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Acquisition of foods from the National School Feeding Program in the extreme west of Brazil according to diversity and processing level

Aquisição de alimentos do Programa Nacional de Alimentação Escolar no extremo oeste brasileiro segundo diversidade e nível de processamento

Abstract

Introduction: Resolution CD/FNDE No. 06/2020 defines that the application of resources under the National School Feeding Program (PNAE) must consist of at least 75% of fresh or minimally processed foods, up to 20% of processed and ultra-processed foods, and a maximum of 5% for culinary ingredients. *Objective*: To evaluate the application of PNAE financial resources according to food processing level and diversity in Regional Juruá in the extreme west of Brazil. *Methods*: This cross-sectional observational study used 2022 data from Sistema de Gestão de Prestação de Contas (Accountability Management System - SiGPC) for the municipalities in Regional Juruá in the state of Acre. Foods were categorized according to processing level. *Results*: In 2022, the PNAE of the Juruá Regional reported to the SiGPC an average procurement of 56.2 food items. The proportion of fresh or minimally processed foods ranged from 47.37 to 79.03% in the Regional Juruá municipalities, only one of which showed the minimum 50-item diversity. The proportion of financial resources spent in fresh or minimally processed foods ranged from 57.34 to 85.39%; for processed and ultra-processed foods, from 10.80 to 36.74%; and for culinary ingredients,from 3.50 to 7.70%. *Conclusion:* Regional Juruá municipalities still face difficulties in complying with the proportional obligation to allocate financial resources according to the level of processing and minimum diversity of 50 fresh or minimally processed foods.

Keywords: School feeding. Food processed. Menu planning. Food quality.

Resumo

Introdução: A Resolução CD/FNDE nº 06/2020 define que a aplicação dos recursos no âmbito do Programa Nacional de Alimentação Escolar (PNAE) deve ser composta por no mínimo 75% de alimentos *in natura* ou minimamente processados; e que até 20% dos recursos utilizados poderão ser investidos na compra de alimentos processados e ultraprocessados, e no máximo, 5% para aquisição de ingredientes culinários. *Objetivo*: Avaliar a aplicação dos recursos financeiros do PNAE segundo a diversidade e o nível

de processamento dos alimentos na Regional Juruá, extremo oeste brasileiro. *Métodos*: Trata-se de um estudo observacional seccional que utilizou dados do Sistema de Gestão de Prestação de Contas (SiGPC) dos municípios da Regional Juruá no estado do Acre, referentes ao ano de 2022. Os alimentos foram categorizados segundo nível de processamento. *Resultados*: No ano de 2022, o PNAE da Regional Juruá informou no SiGPC uma aquisição média de 56,2 gêneros alimentícios. A proporção de alimentos *in natura* ou minimamente processados variou de 47,37% a 79,03% nos municípios da Regional Juruá, e apenas um município apresentou diversidade mínima de 50 alimentos deste grupo. A proporção de recursos financeiros para aquisição de alimentos *in natura* ou minimamente processados variou de 57,34% a 85,39%; para alimentos processados e ultraprocessados, de 10,80% a 36,74%; e para ingredientes culinários, de 3,50% a 7,70%. *Conclusão*: Os municípios da Regional Juruá ainda enfrentam dificuldades para cumprimento da obrigatoriedade proporcional de destinação de recursos financeiros segundo nível de processamento e diversidade mínima de 50 alimentos *in natura* ou minimamente processados.

Palavras-chave: Alimentação escolar. Alimentos Processados. Planejamento de cardápio. Qualidade dos alimentos.

INTRODUCTION

The eating experiences acquired during childhood play a decisive role in the configuration of eating patterns during adult life.Schools emerge as crucial spaces that can introduce and consolidate healthy eating habits.[1] In view of the importance of school feeding, Brazil implemented the National School Feeding Program (PNAE) in 1979 to ensure nutritionally adequate and healthy school feeding for students in the public school system by transferring federal resources to states and municipalities.[2,3]

To serve students in federal, state, and municipal basic education, National Fund for Educational Development (FNDE), an autarchy linked to Brazilian Ministry of Education (MEC), manages the resources allocated to basic education in Brazil, annually transferring to state departments of education, federal institutions, and municipal governments the supplementary resources from PNAE.[2] In 2023, FNDE substantially invested to improve food in schools, with a special focus on PNAE. One of its main achievements refers to its readjustment of PNAE values per capita, which had remained static for six years. These values increased from 28 to 39% via Resolution CD/FNDE No. 02/2023, of March 10, 2023, improving the supply of food to students in public schools throughout Brazil.[4]

