

BRAZIL

By Celso Pinto Ferraz

At the beginning of 2001 there was optimism in Brazil, based largely on the buoyancy of the economy during the final quarter of 2000, that the country would achieve strong economic growth during the year. This was not to be. The world economic slowdown, the crisis in neighbouring Argentina, higher interest rates and energy rationing forced by drought, all combined to confound hopes of strong growth.

The Brazilian economy in 2001 grew by just 1.5%, much less than the 4.36% achieved in 2000, and GDP grew from BR1,075 billion (US\$549.2 billion) to BR1,184 billion (US\$503.9 billion). The inflation rate for the year reached 7.67%, higher than the 5.97% in 2000 and way above the target of 4%. The trade balance showed a surplus of US\$2.64 billion compared with a deficit in 2000 of US\$725 million, with exports worth US\$58.2 billion, 5.6% up on 2000, and imports down 0.4% to US\$55.5 billion. In December 2000, the exchange rate was BR1.955 to the dollar and in December 2001 the rate was BR2.32. Brazil's monetary reserves were US\$33.01 billion at the end of 2000, and at the end of 2001 they stood at US\$35.86 billion. The value of gold held in this reserve reduced from US\$577 million in 2000 to US\$303 million in 2001.

The Brazilian mining and metallurgical sector was adversely affected by the downturn in the domestic and world economy, and also by the power rationing in the country which forced production cutbacks and a consequent reduction in profit margins in many cases. This, allied to low commodity prices in the international marketplace, obliged a number of companies to postpone major new investments.

Proposed changes to the government structure that administers the use of Brazil's mineral resources that had previously been announced (eg, the establishment of a

National Mining Agency) did not happen in 2001 and it is unlikely that they will be carried out during 2002 as it a year of elections for President, State Governors and federal and state deputies.

In 2001, the National Department of Mineral Production (DNPM) issued 11,225 exploration licences, barely half the 21,200 issued in 2000. However, the DNPM estimated that mineral exploration investment in 2001 reached US\$136 million, 31% higher than the US\$104 million in the preceding year. Also, during 2001, the DNPM open 9,081 areas for mining.

Aluminium

Bauxite production in 2001 fell by 5% to an estimated 13.1 Mt. Of this total, Mineração Rio do Norte (MRN) accounted for 10.7 Mt. MRN is a joint venture between state-owned CVRD-Aluvale (40%), Billiton (14.8%), Alcoa (13.2%), Alcan (12%), Cia Brasileira de Alumínio - CBA (10%), Norsk Hydro (5%) and Reynolds (5%). The remainder was produced by the mines of CBA, Alcoa, Alcan, Mineração Curimbaba and MSL Minerais SA. About 420,000 t of this production was refractory-grade bauxite produced mainly by two companies - Mineração Curimbaba and MSL. Bauxite exports in 2001 were 3.43 Mt, 17.7% down on 2000 and valued at US\$98.5 million, 12.9% lower. MRN invested US\$83 million to expand annual production capacity at the Trombetas mine in Amazonas to 16.3 Mt/y by the end of 2002. The total budget for the project will be about US\$206 million.

The Alunorte alumina refinery, operated by a consortium comprising Aluvale (45.58%), Norsk Hydro (32.28%), MRN (12.6%), Nippon Amazon Aluminium (4.49%), CBA (3.62%) and JAIC (1.41%) produced 1.61 Mt of alumina in 2001, down 1.7% on the 1.63 Mt produced in the previous year. Total Brazilian alumina production was about 3.5 Mt. Alumina

exports in 2001 were 1.08 Mt, valued at US\$198.4 million. Alunorte began an expansion of the refinery that should increase capacity by 55%, to 2.3 Mt/y in November 2002. By the end of 2001, US\$69 million had been invested in the project out of a budgeted total of US\$286 million.

