2,118 ha. There are currently 24 families. The average area arable is 30.69%, with 32.45% occupied by native forest area and 36.04% is exposed soil. The Pau Santo community has 32 settled families, the average area arable is 13.82%, with 33.44% occupied by native forest area and 52.70% is exposed soil.

Genivaldo Moura

Genivaldo Moura is a municipality in the municipality of Delmiro Gouveia - AL, part of the Serto mesoregion, with a population of 48,096 people according to the most recent census (2019), and an HDI of 0.612 (PUND, 2010). The Genivaldo Moura settlement was created in 2007 (INCRA, 2021), with a total area of 1,948 ha and 33 families currently settled. The average arable area is 51.99%, native forest area is 45.32%, and exposed soil is 0.98%.

Olga Benário

Olga Benário is located in the municipality of Piranhas - AL, forming part of the Sertão mesoregion, and has a population of 23,045 inhabitants according to the last census (2019), with an HDI of 0.589 (PUND, 2010). The Olga Benário which was created in 2008 and is registered with INCRA (2021) as "Lagoa Comprida", has 22 settled families and a total area of 385.09 ha. The average arable area is 64.54%, native forest area is 30.03%, and exposed soil is 5.43%.

Data collection

Semi-structured interviews were conducted with the person in charge of each family who had knowledge of the main economic activity, what was produced, and where the production went. If irrigation techniques were used, what was the source of the water, what type of inputs and/or pesticides used in production? A total of 245 families were interviewed from the six settlements included in the survey. Following the administration of the questionnaires, the data was tabulated, converted to percentages, and analyzed in the form of tables.

RESULTS AND DISCUSSION

There was a diversity of crops in the studied settlements (Table 1), with maize and beans occurring only during the rainy season in regions where water availability is

Table 1. Frequency of crops (annual crops) between settlements in the Alagoas mesoregions.

Culture	East Mesoregion		Agreste Mesoregion		Sertão Mesoregion	
	Zumbi P.	D. Helder	Sta. M ^a	P. Santo	G. Moura	O. Benário
	Freq.%	Freq.%	Freq.%	Freq.%	Freq.%	Freq.%
Bean carioca	38.89	50.00	81.25	84.21	48.00	95.00
Yam	12.96	57.14	0.00	0.00	0.00	0.00
Manioc	72.22	92.86	6.25	5.26	32.00	0.00
Corn	50.00	57.14	87.50	89.47	88.00	90.00

Source: CECA/UFAL (2022).

Table 2. Frequency of crops (vegetables and vegetables) between settlements in the mesoregions of Alagoas.

Culture	East Mesoregion		Agreste Mesoregion		Sertão Mesoregion	
	Zumbi P.	D. Helder	Sta M ^a	P. Santo	G. Moura	O. Benário
	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %
Lettuce	12.96	0.00	0.00	0.00	0.00	0.00
Onions	14.81	0.00	5.56	5.26	8.00	5.00
Coriander	31.48	0.00	6.25	10.53	0.00	5.00
Cabbage	22.22	0.00	6.25	0.00	8.00	0.00
Pepper	5.56	5.56	6.25	0.00	0.00	5.00
Bell pepper	5.56	0.00	6.25	5.26	0.00	5.00
Arugula	1.85	0.00	0.00	0.00	4.00	0.00

Source: CECA/UFAL (2022).

greater, and in regions where water scarcity exists, the main crops, such as maize and beans, occurring only during the rainy season, because most properties lack water storage for irrigation. In Alagoas, yam, beans, cassava, and corn production is almost entirely the responsibility of the family farming.

According to Cosme (2019), during the rainy season, the settlers grow corn, beans, watermelon, pumpkin, milk, and meat, which contributes to the diversification of foods sold at street markets. According to Pereira (2015), low production, even in agriculture with irrigation systems and water resources, a determining factor for production and development in the semi-arid region, is caused by poor water solutions and a lack of public policies aimed at family farming. Zumbi dos Palmares stood out among the six settlements in the cultivation of lettuce (12.96%), chives (14.81%), coriander (31.48%), and cabbage (22.22%), primarily for marketing (Table 2).

Acerola, cashew, guava, and mango were the most common fruit trees found in all settlements (Table 3). Because of the difficulty in marketing production, fruit marketing is the main barrier for producers. Fruits are typically sold in their natural state, with little or no processing.

According to Cândido and Sturza (2018), self-consumption production is an important activity among families who use their backyards as orchards with a wide variety of fruits. According to Pimentel (2017), "agroforestry backyards" demonstrate that it is an essential strategy in the subsistence of settled families, a fact that can also be observed in Alagoas settlements.

It was discovered that few producers sell their products in fairs and markets located within the urban perimeter, with most being sold on properties or door to door within the settlement itself. Short marketing circuits, according to Cândido and Sturza (2018), strengthen geographic proximity and the producer/consumer relationship. According to Darolt et al. (2013), the properties that work with these "circuits" produce a more diverse range of plant and animal products.