Brazilian states, Federal District, and municipalities have the constitutional and legal responsibility to ensure the supply of meals during the school period according to students' nutritional needs. Thus, the resources the executing entity transfers should constitute the main source of funding for school meals rather than counterparts (as the term means "complement"). FNDE financiallyaids the Program so its resources only serveto purchase food.[2,4,5]

Resolution CD/FNDE No. 06, published on May 8, 2020, defines that the use of resources under PNAE must consist of at least 75% of fresh or minimally processed foods, up to 20% of processed and ultra-processed foods, and a maximum of 5% of culinary ingredients. Recommendations also suggest that the executing entities vary their annually purchased items, with at least 50 fresh or minimally processed foods.[6]

PNAE currently aims to meet students' nutritional needs during the school period, contributing to their biopsychosocial growth and development, directly influencing their learning capacity and school performance, encouraging their adoption of healthy eating habits, and providingmeals that meet their nutritional needs according to their age group. It also advises that school curricula include food and nutrition education actions to encourage healthier eating habits.[3]

The rules to implement the Program in Resolution CD/FNDE No. 06/2020 define nutritionists as the technician responsible for the PNAE and for preparing school menus based on the use of fresh or minimally processed foods. These menus should offer portions according to students' age group and daily nutritional needs, paying attention to the minimum weekly supply of fruits and vegetables. In fact, this regulation prohibits the supply of trans and industrialized fats in all menus and limits the offer of meat, milk drinks with additives or sweeteners, breads, cakes, cookies, simple sugar, sweet regional preparations, and margarine. It also prohibits the supply of ultra-processed foods, added sugar, honey, and sweeteners for children aged up to three years.[6]

Assessments of adequacy to Resolution CD/FNDE No. 06/2020 are essential to ensure that food choices in schools are aligned with established guidelines, promoting appropriate nutritional choices that directly impact students' school performance, health, and well-being. This process is crucial to ensure the compliance of educational practices and the efficient use of public resources.[6] Moreover, analyzing how municipalities use PNAE resources (especially when the percentage remains below that stipulated by law) is extremely important. Such analysis can evince the flaws in the efficacy of the Program, public management, school meal

quality, and compliance with legal standards, strengthening this important public policy of nutrition and education that serves millions of students in the public school system in Brazil.[7,8]

Analyzing social control is essential to ensure that the adopted processes are based on reliable methods and models that can provide accurate and secure information. This assessment can find possible weaknesses that may compromise action efficacy and ensure that public policy objectives are being effectively achieved. The appropriate indicators can assess whether the planned goals are being achieved, which contributes to continuously improving policies and promoting equity.[9]

A study on the acquisition of food from family farming by PNAE in 93.2% of Brazilian municipalities showed that 78.5% directly purchased from family farming. However, this distribution showed important regional variations, in which the Brazilian South (95.5%) and the Midwest (67.9%) showed the greater prevalence. Less than a quarter of the municipalities in the state of Acre applied more than 30% of PNAE resources to purchase from family farming. Some variables that negatively influenced their decisions toward these purchases included I) municipal population; II) the mixed, decentralized, or outsourced management of school feeding; and III) the absence of nutritionists as the responsible technicians. Despite advances in compliance with the rules, 50% of the municipalities in the state still failed to reach the required minimum, suggesting the need for educational actions and technical support to ensure compliance with the legislation, especially in states with greater difficulties.[10]

The Program requires compliance with rules, inspecting and controlling the food offered to students. As the Program evolved, it currently concernsitself to basic food assistance, the nutritional quality of the food, and the promotion of healthy eating habits.[11] The requirement that at least 30% of its resources be spentin family farming products fails to always be met due to the scarcity of adequate funds, the complexity of purchasing processes, and the structural limitations in some regions.[2,12,13]

Thus, this study aimed to evaluate the application of PNAE financial resources according to food diversity and processing level in Regional Juruá the extreme west of Brazil.

METHODS

Fully accessible public data from the FNDE Sistema de Gestão de Prestação de Contas (Accountability Management System - SiGPC) regarding the Regional Juruá municipalities in the state of Acre in 2022 were collected in this study.

The state of Acre has 830,026 inhabitants over an area of 164,173.43 km², resulting in a population density of 5.06 inhabitants per km².[14]

Its 22 municipalities comprise two geographic mesoregions: the Vale do Acre and Vale do Juruá mesoregions,the latter of which has two microregions: Regional Juruá and Regional Taraucá-Envira. The Juruá Regional, the focus of this study, is the westernmost geographic microregion in Brazil and encompasses 19.46% of the territorial area of the state of Acre, comprising the municipalities of Cruzeiro do Sul, Mâncio Lima, Marechal Thaumaturgo, Porto Walter, and Rodrigues Alves (Figure 1).