Last year, Brazil's primary aluminium production fell by 11% to 1.13 Mt. The Albrás facility at Vila do Conde in Pará (Aluvale 51% and Japanese companies 49%) produced 333,500 t, Alcoa 243,900 t, CBA (Votorantim group) 230,400 t, Billiton 187,200 t, Alcan 92,100 t and Aluvale 43,600 t. The Alumar plant (Alcoa and Billiton) at São Luiz, Maranhão, reported production of 325,100 t, CBA's plant at Mairinque in São Paulo produced 230,400 t, the Valesul plant (Aluvale 54.5% and Billiton 45.5%) at Santa Cruz, Rio de Janeiro, 79,900 t, the Alcoa plant at Poços de Caldas, Minas Gerais 69,700 t, and the Alcan plants at Ouro Preto in Minas Gerais and Aratu in Bahia produced 44,500 t and 47,600 t respectively.

The Alumar refinery at Maranhão is investing US\$550 million in an expansion programme, while CBA has already completed 40% of a US\$450 million investment to increase production from 240,000 t to 340,000 t/y in a first stage and to 500,000 t/y in a second stage, to be completed in 2006/07. Albrás completed a capacity expansion to 45,000 t/y in October, 2001.

In 2001, Brazil's imports of aluminium in all forms totalled 137,513 t (worth US\$451 million), 20% more than in previous year. Exports reached 716,111 t (worth US\$1.16 billion), 20% less than 2000. The supply of primary aluminium to the domestic market was 7.3% higher, at 551,500 t.

Brazil recycled 85% of all aluminium cans for beverages consumed in 2001. This rate, disclosed by the Brazilian Aluminium Association, is the highest rate achieved since 1990. Brazil may become the world leader, depending on Japan's rate (81% in 2000).

Coal

Brazil's run-of-mine (ROM) coal production fell 2.3% to 11.2 Mt from 11.5 Mt (revised) in 2000, and the marketable output fell 27% to 5.6 Mt. Copelmi was the largest producer with ROM output of 1.95 Mt, followed by CRM at 1.71 Mt, Rio Deserto at 1.61 Mt, Metropolitana at 1.61 Mt and Criciuma at 1.27 Mt. In 2001, the domestic coal sold (5.9 Mt) was used in the three southernmost states: Santa Catarina (50.5%), Rio Grande do Sul (48.1%) and Paraná (1.4%). Brazil's requirements for metallurgical coal imports decreased from 14.87 Mt to 14.79 Mt in 2001, valued at US\$567 million, 8.2% higher than in 2000, and bought mainly from the US (33.0%), Australia (31.0%), Canada (10.6%), China (7.6%) and Venezuela (5.0%).

In 2001, a hard drought period led, for the first time in Brazil, to a rationing of 25% on electricity consumption. The federal government tried to go ahead with its 'Priority Programme for Thermoelectricity' that involves 49 power stations, based mainly on natural gas. Three of them, to be constructed in Rio Grande do Sul, will be based on coal: the 250 MW Seival plant of Copelmi; the 350 MW Candiota II of Eletrobras; and the 350 MW Jacui plant of Tractebel. The mining company CRM is investing US\$3 million to supply coal to Candiota and Jacui. The Jacui plant received its installation licence from FEPAM (the environmental control agency of the State of Rio Grande do Sul) in December, 2001. In Santa Catarina, the 400 MW Sul Catarinense plant will be constructed with Metropolitan and Criciuma mines as partners. The Figueira thermoelectric plant of Cia Paranaense de Energia (COPEL), based on coal, will be upgraded from 20 MW to 140 MW, and is projected to begin operations at the increased capacity in October 2003.

Copper

Brazilian production of copper in concentrates rose in 2001 by 7.2% to 34,448 t and was recovered at the country's only copper mine, owned by Mineração Caraíba (MSB group) in Bahia. Total primary metal production rose by

15% to 212,243 t. Caraiba Metais (Paranapanema group) is the sole electrolytic copper producer and in 2001 it invested US\$12.6 million in various projects including: the completion of a plant to produce 6,000 t/y of oxygen-free bars; the installation of a gas recovery system; and various operational improvements to improve productivity. The proposed US\$300 million expansion programme, scheduled for completion in 2005, was postponed owing to the low copper price. This decision means that annual production will be maintained at around 210,000 t/y.

In 2001, 543,817 t of concentrates valued at US\$238 million were imported for smelting and refining, an increase of 9.7% over 2000. To meet primary copper demand of around 345,000 t/y, imports of copper in all forms in 2001 totalled 177,000 t, a decrease in volume terms of 4.6%, compared with 2000, and 13.4% lower in value (US\$349 million). With copper exports of just 67,911 t, this sector of the mining industry recorded a trade deficit of US\$232 million.

