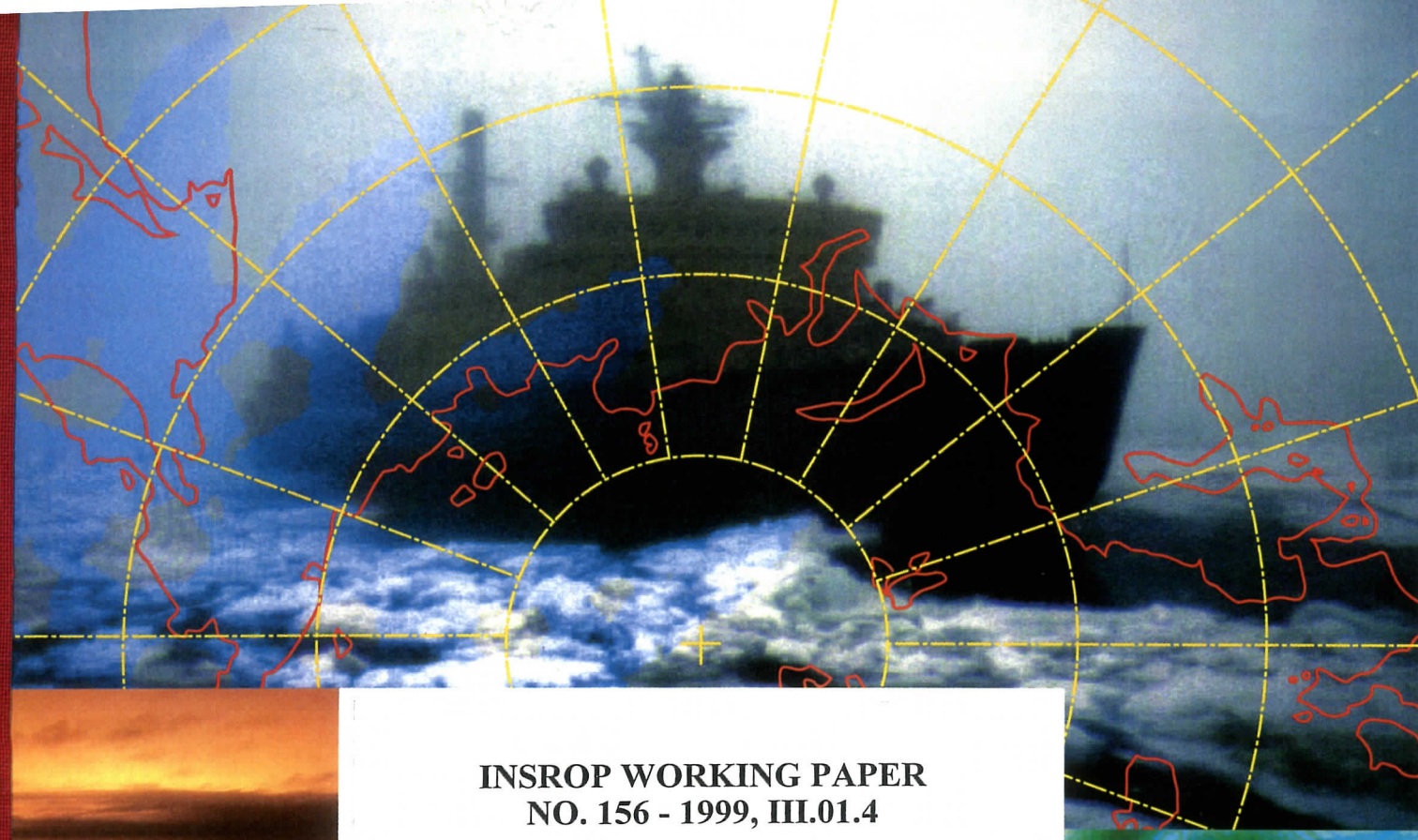



**INSROP WORKING PAPER**
**NO. 156 - 1999, III.01.4**

# The Russian Fertilizer Industry. Fertilizers as a Cargo Segment on the Europe – Far Eastern Trade.

**By Trond R. Ramsland**



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| Supervisor: | Trond R. Ramsland |
| **Title:** | **The Russian Fertilizer Industry. Fertilizers as a Cargo Segment on the Europe – Far Eastern Trade.** |
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## FOREWORD - INSROP WORKING PAPER

INSROP is a five-year multidisciplinary and multilateral research programme, the main phase of which commenced in June 1993. The three principal cooperating partners are **Central Marine Research & Design Institute (CNIIMF)**, St. Petersburg, Russia; **Ship and Ocean Foundation (SOF)**, Tokyo, Japan; and **Fridtjof Nansen Institute (FNI)**, Lysaker, Norway. The INSROP Secretariat is shared between CNIIMF and FNI and is located at FNI.