Figure 1. Location of Regional Juruá in the State of Acre.
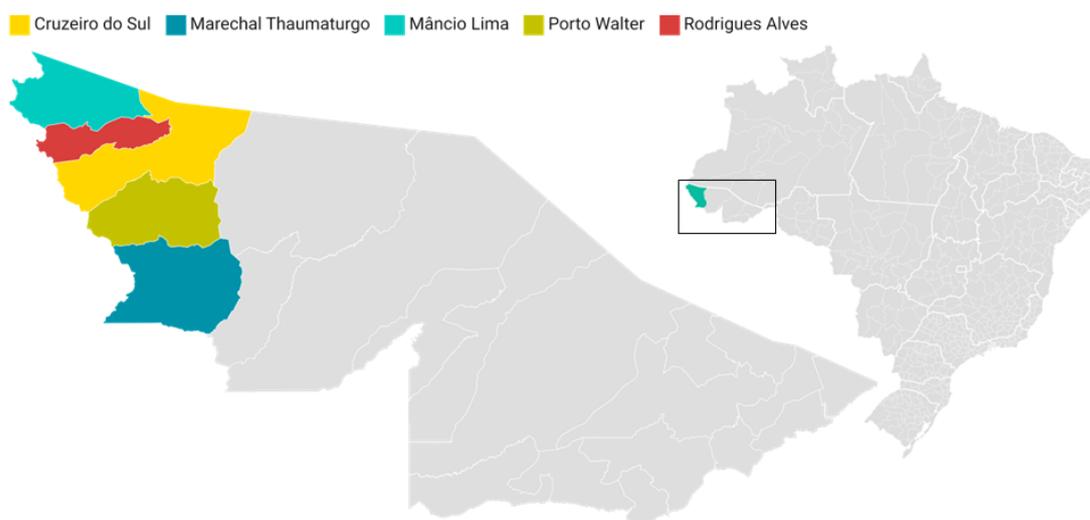
Data were collected from the SiGPC website in December 2023.[a] All data regarding the food the executing entities of each Regional Juruá municipality purchased in 2022 and was reported in SiGPC were collected.

Food description, purchased quantity of each food, and paid amount (R$) were chosen as the variables to be collected from the system. The variables food processing level and fresh or minimally processed food diversity were created based on this information.

Food processing level was evaluated according to the extent and purpose of industrial processing and categorized into fresh food, culinary ingredients, minimally processed foods, processed foods, and ultra-processed foods, as per the Dietary Guidelines for the Brazilian population[15] and the FNDE Technical Note No. 1879810/2020/COSAN/CGPAE/DIRAE, which addresses the changes in the aspects of food and nutrition and food and nutritional security in Resolution CD/FNDE No. 06.[6,16]

According to Technical Note No. 1879810/2020:[16]

> Fresh foods are directly obtained from plants or animals and undergo no change after leaving nature. Culinary ingredients are products extracted from natural foods or from nature by processes such as pressing, grinding, grinding, pulverizing, and refining. They are used to season and cook food and to create culinary preparations. Minimally processed foods correspond to fresh foods that have been subjected to cleaning processes, removal of inedible or undesirable parts, fractionation, grinding, drying, fermentation, pasteurization, refrigeration, freezing, and similar processes that involve no addition of salt, sugar, oils, fats, or other substances to the original food. Processed foods are manufactured by industries by adding salt, sugar, or other culinary substances (such as oil, vinegar, etc.) to fresh foods to make them durable and more pleasant to the palate. These products are directly derived from food and recognized as versions of the original foods. They are usually consumed as part of or as an accompaniment to culinary preparations made from minimally processed foods. Ultra-processed foods are industrial formulations entirely or mostly made of food-derived substances combined with additives with little or no unprocessed foods. Its ingredients typically include sugar, oils, fats, salt, and atypical sources of energy and nutrients for culinary preparations, such as casein, lactose, gluten, and processing derivatives of food

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[a] <https://www.fnde.gov.br/sigpcadm/sistema.pu?operation=localizar>

constituents, such as hydrogenated and interesterified fat, maltodextrin, hydrolyzed protein, soy protein isolate, invert sugar, and high-fructose corn syrup. The additives in these foods include some also used in processed foods such as preservatives, antioxidants, and stabilizers and specific classes added to mimic or improve the sensory quality of foods or to mask unpalatable aspects of the final products, such as colorings, flavorings, sweeteners other than sugar, carbonating agents, anti-humectants, emulsifiers, and others. Ultra-processed foods undergo processing that has no domestic equivalents such as hydrogenation, extrusion, and pre-processing before frying.

Fresh or minimally processed food diversity was evaluated by counting the foods in these categories that were purchased in 2022.