The settlements of the mesoregions Agreste and Serto had a low frequency of vegetable production, with the existing crops being native fruit trees used primarily to feed families. Camargo and Navas (2017) observe in this context that "the diversity among the group is high, but the diversity in the properties is relatively low in relation to the group." Despite the fact that most properties have cisterns that are supplied by water trucks, the city's water

Table 3. Frequency of crops (fruit trees) between settlements in the Alagoas mesoregions.

Culture	East Mesoregion		Agreste Mesoregion		Sertão Mesoregion	
	Zumbi P.	D. Helder	Sta. M ^a	P. Santo	G. Moura	O. Benário
	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %
Abocado	11.11	42.86	0.00	5.26	8.00	0.00
Pineapple	7.41	42.86	0.00	0.00	4.00	0.00
Açaí	1.85	0.00	0.00	0.00	0.00	0.00
Acerola	27.78	64.29	56.25	15.79	48.00	60.00
Banana	5.56	85.71	6.25	0.00	40.00	0.00
Cashew	35.19	64.29	31.25	31.58	48.00	30.00
Poop	57.41	78.57	18.75	0.00	28.00	45.00
Guava	42.59	50.00	31.25	5.26	24.00	50.00
Jaca	46.30	85.71	0.00	0.00	0.00	0.00
Orange	88.89	71.43	18.75	0.00	40.00	40.00
Mango	66.67	92.86	12.50	5.26	32.00	30.00

Source: CECA/UFAL (2022).

Table 4. Frequency of animal husbandry among settlements in the Alagoas mesoregions.

Animals	East Mesoregion		Agreste Mesoregion		Sertão Mesoregion	
	Zumbi P.	D.Helder	Sta. Maria	Pau Santo	G. Moura	O. Benário
	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %
Bee	1.85	0.00	0.00	0.00	4.00	0.00
Birds	59.26	50.00	87.50	78.95	68.00	85.00
Cattle	40.74	14.29	62.50	10.53	36.00	50.00
Goats	18.52	0.00	62.50	15.79	52.00	45.00

Source: CECA/UFAL (2022).

supply is limited to basic needs. This is supported by Sangalli et al. (2014), who report that "many settlements are installed in places with poor soil, water, and access to the consumer market, becoming dependent on public policies for settlement settlement."

As an alternative to low plant productivity, the communities of the mesoregions Agreste and Serto have small animal creation, the most common of which are poultry and goats/sheep, where production is primarily for sale. In the eastern region (Zone of Mata) the destination is self-consumption (Table 4).

The animals drink water from dams and weirs, and their diet consists of forage palm (a high percentage of cultivation among the families studied) and native vegetation. The situation of the semiarid region demonstrates the persistence of socioeconomic problems and a lack of public policies, which worsens during prolonged periods of drought, where "the problem of droughts" makes subsistence production difficult for those who already live in "limit conditions" of poverty. This low productivity eliminates a potential source of income for

families, contributing to the rural exodus (Silva, 2006). According to Gualdani (2015), productive adaptations are strategies to overcome the situation of scarcity of water supply, which opt for the production of small animals to sell milk due to the difficulty of access to water. It is also highlighted that agricultural production is subsistence, with plant production intended for animal feed.

The study also emphasizes the cultivation of forages (Table 5) for animal feed and Neem for medicinal purposes. The presence of a high frequency in the three mesoregions. In the plots studied, it was discovered that 43.70% of the settlers use agroecological inputs (manure, cover, etc) in their management practices; 85.71% of these inputs are produced on their properties, and 98% of respondents do not use pesticides.

The forage cactus (*Opuntia ficus-indica*) adapts well to the semiarid region, as it is a food with nutraceutical values, is low in cost, and is well accepted by small animals (Oliveira et al., 2011). Small and large palms are the most cultivated in the Brazilian Northeast, with a distinct adaptation to the semi-arid climate and superior

Table 5. Frequency of crops (forage) in the Alagoas mesoregions.

Culture	East Mesoregion		Agreste Mesoregion		Sertão Mesoregion	
	Zumbi P.	D. Helder	Sta. M ^a	P. Santo	G. Moura	O. Benário
	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %
Neem (nim)	100.00	100.00	100.00	100.00	100.00	100.00
Big palm	100.00	100.00	100.00	100.00	100.00	100.00
Small palm	0.00	0.00	75.00	42.11	40.00	85.00

Source: CECA/UFAL (2022).

water efficiency when compared to other plants (de Almeida, 2012).

Neem (*Azadirachta indica*) is resistant to semiarid conditions. This plant acts as an organic fertilizer (leaves). When combined with urea, it can be an excellent soil fertilizer as well as a biocide, with insecticidal and repellent properties. It is a quality and low-cost alternative to synthetic chemical pesticides. According to traditional knowledge, many communities use neem as a medicinal plant, with all parts used to make home remedies for lice and human endoparasites. Aside from medicinal purposes, the tree is used to reduce desertification and is thought to be an excellent carbon dioxide absorber (CO₂) (Domínguez and Fareih, 2013).