INSROP is split into four main projects: 1) Natural Conditions and Ice Navigation; 2) Environmental Factors; 3) Trade and Commercial Shipping Aspects of the NSR; and 4) Political, Legal and Strategic Factors. The aim of INSROP is to build up a knowledge base adequate to provide a foundation for long-term planning and decision-making by state agencies as well as private companies etc., for purposes of promoting rational decisionmaking concerning the use of the Northern Sea Route for transit and regional development.

INSROP is a direct result of the normalization of the international situation and the Murmansk initiatives of the former Soviet Union in 1987, when the readiness of the USSR to open the NSR for international shipping was officially declared. The Murmansk Initiatives enabled the continuation, expansion and intensification of traditional collaboration between the states in the Arctic, including safety and efficiency of shipping. Russia, being the successor state to the USSR, supports the Murmansk Initiatives. The initiatives stimulated contact and cooperation between CNIIMF and FNI in 1988 and resulted in a pilot study of the NSR in 1991. In 1992 SOF entered INSROP as a third partner on an equal basis with CNIIMF and FNI.

The complete series of publications may be obtained from the Fridtjof Nansen Institute.

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TROND R RAMSLAND – SYNERGY RESEARCH

# THE RUSSIAN FERTILIZER INDUSTRY

## "FERTILIZERS AS A CARGO SEGMENT ON THE EUROPE - FAR EASTERN TRADE"

INSROP III.01.4

# 1 INTRODUCTION.

The conception of the paper was based on the preliminary findings of INSROP Phase I sub-programme III, Transit Study. The aim of the study was to make preliminary estimates of cargo segments that could be viable to attack for an operator on the Northern Sea Route. It was thus necessary to identify the cargo segments that were moved by ships between the relevant cargo generating regions.

In general terms the cargo generating region North West Europe (NWE) was defined to be, Norway, Sweden, Finland, Denmark, Russia, the Baltics, Germany, Benelux, Great Britain, Ireland & France. The Far East (FE) was defined to be South Korea, China including Hong Kong, Japan, and Taiwan.

From general shipping statistics we know that both regions are net cargo importing in terms of tonnage relating to the major bulk cargoes, Crude Oil, Iron Ore, Coal and Grains. These cargo segments mainly originates outside the two regions and cross trade is small compared to the overall volume. Based on the preliminary study it was clear that factor deficiency affect Far East Asia more than Northwest Europe, and that bulk cargoes moved mainly along the west – east axis to FE.

**Southbound Suez Volumes 1994, Bulk Cargoes, NWE Export ('000 Tonnes).**

| Product | Total Volumes | NWE Export | Percent of Total | Russian Export | Percent of NWE total | NSR Relevant |
|---|---|---|---|---|---|---|
| Fabricated Metals | 32 094 | 16 437 | 51 % | 7 780 | 47 % | Yes |
| Mineral Fertilisers | 13 769 | 7 693 | 56 % | 4 727 | 61 % | Yes |
| Cereals | 11 213 | 4 688 | 42 % | 0 | 0 % | Yes |
| Oil Products | 9 288 | 2 218 | 24 % | 178 | 8 % | Doubtful |
| Chemical Products | 6 362 | 1 705 | 27 % | 327 | 19 % | No |
| Cement | 4 200 | 491 | 12 % | 321 | 65 % | No |
| Metals & Ores | 1 708 | 1 135 | 66 % | 0 | 0 % | Yes |
| Sugar | 1 280 | 993 | 78 % | 0 | 0 % | No |
| Sum | 79 914 | 35 360 | 44 % | 13 333 | 38 % | |

*Source : Suez Canal Annual Yearbook : 1995*

Relating to the minor bulk cargoes and other relevant cargo segments, Suez Canal Statistics proved that there was one dominant country in each region. From the table above, restricted to the west - east trade for 1994, Russia accounted for 38 % of total NWE export, China

accounted for 54 % of Far East import. This conformed to the factor endowments and the "seaborne trade development cycle" theory.

