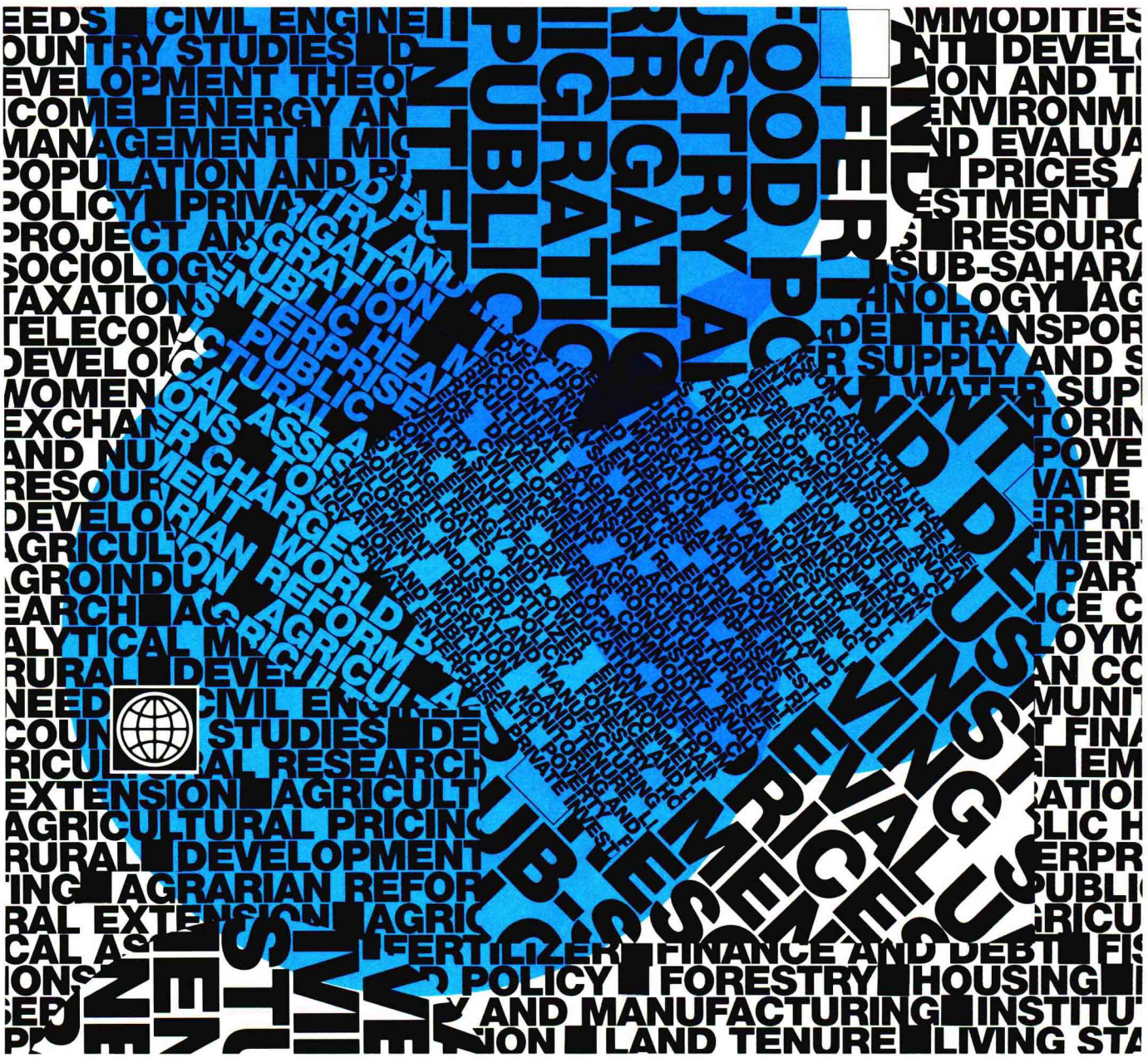
WORLD BANK TECHNICAL PAPER NUMBER 309

World and Regional Supply and Demand Balances for Nitrogen, Phosphate, and Potash, 1993/94-1999/2000

The World Bank/FAO/UNIDO/Industry
Fertilizer Working Group



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The World Bank
Washington, D.C.