Feasibility studies up to now suggest that CVRD's copper projects are very competitive. The development of the projects in 2001 reinforced expectations that CVRD will become a significant copper producer, with annual production of some 690,000 t beginning in 2007. In October 2001, CVRD acquired the 50% stake that Phelps Dodge owned in the Sossego project in the Carajas region for US\$42.5 million. The wholly-owned project should produce 500,000 t/y of concentrate and yield 150,000 t/y of copper and 3.5 t/y of gold. When the Sossego project comes on stream in 2004, it will stimulate other projects such as 118 and Cristalino, located in the southern part of Carajás.

For the Cristalino project, CVRD is associated with BNDES - the National Bank of Economical and Social Development (50%), an association that prevails in all the other CVRD copper projects in Carajás. The project is quite similar to Sossego and should also produce 150,000 t/y copper and 3.5 t/y of gold. The Alemão project, in association with

BNDES, is envisaged as an underground operation producing 80,000 t/y of copper and 4 t/y of gold. The 118 project contains a copper oxide resource of 100-120 Mt averaging 0.8% Cu and a feasibility study should be concluded later this year.

The other major copper project, Salobo, is now being re-evaluated using a hydrometallurgical recovery process. Results to date are extremely promising. In April 2001, CVRD completed an economic pre-feasibility study which confirmed the viability of a new process route for the Salobo project developed by Cominco Engineering Services Limited - CESL. The estimated investment needed for the construction of a plant using this new process route is US\$1 billion, for an annual production capacity of 200,000 t of copper cathodes.

In November 2001, CVRD and Codelco of Chile signed a Memorandum of Understanding which established the joint basis of exploiting opportunities in the area of copper production and processing.

Gold

Brazil's gold production in 2001 is estimated to have been around 54 t comprising 38 t from mining companies and about 16 t from garimpo operations. This represents a decrease of 4 t in mining companies' production compared with 2000. Exports fell last year by 10.6% from US\$375.4 million in 2000 to US\$335.8 million. Output by CVRD, the biggest producer, fell by 1,572 kg to 15,815 kg. AngloGold, the second largest gold producer, reported production of 6,501 kg from Mineração Morro Velho and 6,076 kg from Mineração Serra Grande (Anglo - TVX). Rio Paracatu Mineração (Rio Tinto 51%, Autram 49%) is the third largest gold producer and reported a production of 5,816 kg. In fourth place, São Bento Mineração (Eldorado Gold Corp.) produced 3,187 kg.

Iron Ore

In 2001, iron ore was Brazil's main export commodity, accounting for 5% of the total value of Brazilian exports of US\$58.2 billion.

Marketable iron-ore production rose by 1.4% to 215.5 Mt, whilst exports decreased by 0.7% to about 156 Mt, worth US\$2.93 billion. Exports went to 40 countries, the biggest customers being China (taking about 16.5% of total shipments by value), Japan 15.6%, Germany 12.3%, Italy 6.8%, Belgium and Luxembourg 4.8%. Five companies account for more than 90% of production: Companhia Vale do Rio Doce (CVRD), Mineração Brasileiras Reunidas (MBR), Ferteeco, Samarco Mineração and Cia Siderúrgica Nacional (CSN).

During 2001, as in 2000, CVRD continue to make acquisitions that helped to consolidate its leading position in the global iron-ore market. On April 27, 2001, it concluded negotiations to purchase 100% of Ferteeco for US\$566 million. Ferteeco operates two iron ore mines, Fábrica and Feijão, and a pelletising plant located in the Iron Quadrangle region in the state of Minas Gerais. It has an annual production capacity of 16.2 Mt of iron ore and 4.3 Mt of pellets. Ferteeco holds 10.5% of the total capital of MRS and operates a maritime terminal at the port of Sepetiba, in the state of Rio de Janeiro. Until CVRD's purchase of Ferteeco, MRS had been the only company in Brazil operating an iron-ore railway in which CVRD did not have a stake.