The adequacy of the expenditure of financial resources to acquire food within the PNAE scope according to diversity and level of processing was analyzed following Resolution CD/FNDE No. 06.[6] Municipalities that met the recommendation of at least 50 types of fresh or minimally processed foods in 2022 were considered as having adequate regarding dietary diversity.

With regard to processing level, municipalities were considered adequate if they allocated at least 75% of their financial resources to fresh or minimally processed foods, no more than 20% to processed and ultra-processed foods, and no more than 5% to processed culinary ingredients.

The percentage distribution and the monetary value (R$) of food purchased within PNAE from family farms in Regional Juruá, Acre, in 2022, and the percentage of financial resources earmarked for fresh or minimally processed foods, were evaluated (except for tea and coffee, which were excluded from this classification) according to the food groups defined by the Dietary Guidelines for the Brazilian population.

The data in this research stems from fully accessible public documents by the SiGPC. Thus, this research required no ethical appreciation by the Ethics Committee for Research with Human Beings under the terms of CNS Resolution no. 466/2012.

RESULTS

In 2022, the Regional Juruá PNAE in the SiGPC averaged 56.2 foods (Table 1). The proportion distribution of fresh or minimally processed foods varied from 47.37 to 79.03% in Regional Juruá (Cruzeiro do Sul: 79.03%; Mâncio Lima: 47.37; Marshal Thaumaturgo: 68.42%; Porto Walter: 69.64%; Rodrigues Alves: 73.53%). Only Rodrigues Alves reached the minimum recommendation of 50 fresh or minimally processed foods (Table 1). However, Marechal Thaumaturgo showed the largest number of regional foods or biodiversity, such as: dali dali (a kind of local yam), patauá wine (a non-alcoholic beverage from the fruit of *Oenocarpusbataua*), and peach palm.

Table 1. Distribuição (%) dos alimentos adquiridos, pelo Programa de Alimentação Escolar e informados no SiGPC, segundo nível de processamento. Regional Juruá, Acre, 2022.

Município	Total de alimentos n	In natura ou minimamente processados n (%)	Ingredientes culinários n (%)	Processados n (%)	Ultraprocessados n (%)
Cruzeiro do Sul	62	49 (79,03)	4 (6,45)	3 (4,84)	6 (9,68)
Mâncio Lima	38	18 (47,37)	6 (15,79)	7 (18,42)	7 (18,42)

Table 1. Distribuição (%) dos alimentos adquiridos, pelo Programa de Alimentação Escolar e informados no SiGPC, segundo nível de processamento. Regional Juruá, Acre, 2022. (Continues).

Município	Total de alimentos n	In natura ou minimamente processados n (%)	Ingredientes culinários n (%)	Processados n (%)	Ultraprocessados n (%)
Marechal Thaumaturgo	57	39 (68,42)	5 (8,77)	7 (12,28)	6 (10,53)
Porto Walter	56	39 (69,64)	5 (8,93)	5 (8,93)	7 (12,50)
Rodrigues Alves	68	50 (73,53)	3 (4,41)	7 (10,29)	8 (11,76)

Table 2 shows the distribution of financial resources for food acquisition according to processing. The proportion of financial resources to purchase fresh or minimally processed foods ranged from 57.34 to 85.39%; that for processed and ultra-processed foods, from 10.80 to 36.74%; and that for culinary ingredients, from 3.50 to 7.70%.

Table 2. Distribution (%) of the financial resources to purchase food by theSchool Feeding Program reported in the SiGPC according to processing level. Regional Juruá, Acre, 2022.

	Cruzeiro do Sul (n=62)	Mâncio Lima (n=38)	Marechal Thaumaturgo (n=57)	Porto Walter (n=56)	Rodrigues Alves (n=68)
Fresh or minimally processed (n)	49	18	39	39	50
Acquired value in Reais	R$ 1,339,595.70	R$ 178,548.35	R$ 448,491.03	R$ 257,540.38	R$ 609,133.61
% of the total value	85.39	57.34	67.34	60.87	77.12
Culinary ingredients (n)	4	6	5	5	3
Acquired value in Reais	R$ 59,755.70	R$ 18,431.46	R$ 23,341.35	R$ 32,590.30	R$ 34,174.50
% of the total value	3.81	5.92	3.50	7.70	4.33
Processed (n)	3	7	7	5	7
Acquired value in Reais	R$ 52,325.85	R$ 32,268.96	R$ 70,852.95	R$ 46,506.20	R$ 68,763.45
% of the total value	3.34	10.36	10.64	10.99	8.71
Ultra-processed (n)	6	7	6	7	8
Acquired value in Reais	R$ 117,052.24	R$ 82,151.48	R$ 123,357.50	R$ 86,478.00	R$ 77,792.30
% of the total value	7.46	26.38	18.52	20.44	9.85

Only the municipalities of Cruzeiro do Sul and Rodrigues Alves complied with the proportional allocation of financial resources according to the processing level criteria established in Resolution CD/FNDE No. 6/2020.[6]

Table 3 shows the PNAE resources allocated to family farming in Regional Juruá, Acre, in 2022. Cruzeiro do Sul received the highest amount (R$ 1,292,096.00) and used 43.39% of this amount; Marechal Thaumaturgo, 45.63%; Mâncio Lima spent the least, only 5.92%; Porto Walter used 34.16% of its resources; and Rodrigues Alves exceeded its received amount (140.94%). The data indicate significant differences in resource application, suggesting the need for adjustments in financial management.