Manufactured in the United States of America
First printing December 1995

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ISSN: 1014-9848
ISBN: 0-8213-3495-6

Foreword

Since the establishment of the World Bank/FAO/UNIDO/Industry Fertilizer Working Group in the mid 1970's, the Bank has chaired the Group and maintained its extensive fertilizer database in cooperation with FAO, UNIDO, IFDC and the international fertilizer industry. One of the main activities of the Group is the preparation of annual fertilizer nutrient supply demand balances that cover the latest two-year historical data and forecasts over the next five-years.

The World Bank agreed in 1991 to publish annually on behalf of the Fertilizer Working Group the new fertilizer supply demand balances as soon as they become available. This current issue of the "World and Regional Supply and Demand Balances for Nitrogen, Phosphate, and Potash" reflects the conclusions of the 1995 meetings of the World Bank/FAO/UNIDO/Industry Fertilizer Working Group.

Richard Stern
Director
Industry and Energy Department
Finance and Private Sector Development

Abstract

Since 1991 the World Bank has been publishing "The World and Regional Supply and Demand Balances for Nitrogen, Phosphate, and Potash" on an annual basis in the form of World Bank Technical Papers. The current publication again provides statistical data in tabular format on the most recent historical fertilizer nutrient supply and demand balances as well as a five-year forecast and is based on the August 1995 assessments by the World Bank/FAO/UNIDO/Industry Fertilizer Working Group.

Global and regional data are presented for the three main fertilizer nutrients: nitrogen, phosphate, and potash. A brief introduction supplies some background on the activities and composition of the Group and explains its methodologies used for the projections.

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INTRODUCTION

The World Bank/FAO/UNIDO/Industry Fertilizer Working Group (the 'Group') includes a number of specialists who are experienced in the analysis of trends in the production and consumption of the three main fertilizer nutrients (nitrogen, phosphate and potash) and fertilizer raw materials. Other members of the Group represent major industrial associations of the nitrogen, phosphate, potash and sulfur industries. Technical, production, marketing and agricultural interests are also represented within the Group.

The capacity and supply capability of the main fertilizer raw materials and intermediates are calculated on a country by country basis and take into account the phasing-in of new plants, anticipated plant utilization rates and idle capacity. Because some of these materials are also used for purposes other than fertilizers, their industrial consumption is subtracted from the supply capability to arrive at availability for fertilizer use; further, allowances are made for processing and distribution losses. The resultant figure is the potential fertilizer supply capability at the farm level.

Demand projections are the consensus of the Group and take into account a variety of methodologies, including trend analyses, market surveys, agricultural programs and, for some large countries, econometric modelling. Other economic factors that are taken into account by the Group include the impact of oil and agricultural prices on fertilizer demand and the possible constraints arising from environmental legislation. Policy issues and agricultural programs in the major fertilizer consuming countries are also taken into consideration. Of particular importance to both fertilizer demand and trade are current political and economic changes that are taking place, especially in Eastern Europe and the former Soviet Union (FSU).

In preparing the forecasts, the Group makes contact with fertilizer experts in major fertilizer consuming and producing countries and asks them for their most recent views on the fertilizer situation in their country or region. Their valued comments form an important and integral part of the discussions.

The Group operates in an informal manner and members are encouraged to discuss available data freely before a consensus is taken. Generally, anyone representing a major fertilizer interest is welcome to join the Group, provided he or she is willing and able to make a positive contribution to the work. A wide geographical membership is encouraged.

It is understood that the forecasts of the Group do not necessarily reflect the detailed views of all members of the Group or their associations. A particular strength of the Working Group is that it is prepared to take all views into account, but has no obligations other than that an objective consensus be reached after all relevant issues have been discussed.

Further, it should be noted that the projected supply capabilities for nitrogen, phosphate and potash will not necessarily correlate with actual industry outputs, as production will in most instances follow relevant market trends, whereas the listed supply capabilities reflect the potential output based on the current knowledge of the industry and in the absence of external constraints. The demand projections include historical trend analyses and economic considerations, but do not indicate agronomically optimized scenarios based on maximum sustainable agricultural production including best cropping patterns and technologies.