Also during 2001, CVRD completed the purchase of 50% of the common shares of Caemi Mineração e Metalúrgica SA (Caemi) on December 7, for US\$278.7 million. Caemi is a non-operational holding company, with significant shareholdings in iron-ore businesses through a controlling stake in MBR, Brazil's second-largest producer of iron ore and a significant producer of kaolin and refractory bauxite. MBR holds a 31.95% stake in the total capital of MRS. MBR sold 28.1 Mt of iron ore in 2001, while Cadam, a producer of kaolin, sold 771,900 t of this product. The acquisition of Caemi was approved by the European Commission, on condition that it sold its 50% stake in Quebec Cartier Mining Co., a Canadian iron ore and pellet producer.

Through these acquisitions and their subsequent consolidation into CVRD's operations, a substantial cost reduction was achieved in the Southern System as well as increased operational flexibility. CVRD gained flexibility by widening its range of end-products, allowing alternative blending to improve quality and adapting products to customer requirements.

Nickel

Production of electrolytic nickel, nickel in ferro-nickel alloys and nickel in matte reached 32,622 t in 2001, 2% higher than the 31,991 t reported a year earlier. Production by Cia Niquel Tocantins (Votorantim group) reached 16,684 t of electrolytic nickel, while Codemin (Anglo American) produced 5,768 t. Rio Tinto's Mineração Serra da Fortaleza operation produced 10,170 t of contained nickel in matte a 16.4% increase on the 8,738 t in 2000. Serra da Fortaleza, after the transition from open-pit to underground mining, improved its mining and metallurgical performance and achieved its full capacity.

Matte exports increased to 20,038 t worth US\$48.9 million, compared with 16,330 t worth US\$57.7 million in 2000. The exports of electrolytic nickel decreased to 9,614 t, worth US\$56 million, compared with 11,927 t worth US\$100.7 million in 2000. Exports of ferro-nickel decrease by 62% from 6,655 t worth US\$16.6 million, to 2,518 t worth US\$4.7 million. Imports of ferro-nickel were insignificant but imports of primary nickel totalled 8,899 t worth US\$67.7 million, compared with 11,602 t worth US\$118 million in 2000.

Tin

Production of tin-in-concentrate decreased by 5.3% to 13,048 t last year. Mamoré Mineração e Metalurgia (Paranapanema group) produced 9,115 t, Cesbra 1,120 t and others 2,813 t. Refined output decrease by 12.4% to 12,109 t. Mamoré produced 9,235 t, Cesbra 1,475 t, Best 486 t and others 914 t. Exports fell by 9.4% to 6,454 t, and were shipped mainly to the US (85.6%), Argentina

(8.2%), Belgium (2.2%) Chile (1.9%) and Netherlands (0.9%). Accordingly, earnings from tin exports fell by US\$9 million to US\$26 million.

At the Pitinga mine (Mamoré), a great effort was made to reduce costs in a bid to offset the fall in the price of tin. As the company possesses its own hydroelectric plant, it was not affected by rationing of electricity supplies. In 2001, after completing the installation of the necessary equipment to recover tin contained in low grade ore (about 16,000 t) alluvial mining ceased in mid-year. The alluvial cassiterite reserves are nearly exhausted and the company is now developing the Rocha São deposit. This is a primary deposit and the mine and concentrator requires an investment of some US\$130 million. Financing is being negotiated.

At the beginning of 2000, Mamoré acquired a chemical plant in Minas Gerais for the production of tantalum and niobium oxides - columbite and tantalum tantalite occur in Pitinga's cassiterite ore. The plant commenced operations in February of 2001 but production will be reliant on the availability of raw materials and this will be dependent on the mining programme and the costs of extracting the tin ore (cassiterite) at the Pitinga mine.

Zinc

Zinc metal output rose in 2001 by 0.7% to 193,061 t. Cia Mineira de Metais (Votorantim group) produced 114,978 t (59.5% of the total) up 3.9% from 2000, mainly from domestic concentrates treated at the Tres Marias metallurgical plant. Output from Cia Paraibuna de Metais, at its Juiz de Fora complex in Minas Gerais, fell by 3.7% to 78,083 t (40.5% of the total) and was based exclusively on imported concentrates. To meet primary zinc demand of about 203,000 t/y, imports of zinc in all forms in 2001 totalled 37,485 t an increase in volume terms of 41% compared with 2000, and 22.1% higher by value (US\$38 million). Zinc exports in 2001 totalled 24,506 t, hence the trade deficit was 12,979 t valued at US\$15.2

million. Imports of zinc concentrate decreased by 1.7% to 183,790 t worth US\$52.4 million, compared with 186,945 t worth US\$64.4 million in 2000.