Table 3. Distribution (% and R$) of food purchased by the School Feeding Program from family farming at the SiGPC. Regional Juruá, Acre, 2022.

Municipality	Transferred amount (R$)	Acquisition value (R$)	Percentage (%)
Cruzeiro do Sul	1,2922,096.00	560,592.27	43.39
Mâncio Lima	330,690.00	19,575.00.	5.92
Marechal Thaumaturgo	474,066.00	216,320.16	45.63.
Porto Walter	283,975.95	97,010.58	34.16.
Rodrigues Alves	130,251.00	183,574.36	140.94

The analysis in Table 4 shows the percentage distribution of financial resources for fresh or minimally processed foods PNAE in Regional Juruá, Acre, in 2022, according to food groups. The data show that all municipalities allocated most of their resources to meat and eggs, ranging from 30.61 (Porto Walter) to 42.75% (Mâncio Lima); whereas that of cereals, from 4.89 (Porto Walter) to 13.40% (Rodrigues Alves);and milk and cheeses, from 5.92 (Porto Walter) to 29.17% (Mâncio Lima). Porto Walter (15.80%) and Marechal Thaumaturgo (18.38%) bought much fruit but Mâncio Lima (3.40%) and Rodrigues Alves (12.33%) less so. Investment in vegetables varied from 12.10 (Cruzeiro do Sul) to 7.34% (Marechal Thaumaturgo), whereas roots and tubers showed greater and lower prominence in Porto Walter (13.19%) and Mâncio Lima (2.25%), respectively. The volume of purchased seasonings and condiments ranged from 0.20 (Mâncio Lima) to 1.60% (Rodrigues Alves), reflecting their lower financial impact on total resources.

Table 4. Distribution (%) of financial resources to purchase fresh or minimally processed foods by theSchool Feeding Program reported in the SiGPC according to food group. Regional Juruá, Acre, 2022.

	Cruzeiro do Sul (n=62)	Mâncio Lima (n=38)	Marechal Thaumaturgo (n=57)	Porto Walter (n=56)	Rodrigues Alves (n=68)
Meat and eggs (n)	3	3	5	3	2
Acquired value in Reais	R$ 485,666.93	R$ 73,373.43	R$ 147,126.40	R$ 75,637.10	R$ 236,814.02
% of the total value	37.60	42.75	33.34	30.61	39.83
Cereals (n)	5	3	4	4	7
Acquired value in Reais	R$ 120,401.93	R$ 15,086.88	R$ 46,269.89	R$ 12,080.00	R$ 79,651.16
% of the total value	9.32	8.79	10.48	4.89	13.40
Beans (n)	1	1	1	1	1
Acquired value in Reais	R$ 85,450.18	R$ 9,550.90	R$ 25,674.98	R$ 43,570.00	R$ 29,961.84
% of the total value	6.61	5.56	5.82	17.63	5.04
Fruits (n)	13	1	8	10	13
Acquired value in Reais	R$ 174,574.77	R$ 5,841.36	R$ 81,116.46	R$ 39,054.78	R$ 73,293.50
% of the total value	13.51	3.40	18.38	15.80	12.33
Vegetables (n)	17	4	10	12	16
Acquired value in Reais	R$ 156,308.16	R$ 13,512.31	R$ 32,393.94	R$ 26,098.20	R$ 52,137.85
% of the total value	12.10	7.87	7.34	10.56	8.77
Milk and cheeses (n)	1	2	1	1	1
Acquired value in Reais	R$ 185,897.55	R$ 50,067.00	R$ 65,934.00	R$ 14,630.00	R$ 74,128.10
% of the total value	14.39	29.16	14.94	5.92	12.47

Table 4. Distribution (%) of financial resources to purchase fresh or minimally processed foods by theSchool Feeding Program reported in the SiGPC according to food group. Regional Juruá, Acre, 2022. (Continues).