The World Bank acts as the custodian of the fertilizer data base that has been developed and maintained by the Group. With the help of other members of the Group, the Bank regularly prepares the updated regional and global supply/demand balances, typically for 5-year periods. The balances are discussed and updated if required in the light of further information then available before publication. The World Bank has undertaken to publish, on behalf of the Group, the annual fertilizer supply and demand balances as soon as they have been finalized after the relevant meetings.

Historical Background

In 1974, the world experienced its worst fertilizer crisis ever with prices rising several-fold to unprecedented levels. Many farmers in developing countries could no longer afford to buy or justify the use of fertilizers. Undoubtedly, one of the factors aggravating the problem was the lack of reliable information on supply and demand forecasts for fertilizer materials. Projections from the international agencies and fertilizer industry associations varied widely and a common view was that the world was heading for a catastrophic shortage of fertilizers.

At the World Food Conference held in Rome in November 1974 to discuss the food and fertilizer crisis, it was recognized that there was an urgent need for authoritative and reliable information on the supply and demand of fertilizers which could be disseminated widely throughout the world. Such data provide a valuable input for planning and decision making, assist developing countries in assessing the true state of the market and help planners of new capacity to make better decisions so as to minimize surges in supply and demand.

One of the recommendations of the World Food Conference was that the international agencies establish and maintain an authoritative analysis of the medium and long term fertilizer supply and demand situation and provide information that would assist in avoiding major imbalances between supply and demand.

Since the beginning of 1975, the World Bank, FAO and UNIDO, in association with other international fertilizer agencies and representatives from the international fertilizer industry, have been responsible for maintaining a fertilizer data base and

providing five-year forecasts of world and regional supply and demand balances through the World Bank/FAO/UNIDO/Industry Fertilizer Working Group.

Membership of the Fertilizer Working Group

- International Fertilizer Industry Association (IFA)
- International Fertilizer Development Center (IFDC)
- European Fertilizer Manufacturers Association (EFMA)
- United Nations Industrial Development Organization (UNIDO)
- Food and Agriculture Organization of the UN (FAO)
- The World Bank (IBRD)
- Canpotex Limited
- Kali und Salz AG

All of these organizations maintain their own comprehensive data bases on fertilizers from which information is available to the Group.

- International Food Policy Research Institute (IFPRI)
- Fertilizer Industry Advisory Committee (FIAC)
- International Potash Institute (IPI)
- The Sulphur Institute (TSI)
- The World Phosphate Institute (IMPHOS)
- Potash and Phosphate Institute (PPI)
- Arab Fertilizer Association (AFA)
- Association for the Promotion of Fertilizers and Lime, Brazil (ANDA)
- Fertiliser Association of India (FAI)
- Japan Urea & Ammonium Sulphate Industry Association (JUASIA)
- The Fertilizer Institute of the USA (TFI)
- Prism Sulphur Corporation (as successor of Canada Sulphur Exporters, CANSULEX)

Government Agencies

- US Bureau of Mines (USBM)
- US Department of Agriculture (USDA)
- State Institute of Nitrogen Industry, FSU (GIAP)
- Ministry of Chemical Industry, China

Regional Country Classification[1]

AFRICA

Algeria
Angola
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Central African Rep.
Chad
Congo
Cote d'Ivoire
Egypt
Ethiopia
Gabon
Gambia
Ghana
Guinea
Guinea Bissau
Kenya
Lesotho
Liberia
Libya
Madagascar
Malawi
Mali
Mauritania
Mauritius
Morocco
Mozambique
Niger
Nigeria
Reunion
Rwanda
Senegal
Sierra Leone
Somalia
South Africa
Sudan
Swaziland
Tanzania
Togo
Tunisia
Uganda
Zaire
Zambia
Zimbabwe

AMERICA

North America
Canada
United States

Central America
Bahamas
Barbados
Belize
Bermuda
Costa Rica
Cuba
Dominica
Dominican Rep
El Salvador
Guadeloupe
Guatemala
Haiti
Honduras
Jamaica
Martinique
Mexico
Nicaragua
Panama
St Kitts & Nevis
Saint Lucia
Saint Vincent
Trinidad & Tobago
Virgin Islands

South America
Argentina
Bolivia
Brazil
Chile
Colombia
Ecuador
French Guyana
Guyana
Paraguay
Peru
Surinam
Uruguay
Venezuela