Cia Mineira de Metais continued with its US\$150 million expansion programme at the Vazante and Morro Agudo mines, and at the Tres Marias plant. By the end of 2004, this will have increased capacity from the current 114,000 t/y to 160,000 t/y. Feasibility studies for a further expansion to 240,000 t/y have already begun.

Phosphate

Brazil's production of phosphate rose by 1.7% in 2001 to an estimated 4.8 Mt of concentrate. Four companies account for about 94% of production: Fosfertil (Fertifos group) 34%, Bunge Fertilizantes 30%, Ultrafertil (Fertifos group) 15% and Copebras (Anglo American) 15%.

Fosfertil and its subsidiary Ultrafertil have as their principal shareholders the Fertifós Group (81.54%) and CVRD (10.96%). Fertifós is controlled by Bunge (52%), Cargill (33%), Fertibras (12%) and Fertiza (10%). In 2001, the company maintained its position as the principal producer of phosphate and nitrate-based fertilisers. The phosphate is produced from its mines at Tapira and Patos de Minas in Minas Gerais (Fosfertil) and Catalão in Goiás (Ultrafertil). In 2001, they produced a total of 2.53 Mt of phosphate concentrate. The Tapira mining complex recently increased its installed capacity from 1.6 Mt to 2.0 Mt/y. At Patos de Minas, installed capacity is 150,000 t/y and at Catalão (Ultrafertil), capacity is around 1 Mt/y.

On October 26, 2001, Fosfertil and Ultrafertil inaugurated the first stage of the 'integration' of the Catalão mining complex. The investment was some US\$20 million and was directed primarily towards the construction of plants to produce powder or granulated Simple Super Phosphate, with a production capacity of 350,000 t/y. Part of the investment went towards the building of curing and

storage warehouses, the biggest of which can store 45,000 t of granulated product.

Bunge Fertilizantes has two mines, at Araxá in Minas Gerais and at Cajati in São Paulo. It is organised into two business units: fertilisers and animal feed nutrients. Due to the quality of the phosphate rock found at Cajati, mine output there is destined exclusively for products for animal and human nutrition. At Araxá, output is principally used in the production of phosphate for use in agricultural fertilisers. In total, Bunge produces around 1.4 Mt/y of phosphate concentrate. A new mine (Salitre) is scheduled to begin operations in 2004, at which time annual production is expected to be 4.8 Mt/y of crude ore. Reserves are sufficient to last for almost 100 years.

Copebrás (Anglo American) produces around 15% of the total Brazilian production of phosphate concentrate or some 720,000 t/y from Catalão in Goiás. In January, 2001, construction began on a project to produce superphosphate.

Adubos Trevo produces around 200,000 t of phosphate rock in 2001 from its lagamar mine in Minas Gerais. In July, 2000, the company, in a 'preventive concordat', transferred corporate control to Norsk Hydro. Subsequently, it resolved its financial problems and last year the company achieved a sales increase of 74%. Norsk Hydro's arrival on the scene has added one more international group to Brazil's fertiliser industry, alongside Bunge, Cargill and Archer Daniels Midland (ADM).

The growth potential of the Brazilian fertilisers industry is enormous due to new transport and energy infrastructure inside the country. In 2001, Brazil used 16.53 Mt of fertilisers compared with 16.39 Mt in 2000. Brazil could soon be third-largest world market for fertilisers, behind China (34 Mt) and the US (20 Mt). Actual production last year decreased by about 5% to 7.6 Mt. Imports also decreased, by 5.5% to 9.74 Mt.