Conclusion

The communities studied employ agroecological techniques that do not rely on chemical inputs or pesticides. Plant and animal production in the six settlements is primarily for self-sufficiency. Low productivity is prevalent in the families of the three mesoregions studied. Obstacles can be considered the edaphoclimatic conditions of each region, as well as the absence of public policies that allow for an increase in production.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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REFERENCES

Aquino JR, Gazolla M, Schneider S (2018). Dualism in the Field and Internal Inequalities in Brazilian Family Agriculture. *Journal of Rural*

- Economics and Sociology, Brasília, DF 1:56. Available at: <https://doi.org/10.1590/1234-56781806-94790560108>.
- Barros AHC, Varejão-Silva M, Tabosa JN, Silva AB, Araújo Filho JC, Santiago GACF (2018). Methodological criteria and climatic potential of the State of Alagoas for agricultural crops in dry, regular and rainy rainfall scenarios. *Embrapa Solos- Research and Development Bulletin (INFOTECA-E)*. Available at: <http://www.infoteca.cnptia.embrapa.br/infoteca/handle/doc/1097194>.
- CECA/UFAL (2022). *Campus de Engenharias e Ciências Agrárias, Universidade Federal de Alagoas, Rio Largo – AL, 2022*.
- Cosme CM (2019). The resistance of the peasantry settled in a territorial formation marked by the agrarian counter-reform: from the struggle for land to the struggle to remain in the territory of rural settlements in the Sertão of Alagoas. Available at: <https://repositorio.ufpe.br/handle/123456789/35353>.
- Cândido HT, Sturza JAI (2018). Participatory methods for the diagnosis of food sovereignty in the rural settlement PA São Francisco, Rondonópolis – MT. *Portraits of Settlements* 2(21):147-174. Available at: <https://doi.org/10.25059/2527-2594/retratosdeassentamentos/2018.v21i2.319>.
- Camargo JSM, Navas R (2017). Buying institutional programs of family farming in the municipality of Ribeirão Grande/SP: an analysis from the production and consumption. *Revista Nera* 35(20):230-245. Available at: <https://doi.org/10.47946/mnera.v0i35.4483>.
- Darolt MR, Lamine C, Brandemburg A (2013). The diversity of ecological food short circuits: lessons from the Brazilian and French cases. *Agriculture, Rio de Janeiro* 2(10):8-13. Available at: <http://bibliotecadigital.abong.org.br/bitstream/handle/11465/595/91.pdf?sequence=1&isAllowed=y#page=8>.
- De Almeida RF (2012). Forage palm in the feeding of sheep and goats in the Brazilian semiarid region. *Green Journal of Agroecology and Sustainable Development, Mossoró - RN* 4(7):2. Available at: <https://dialnet.unirioja.es/servlet/articulo?codigo=7422236>.
- Domínguez G, Fareih O (2013). Evaluación del efecto de Bioplaguicidas de extracto de Neem (*Azadirachta Indica*, A. Juss) Y Mata-Ratón (*Gliricidia Sepium*, Jacquin) sobre cultivo de maíz (*Zea Mays*, Schrader) en Agricultura de Conservación.
- EMBRAPA News (2017). Alagoas settlement in a conservation unit receives social technology. Available at: <https://www.embrapa.br/busca-de-noticias/-/noticia/30270658/assentamento-alagoano-em-unidade-de-conservacao-recebe-tecnologia-social>.
- Gazolla M, Schneider S (2004). Family farming, food security and public policies: an analysis based on self-consumption production in the territory of Alto Uruguai/RS. *Federal University of Rio Grande do Sul. Faculty of Economic Sciences* pp. 74-75. Available at: <http://hdl.handle.net/10183/5583>.
- Gualdani C (2015). Social technologies for coexistence with the semiarid: The experience of family farmers in the Alagoas hinterland. Available at: <http://dx.doi.org/10.26512/2015.07.D.19194>.
- INCRA (2021). INCRA-List of created and recognized settlements. Available at: <https://www.gov.br/incra/pt-br>
- Oliveira ASC, Francisco NCF, Adriano HNR, Karoline BPL (2011). Forage cactus: Alternative for the semiarid region. *Green*

- Journal of Agroecology and Sustainable Development. Mossoró – RN 3(6):6. Available at: <https://dialnet.unirioja.es/servlet/articulo?codigo=7435949>.
- Pimentel NGL (2017). Survey of floristic composition in rural agroforestry backyards in the region of Mossoró-RN and socioeconomic status of families. Available at: <http://repositorio.ufersa.edu.br/handle/prefix/5461>.
- PUND (2010). Ranking IDHM Municipalities 2010. Available at: <https://www.br.undp.org/content/brazil/pt/home/idh0/rankings/idhm-municipios-2010.html>.
- Sangalli AR, Schlindwein MM, Camilo LR (2014). Production and income generation in the family farm: a diagnosis in the of Lagoa Grande rural settlement in Dourados, in the of Mato Grosso do Sul state. *Ciência e Natura* 36(2):180-192.
- Silva RMA (2006). Between combating drought and living with the semi-arid: paradigmatic transitions and development sustainability. University of Brasilia, Brasilia. Available at: <https://repositorio.unb.br/handle/10482/2309>.