ASIA

West Asia
Bahrain
Cyprus
Iran
Iraq
Israel
Jordan
Kuwait
Lebanon
Oman
Qatar
Saudi Arabia
Syria
Turkey
United Arab Emirates
Yemen

South Asia
Afghanistan
Bangladesh
Bhutan
India
Nepal
Pakistan
Sri Lanka

East Asia
Cambodia
China
Indonesia
Japan
Laos
Malaysia
Mongolia
Myanmar
Korea DPR.
Korea Rep
Philippines
Singapore
Taiwan
Thailand
Vietnam

EUROPE

East Europe
Albania
Bulgaria
Czech Rep
Hungary
Poland
Romania
Slovak Rep
Former Yugos [2]

West Europe
Austria
Belgium-Luxburg
Denmark
Finland
France
Germany
Greece
Iceland
Ireland
Italy
Malta
Netherlands
Norway
Portugal
Spain
Sweden
Switzerland
United Kingdom

FSU (Former Soviet Union)
Armenia
Azerbaijan
Belarus
Estonia
Georgia
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Moldovia
Russia
Tajikistan
Turkmenistan
Ukraine
Uzbekistan

OCEANIA

Australia
Fiji
French Polynesia
Caledonia
New Zealand
Papua New Guinea

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[1] The classification is combatible with the FAO geographical classification which makes for easy comparison of historical data.

[2] Bosnia-Herzegovina, Croatia, Macedonia, Slovenia, Yugoslavia (Serbia & Montenegro)

INTRODUCTION TO THE TABLES

The World Bank/FAO/UNIDO/Industry Fertilizer Working Group has updated its forecasts of world and regional fertilizer nutrient supply and demand balances. The supply potential calculated in the tables is **the supply that would be available from existing capacities without any market constraints**. Recent developments in Eastern Europe and the former Soviet Union have been taken into account and due consideration was also given to current and anticipated constraints in fertilizer related sectors, such as agriculture, energy and infrastructure. **Fertilizer demand is the projected effective market requirement and is not necessarily identical with projected agronomic fertilizer needs.**

General Notes on Terminology

Capacity:

Refers to nominal or name-plate capacity of ammonia plants, phosphoric plants or potash mines. Effective capacity is nominal capacity less an allowance for capacity that has not been fully realized during the phasing-in of new plants. Idle plants that have the potential for resuming operation are included in nominal capacity. Effective capacity and supply capability does not include idle capacity. Shorter periods of non-operation are accounted for in the utilization rates.

Supply Capability:

Is the total production supply capability for either ammonia, phosphoric acid or potash. It is estimated by applying forecasts of specific country operating rates to effective capacity. Projected operating rates reflect past performance and take into account anticipated future technical improvements or otherwise. No market constraints to production are assumed in projecting operating rates.

Fertilizer Supply Potential:

Is derived from supply capability. First, non-fertilizer use is subtracted, followed by processing losses, where appropriate. Fertilizers available from other sources are added to yield fertilizer supply potential. Allowance is made for distribution losses and stock changes.

Balances (-Deficits):

A nutrient surplus or deficit is obtained by subtracting fertilizer demand from fertilizer supply potential. It shows the difference between fertilizer supply potential and demand, assuming no market constraints to production. Care is needed in comparing balances from different sources in absolute terms as they may vary significantly depending on assumptions made for capacities, utilization rates,

losses etc. Also, projected balances may often not be realized in practice, particularly in those cases where a negative balance is indicated and demand has to adjust to meet available supply. In a surplus situation, supply will be adjusted downwards by operating at rates below the supply potential.

The main function of the balances is to help estimate future trends in the supply and demand relationship based on a consistent set of assumptions compared with existing and past situations. These trends provide useful information on the market place and the need for new production capacity.

Time Reference:

Data refer to the fertilizer year July 1 - June 30. For countries that report their fertilizer statistics on a calendar year basis, data are shown under the fertilizer year, the first part of which corresponds to the calendar year, i.e. 1988 calendar year data are shown under fertilizer year 1988/89.

Units:

All figures are given in metric tons of plant nutrients: N, P_2O_5 and K_2O. The terms "P_2O_5" and "K_2O" are conventionally used to express the fertilizer nutrients "phosphate" and "potash". They represent the oxides of the elements P and K.