	Cruzeiro do Sul (n=62)	Mâncio Lima (n=38)	Marechal Thaumaturgo (n=57)	Porto Walter (n=56)	Rodrigues Alves (n=68)
Roots and tubers (n)	6	2	7	6	7
Acquired value in Reais	R$ 76,084.22	R$ 3,865.02	R$ 37,502.51	R$ 32,591.40	R$ 39,021.94
% of the total value	5.89	2.25	8.50	13.19	6.56
Seasonings/condiments (n)	1	1	1	2	1
Acquired value in Reais	R$ 7,413.05	R$ 348.45	R$ 5,306.00	R$ 3,456.00	R$ 9.498.68
% of the total value	0.57	0.20	1.20	1.40	1.60

DISCUSSION

The PNAE resources in Regional Juruá to acquire fresh or minimally processed foods in 2022 exceeded that targeting processed and ultra-processed foods asthe municipalities purchased them the most. However, only one municipality acquired the recommended minimum of 50 fresh or minimally processed foods and only two followed the recommended allocation of resources toward processed and ultra-processed foods.

PNAE directs its efforts to encourage healthier food choices, an approach that reflects the strategic allocation of resources, determining at least 75% of financial toward fresh or minimally processed foods. The Program establishes clear limits, reserving a maximum of 20% of investments for processed and ultra-processed foods to control the consumption of these less nutritious products. Moreover, the maximum allocation of 5% for culinary ingredients evinces a concern to promote healthy culinary practices in schools, ensuring that the prepared food maintains its quality and freshness.[6]

Mâncio Lima (57.34%), Marechal Thaumaturgo (67.34%), and Porto Walter (60.87%) showed a low percentage of invested resources to acquire fresh or minimally processed foods. Mâncio Lima (5.92%) and Porto Walter (7.70%) exceeded the maximum limit for acquiring culinary ingredients. Only Cruzeiro do Sul (10.8%) and Rodrigues Alves (18.56%) met the recommendations for the maximum acquisition of processed and ultra-processed foods.

In agreement with these findings, a study in Coari, in the state of Amazonas, also found that fresh or minimally processed foods encompassed the highest investments (50.25%). The reality of Regional Juruá resembles that of this municipality since, although more than half of investments targeted fresh or minimally processed foods, three municipalities (Mâncio Lima, Marechal Thaumaturgo, and Porto Walter) failed to comply with Resolution CD/FNDE No. 6/2020,[6] which establishes the minimum percentages for each processing category.[17]

A national study by Azevedo et al.[18] evaluated 66.4% of all Brazilian municipalities (3,698) and found that the percentage of federal resources spent on fresh or minimally processed foods equaled 69.32%, whereas that for ultra-processed foods, 20.73%. Comparatively, the Juruá municipalities averaged slightly higher, totaling 69.61% for fresh or minimally processed foods and 29.88% for ultra-processed ones. These data show that Regional Juruá acquires fresh or minimally processed foods close to the national average and that it unfortunately spends more on ultra-processed foods than the national average.

The resources transferred and used to acquire food from family farming within the PNAE scope significantly varied between municipalities. Cruzeiro do Sul received the largest number of resources (R$

1,292,096.00) but used only R$ 560,592.27 in family farming food (43.39% of the transferred amount). Marechal Thaumaturgo also stands out as it spent 45.63% of its funds (R$ 474,066.00), acquiring R$ 216,320.16 of family farming food. On the other hand, Mâncio Lima showed the lowest resource use percentage, only spending 5.92% of its transferred amount (R$ 330,690.00), i.e., R$ 19,575.00, on these products. Porto Walter, on the other hand, used 34.16% of its available resources (R$ 97,010.58 in purchases). Rodrigues Alves spent more than the amount it received (R$ 130,251.00), acquiring R$ 183,574.36 (140.94%) in family farming food. This scenario may suggest the complementation of resources from other sources or a possible error in the initial distribution of the transferred amounts.

A 2019 analysis on the resources allocated toward family farming food from 2011 to 2017 showed that the FNDE transferred R$ 2,746,866,252.41 for school meals in the 26 Brazilian capitals and Federal District, of which R$ 357,443,960.12 (13%) served to acquire family farming food. About a third (33.3%) of the 27 analyzed capitals allocated a minimum of 30% of these resources for these products.[19]

In 2024, Acre showed significant food acquisition, investing about R$ 70 million; about R$ 14 million of which came from PNAE, nearly 20% of all investments. Note that 78% of the federal transfer targeted family farming food, significantly exceeding the minimum percentage required by current legislation. This places Acre in a prominent position in the national scene. Previous data show that only the Brazilian North reached the minimum percentage of family farming investment (39.4%), whereas the Southeast, the lowest (6.4%). Of the capitals, Boa Vista had the highest percentage of acquisition with PNAE resources from family farming (56.6%), whereas Rio de Janeiro, only 0.1%. In this context, Acre effectively implemented the public policy of school feeding, appreciating local production and contributing to the food and nutritional security of students in the public network.[19,20]

Data for Juruá municipalities varies significantly. Compared with Araujo et al.,[19] for example, Cruzeiro do Sul allocated 43.39% of its funds for purchasing family farming food, placing above the national (13%) and Northern prevalence (39.4%).[19] Marechal Thaumaturgo also significantly invested in it (45.63%). In turn, Mâncio Lima went against this trend by spending only 5.92%, a percentage considerably below the recommended value. Rodrigues Alves stands out positively (140.94%) by exceeding the received amount and showing greater effort, which may indicate resource complementation.