Brazilian Mineral Exports (US\$ million and t except where stated)

Commodity	2000 ^r		2001 ^p	
	Volume	Value	Volume	Value
Metallic:				
Iron ore (Mt)	158.0	3,048.2	156.0	2,932.0
Bauxite (Mt)	4.16	113.1	3.43	98.5
Manganese (Mt)	1.02	46.5	1.20	56.2
Chromite	142,532	9.3	78,514	5.3
Non-metallic				
Asbestos	63,133	27.5	53,917	21.2
Kaolin (Mt)	1.39	151.5	1.44	157.0
Graphite	17,993	19.0	12,785	13.4
Magnesite	78,961	10.5	56,508	6.7
Dimension stone(Mt)	1.01	270.0	1.01	255.2
Semi-Finished:				
Iron-steel (Mt)	9.60	2,717	9.29	2,278
Aluminium (Mt)	0.89	1,489	0.72	1,166
Tin	7,124	34.99	6,454	26.02
Copper	70,828	137.45	67,911	117.14
Silicon metal	154,009	167.16	104,540	113.34
Nickel ¹	28,518	161.68	29,963	108.17
Ferro-manganese	133,417	57.94	87,837	37.24
Ferro-chrome	135	0.26	143	0.28
Ferro-niobium	27,928	244.04	28,929	252.54
Ferro-nickel	6,655	16.67	2,518	4.71
Ferro-silicon	182,198	122.09	110,232	182.19
Zinc	24,548	28.90	24,506	22.62

Source: MME/SMM; SECEX-MDIC.

^r revised, ^p provisional

¹Except nickel content in ferro-nickel.

Oil

Agencia Nacional do Petroleo (ANP) staged its third auction of oil exploration permits and the results were considered, as in the previous auction, very good. A total of 26 oil companies participated in the bidding process for 53 areas (43 offshore and 10 onshore). No offers were received for 19 blocks but 34 were sold, for about BR595 million, a 27% increase from the previous auction.

On March 15, 2001, Petrobras, the state oil company, faced a serious accident - the sinking of its huge platform P-36 that was operating in the Rocador field which cost the lives of 11 employees. In 2001, the average annual production was 1.4 Mbbbl/d of oil, liquified natural gas (LNG) and condensate, together with 41.1 Mm³/d of natural gas for a total average daily production of 1.64 Mbbbl of oil equivalent, which represents an increase of 5% in relation to the prior year. Petrobras's production goals of 1.90 Mbbbl/d by 2005, remain in place. The goal implies an 8.4% annual growth in production for the 2000/05 period. Offshore production of oil, LNG, condensate and natural gas corresponded to 79% of the total, of which 73% derived from systems located in water depths exceeding 400 m. By 2005, the company plans to reach a 1.9 Mbbbl/d production rate in Brazil and to produce nearly 75% of this from deep and ultra-deepwater (> 1,000 m).

During 2001, the supply of natural gas reached 25.6 Mm³/d. Of this total, 10.1 Mm³ was imported daily from Bolivia which represents a 28.5% increase in relation to 2000.

Brazilian Mineral Production (t except where stated)

Commodity	1999 ^r	2000 ^r	2001 ^p
Iron ore (Mt)	194.0	212	215
Bauxite (Mt)	13.8	13.8	13.1
Coal ¹ (Mt)	5.72	6.79	5.64
Phosphate ² (Mt)	4.34	4.72	4.80
Manganese ² (Mt)	1.64	1.92	2.21
Copper ³	31,371	31,786	34,448
Tin ³	13,200	13,773	13,048
Chromium ⁴	190,000	253,248	174,040
Nickel ⁵	32,268	31,991	32,622
Niobium ⁶	18,866	18,218	24,864
Potassium ⁷	348,231	351,681	357,232
Zinc ³	98,590	100,254	103,000
Gold (kg)	51,000	52,000	54,000
Asbestos	188,400	209,232	172,695
Kaolin ² (Mt)	1.52	1.64	1.81
Fluorite	38,200	43,000	54,000
Gypsum (Mt)	1.45	1.54	1.45
Magnesite ²	260,000	280,000	265,000
Natural gas (Mm ³)	11,456	13,327	14,045
Petroleum ('000 m ³)	64,614	74,000	77,600

Source: DNPM/DIRIM; SMM/MME.

r revised; p provisional;

¹ Marketable Coal

² concentrated or beneficiated

³ metal content

⁴ Cr₂O₃ content

⁵ electrolytic nickel, metal content in ferro-nickel alloy and in matte;

⁶ Nb₂O₅ content;

⁷ K₂O content.