To convert oxides to elements:
multiply P_2O_5 value by 0.4364;
multiply K_2O value by 0.8302.

To convert elements to oxides:
multiply P value by 2.2914;
multiply K value by 1.2046.

Owing to rounding, individual figures may not add up to the totals.

Notes on Nitrogen

New ammonia capacities are phased-in as 80%-90%-100% of nominal capacity for the first three full years of operation. Expansions are phased-in over a two year period.

Non-fertilizer use of ammonia includes industrial uses and ammonia for production of animal feed. As nitrogen recovered as ammonium sulfate has already been included in the fertilizer consumption forecast, it is not listed under non-fertilizer ammonia.

The processing loss of ammonia in the production of nitrogenous fertilizers is assumed to be 3.5% on average.

Sources for non-ammonia nitrogen are coke oven gases, cyanamid and mineral nitrates.

The nitrogen fertilizer supply potential is assumed to be 95 5% of the total fertilizer nitrogen supply capability. This percentage is based on the average historical difference between total nitrogen fertilizer consumption and production for the last five years as recorded in the respective FAO Fertilizer Yearbooks and takes account of transport and distribution losses and stock changes. It also accounts for the fact that in some cases (for example China) consumption is recorded as apparent consumption (i.e. net imports plus production) rather than actual.

Notes on Phosphate

New phosphoric acid capacities are phased-in as 80%-90%-100% of nominal capacity for the first three full years of operation. Expansions are phased-in over a two year period.

Non-fertilizer phosphoric acid consumption includes wet process phosphoric acid for industrial use in detergents, phosphate chemicals etc. and for animal feedstuff.

The processing and conversion loss of phosphoric acid in the manufacture of phosphate fertilizer is assumed to be 4 0% on average

Other P_2O_5 production includes all other phosphates not derived directly from phosphoric acid such as single superphosphate, basic slag, thermal phosphates, nitrophosphates, ground phosphate rock used for direct application as fertilizer, but excludes phosphoric acid feed and the secondary rock in triple superphosphates. Production is based on existing capacity and projected changes in capacity.

Phosphate fertilizer supply potential is assumed to be 97 0% of total fertilizer phosphate supply capability. It is based on the average historical difference between total phosphate fertilizer consumption and production for the last five years as recorded in the respective FAO Fertilizer Yearbooks This statistical adjustment accounts for transport and distribution losses, and stock changes. It also accounts for the fact that in some cases (for example China) consumption is recorded as apparent consumption (i.e. net imports plus production) rather than actual.

Notes on Potash

New potash mine nominal capacities are phased-in as follows:

Fertilizer Year	New Mines Known Ore Body	New Mines Unknown Ore Body
1 (6 months)[a]	30.0%	20.0%
2	67.5%	50.0%
3	82.5%	67.5%
4	95.0%	82.5%
5	100.0%	100.0%

[a] Assuming project completion in mid-year.

Expansions are phased-in over a two-year period.

Potash Fertilizer supply potential is derived from potash supply capability after deducting industrial uses and distribution losses. The specific regional distribution losses are:

Region	Distribution Loss
North America	2.0%
Western Europe	2.0%
FSU	8.0%
Other regions	5.0%

This Technical Paper reflects the most recent fertilizer supply and demand projections prepared by the World Bank/FAO/UNIDO/Industry Fertilizer Working Group in August 1995.

The Group welcomes suggestions and comments on the improvement of its fertilizer supply and demand balances. Any communication relating to the Group's activities and its supply and demand forecasts should be addressed to The World Bank, Industry and Energy Department, Industry and Mining Division, for the attention of Mr. Peter Glenshaw, 1818 H Street, N.W., Washington, D.C. 20433, USA, telephone (202) 473-2426, telefax (202) 477-6619.