Thus, while Juruá municipalities showed varied investments with some,like Cruzeiro do Sul and Marechal Thaumaturgo, surpassing the national and regional averages, others, such as Mâncio Lima, remain below the recommended minimum. Juruá appears to have committed itself to acquiring family farming food, though its municipalities show consistency challenges.

The Vale do Juruá mesoregion has particularities that differentiate it from other Brazilian regions, especially its high concentration of rivers and locations of difficult access. The road network of many local municipalities lacks adequate infrastructure, particularly in the most remote inner areas, significantly impacting the transportation of perishable foodstuffs. Despite recommendations of Resolution CD/FNDE No. 06,[6] the logistical difficulties faced in Acre, worsened by its geographical isolation and precarious transport infrastructure, challenge its operationalization. Current conditions affect food transportation and preservation, compromising the delivery of good products and nutritionally adequate meals in public schools.[13]

Another aggravating factor is the local severe drought, which drastically reduces the river navigability due to low water levels. Porto Walter and Marechal Thaumaturgo exemplify this situation as they stand among the state's isolated locations without land access. The Juruá River constitutes the main means of transport for these municipalities, and boats can take up to a week to complete their journey. Thus,

transportation of foodstuffs in these places occurs exclusively by air and river, increasing costs and hindering access to fresh and healthy food, as recommended by Resolution CD/FNDE No. 06/2020.[6,13,21,22]

The deficient electricity supply also worsens the logistical challenges. Some municipalities have adopted a rotation system to distribute energy, whereas locations like Porto Walter depend on thermoelectric plants for their electricity. This dependence faces frequent interruptions especially due to the difficulty of supplying diesel fuel, risking blackouts. Blackouts directly impact the conservation of perishable food, generating losses that further compromise food security and the ability to provide balanced meals in schools in compliance with PNAE requirements.[21]

Regarding the recommended purchase of at least 50 different types of fresh or minimally processed foods, only Rodrigues Alves purchased adequate amounts. Choosing a rich variety of foods is essential to ensure a varied and nutritionally adequate school diet. Such diversification promotes the intake of essential nutrients, collaborates in the creation of healthy eating practices, stimulates local agriculture, praises regional culinary traditions, correlates it with better school performance, and integrally develop students.

The National Council for Food Security and Nutrition defines three guiding principles for healthy eating: variety (for the set of nutrients necessary for the body by different food groups), moderation (amounts equal or below daily needs), and balance (quantity and quality).[23]

Analysis of the distribution of financial resources for food acquisition in Juruá, in 2022, shows variations in the composition of the food groups purchased by municipalities, reflecting differences in food supply, cultural preferences, and logistical challenges. Prioritization of food groups like meat, cereals, and milk reinforces the importance of ensuring essential macro and micronutrients for students. However, policy-making aimed at promoting healthy eating habits in school meals should consider the need for greater incentives for the consumption of fruits, vegetables, and tubers.

Generally, resource allocation results indicate a predominance of meat and eggs, followed by cereals, milk, cheese, and fruits. This pattern suggests a dietary structure that prioritizes sources of protein, carbohydrates, and calcium, which are essential for child growth and development. However, most municipalities purchased relatively few vegetables, roots, and tubers, which may compromise dietary diversity and the supply of essential fiber, vitamins, and minerals.[24] Results indicate that, despite a relatively diversified food base, municipalities should include groups that ensure greater nutritional variety. The low representativeness of some fiber - and micronutrient-rich foods, such as vegetables and fruits, suggests the need for strategies to expand their offer in the school menu. Moreover, the appreciation of regional foods like roots and tubers should be encouraged, promoting food diversity and the sustainability of local production chains.

Consumption of ultra-processed foods should be limited given their association with an inadequate nutritional profile. Producing these foods involves excessive addition of substances like salt, sugars, fats, and chemical additives. Several ingredients for industrial use often provide attractiveness to products by color, flavor, aroma, and texture, resulting in frequent consumption.[15] This practice restricts important essential micronutrients in a diet with fresh or minimally processed foods, negatively influencing child and adolescent development and increasing energy density that, when unspent, is stored in the body as fat.[15,25]

An analysis using data from the Household Budget Survey conducted in the 11 Brazilian metropolitan regions over three decades (1987 to 2018) found that ultra-processed food products have steadily replaced fresh or minimally processed foods and that with processed culinary ingredients. This pattern occurred in all social strata, indicating a significant change in the population's eating habits over the years.[26] From 2002 onward, the Household Budget Survey encompassed all of Brazil, no longer surveying only metropolitan

regions. From 2002 to 2018, the contribution of ultra-processed foods to the total energy/calories consumed in the country increased from 14.3 to 19.4%. This increase was 0.4 percentage points per year from 2002 to 2009, and decelerated to 0.2 percentage points from 2008 to 2018.[26]

Most energy/calories children and adolescents consume in Brazil consisted of fresh or minimally processed foods (51%), processed culinary ingredients (15-18%), processed foodstuffs (13%), and ultra-processed foods (18%).[27]

Ultra-processed foods significantly and negatively impact the nutritional quality of diets, being associated with increased intake of additional sugars and of total, saturated, and trans fats and a reduction in the intake of proteins, dietary fibers, vitamins, and minerals.[28,29] This contributes to a high prevalence of chronic non-communicable diseases, responsible for over 70% of the causes of death in Brazil. The main associated morbidities include cardiovascular diseases, stroke, diabetes mellitus, chronic obstructive pulmonary disease, kidney diseases, cancer, and Alzheimer's disease, in descending order.[30] Studies have also reported an association between ultra-processed foods and adverse effects on mental health, with symptoms of common disorders such as depression and anxiety occurring more often.[31]

A study on the quality of the food in 38 public daycare centers for children aged from 12 to 36 months showed that a significant portion of the energy consumed (about 45.8%) comes from ultra-processed foods. It also noted that 33.9, 42.8, 48.9 and 20.9% of their diet consisted of lipids, proteins, carbohydrates, and sodium, respectively. Most common ultra-processed foods include porridge, processed cookies and breads, gelatin, instant noodles, reconstituted concentrated juices, industrialized chocolate milk, and industrialized strawberry yogurt.[32]

These worrisome results contradict the PNAE guidelines, which aim to promote healthy eating habits by a balanced and adequate diet. Ensuring that meals meet the PNAE objectives and promoting students' health must reformulate the food in schools.[6]

Determining food intake, especially the increase in the consumption of ultra-processed foods, is multifactorial and many of these factors can be modified, such as distractions caused by electronic devices, cell phones, and televisions during meals, which can interfere with the satiety mechanism. Moreover, the irregular frequency of breakfast (less than four days a week) is correlated with higher consumption of ultra-processed foods.

Other factors include the school environment as private school students in urban areas tend to consume ultra-processed foods excessively due to the frequent presence of canteens and the lower supply of school meals, which may result from the non-mandatory adherence to PNAE. Also, foods with low nutritional value are increasingly advertised on various digital platforms, influencing the formation of eating habits. Thus, finding these consumption patterns is crucial to develop effective food and nutrition education strategies and to prevent problems related to excess weight. [33]

The school feeding guidelines support sustainable development, encouraging the acquisition of foodstuffs from local production and giving priority to those from family farming and rural family entrepreneurs. FNDE requires that at least 30% of the resources be invested in this sector.[6] This will increase nutrient diversity, helping to avoid the need to resort to highly processed foods which represent a significant risk to a healthy and sustainable diet since processing loses many nutrients, leading to the addition of fats, sodium, additive sugars, or preservatives.[34]

Although this is a pioneering study in Acre, its limitations should be acknowledged. The SiGPC has information gaps since only invoices related to food acquisition with FNDE resources are compulsorily

entered in the system, exempting the insertion of notes referring to the municipal counterpart despite recommendation of including them. Thus, this study may have underestimated food acquisition according to the NOVA classification. We therefore emphasize the importance of fully including all information on SIGPC to promote social control. Notably, few studies have used the adopted methodology which limits comparisons of our results with other regions.

CONCLUSION

Regional Juruá municipalities still face difficulties in complying with the proportional obligation to allocate financial resources according to processing level and a minimum diversity of 50 fresh or minimally processed foods.

The proportion distribution of fresh or minimally processed foods varied from 47.37 to 79.03% in Regional Juruá. The proportion of financial resources spent in fresh or minimally processed foods ranged from 57.34 to 85.39%; for processed and ultra-processed foods, from 10.80 to 36.7%; and for culinary ingredients, from 3.50 to 7.70%. Only Rodrigues Alves reached the minimum recommendation of 50 fresh or minimally processed foods. Only the municipalities of Cruzeiro do Sul and Rodrigues Alves complied with the proportional allocation of financial resources according to the processing level criteria established in Resolution CD/FNDE No. 6/2020.[6]

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