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NITROGEN SUPPLY AND DEMAND BALANCES

1993/94 - 1999/00

REGIONAL AMMONIA CAPACITY (000 TONS N)

	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000	Annual Growth
WORLD	**111,448**	**114,399**	**117,099**	**118,180**	**121,353**	**121,807**	**123,526**	**2%**
AFRICA	**3,718**	**3,756**	**3,756**	**3,811**	**3,811**	**3,811**	**4,137**	**2%**
of which								
Egypt	1,224	1,224	1,224	1,279	1,279	1,279	1,605	4%
South Africa	717	755	755	755	755	755	755	1%
AMERICA	**22,089**	**21,935**	**22,479**	**22,639**	**23,490**	**23,659**	**24,064**	**1%**
North America	**16,671**	**16,477**	**16,854**	**16,884**	**17,145**	**17,155**	**17,155**	**0%**
Canada	3,478	3,478	3,719	3,749	3,764	3,774	3,774	1%
USA	13,193	12,999	13,135	13,135	13,381	13,381	13,381	0%
Central America	**3,487**	**3,487**	**3,654**	**3,703**	**4,183**	**4,183**	**4,183**	**3%**
of which								
Trinidad	1,637	1,637	1,804	1,853	2,333	2,333	2,333	6%
South America	**1,931**	**1,971**	**1,971**	**2,052**	**2,162**	**2,321**	**2,726**	**6%**
of which.								
Brazil	1,005	1,045	1,045	1,055	1,085	1,159	1,159	2%
ASIA	**43,855**	**47,466**	**50,119**	**51,363**	**54,234**	**54,581**	**55,178**	**4%**
West Asia	**5,454**	**5,499**	**5,569**	**5,841**	**6,323**	**6,323**	**6,797**	**4%**
of which								
Iran	908	908	908	1,180	1,180	1,180	1,180	4%
Saudi Arabia	1,256	1,256	1,256	1,256	1,256	1,256	1,256	0%
South Asia	**11,631**	**12,365**	**13,352**	**13,604**	**15,088**	**15,130**	**15,253**	**4%**
of which								
Bangladesh	1,144	1,144	1,412	1,412	1,412	1,412	1,412	3%
India	8,658	9,392	9,839	9,949	10,830	10,872	10,995	4%
Pakistan	1,558	1,558	1,830	1,972	2,575	2,575	2,575	9%
East Asia	**26,770**	**29,602**	**31,198**	**31,918**	**32,823**	**33,128**	**33,128**	**3%**
of which								
China	20,263	22,363	23,719	24,439	25,344	25,344	25,344	4%
Indonesia	2,717	3,449	3,689	3,689	3,689	3,689	3,689	5%
Japan	1,636	1,636	1,636	1,636	1,636	1,636	1,636	0%
Korea, D P R	879	879	879	879	879	879	879	0%
Korea Rep of	652	652	652	652	652	652	652	0%

REGIONAL AMMONIA CAPACITY (000 TONS N)

	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000	Annual Growth
EUROPE	**19,527**	**19,436**	**19,228**	**19,311**	**19,311**	**19,311**	**19,311**	**0%**
Eastern Europe	**8,295**	**8,295**	**8,087**	**8,112**	**8,112**	**8,112**	**8,112**	**0%**
of which:								
Bulgaria	1,184	1,184	1,094	1,094	1,094	1,094	1,094	-1%
Poland	2,194	2,194	2,194	2,194	2,194	2,194	2,194	0%
Romania	3,020	3,020	2,902	2,927	2,927	2,927	2,927	0%
Former Yugoslavia	617	617	617	617	617	617	617	0%
Western Europe	**11,232**	**11,141**	**11,141**	**11,199**	**11,199**	**11,199**	**11,199**	**0%**
of which:								
France	1,582	1,582	1,582	1,582	1,582	1,582	1,582	0%
'Germany	2,485	2,485	2,485	2,485	2,485	2,485	2,485	0%
Netherlands	2,544	2,544	2,544	2,602	2,602	2,602	2,602	0%
United Kingdom	1,086	1,104	1,104	1,104	1,104	1,104	1,104	0%
FSU	**21,691**	**21,238**	**20,949**	**20,454**	**19,905**	**19,843**	**20,234**	**-1%**
of which:								
Russian Federation	12,261	12,056	12,240	11,910	11,675	12,065	12,456	0%
Ukraine	5,105	5,021	4,727	4,562	4,562	4,562	4,562	-2%
Uzbekistan	1,675	1,593	1,593	1,593	1,279	827	827	-7%
OCEANIA	**568**	**568**	**568**	**602**	**602**	**602**	**602**	**1%**
of which:								
Australia	492	492	492	492	492	492	492	0%