Main exports from Northwest Europe were related to factor abundance in energy, primarily different metals and fertilizers. These segments originated mainly in either Norway or Russia. Metals exports from Belgium, Netherlands and Germany were also significant. Continental European cargoes were related to agricultural production, and consequently a cargo segment indirectly affected by fertilizers. High quality paper and forest products originated in Scandinavia.

**Southbound Suez Volumes 1994, Bulk Cargoes, Far East Imports ('000 Tonnes)**

| Product | Total Volumes | Far East Import | Percent of Total | Chinese Import | Percent of Far East | NSR Relevant |
|---|---|---|---|---|---|---|
| Fabricated Metals | 32 094 | 13 745 | 43 % | 5 860 | 43 % | Yes |
| Mineral Fertilisers | 13 769 | 5 837 | 42 % | 5 306 | 91 % | Yes |
| Cereals | 11 213 | 848 | 8 % | 461 | 54 % | Yes |
| Oil Products | 9 288 | 1 415 | 15 % | 220 | 16 % | Doubtful |
| Chemical Products | 6 362 | 414 | 7 % | 248 | 60 % | No |
| Cement | 4 200 | 0 | 0 % | 0 | 0 % | No |
| Metals & Ores | 1 708 | 326 | 19 % | 191 | 59 % | Yes |
| Sugar | 1 280 | 0 | 0 % | 0 | 0 % | No |
| Sum | 79 914 | 22 585 | 28 % | 12 286 | 54 % | |

*Source : Suez Canal Annual Yearbook : 1995*

From a Russian competitive viewpoint, the NSR as a transit route were stated to compete internally for cargoes being moved through both the Baltics & Black Sea ports. As can be seen in the table above, Russia defined as a NWE country accounted for about 38 % of overall NWE export through Suez. In the main segments, fabricated metals and mineral fertilizers, Russia accounted for respectively 47 % and 61 % of the NWE exports. On the assumption that these cargoes mainly moved out of the Black Sea ports, opening the NSR will increase competition, both between Russian ports and shipping companies. Expansion in the northern ports, will be at the expense of cargoes through Novorossiysk etc.

Thus on the above-mentioned it was determined to focus on the Russian fertilizer and metals segment as the main segments for INSROP Phase II study, for which reduced budgets only allowed for an evaluation of the fertilizer segment.

A reasonable assumption was that these cargoes to a large degree are carried on Russian dry cargo - dry bulk fleet left intact after the break-up of the FSU. It is also important that Black Sea cargoes would not be subject to the same potential cost and time advantages of the NSR as NWE - Baltic cargoes. Internal Russian location and transportation costs thus to a large degree were assumed to determine the future of NSR carried bulk volumes. That highlighted the complexity, but also simplified the issue regarding bulk cargoes:

Russia had both the incentive to and the disadvantage of developing the NSR, as a major use of the NSR will attract significant cargoes of Russian origin and a shortfall in the Southern ports is likely to occur. Thus regional interests in Russia is likely to ensure a balanced approach to the NSR. At the same time it should be argued that increased use of the NSR would gather momentum as investments in new tonnage are facilitated and attract cargoes of non-Russian origin. Overall this should also lower transport cost for all cargoes.

# 2 THE CURRENT VOLUME OF FERTILIZER SHIPMENTS

To determine whether the segment of fertilizers is stable, it is necessary to expand the time series from the Year 1994 to a prolonged period. Seaborne statistics has been obtained from the Suez Canal Authority for the Year 1986 to 1997. Although overall Southbound volumes varies, they have doubled from 1986 to 1997 from roughly 9,5 million tonnes to 17,4 million tonnes by 1997, reaching a high in 1995 slightly above 20 million tonnes.

## 2.1 SOUTHBOUND EXPORT THROUGH THE SUEZ CANAL 1986 - 97

By analysing the seaborne export and import data from the Suez Canal statistics, one can observe that Russia remains stable as the largest Southbound segment and exporter of fertilizers through the Suez Canal. One also observe that Latvia has gross increase in volumes over the last three years, whereas Russian volumes decrease in the same period. This is highly likely accounted for by through export over Latvian ports.

Mineral Fertilizers Shipments : Southbound Export Through the Suez Canal 1986 - 97

| | 1986 | 1987 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|
| Russia | 1981 | 2767 | 7142 | 4787 | 4727 | 6136 | | 3931 |
| Norway | 0 | 212 | 410 | 300 | 362 | 577 | | 573 |
| Germany | 826 | 1413 | 1314 | 512 | 1026 | 1599 | | 1240 |
| Ukraina | 0 | 0 | 0 | 0 | 826 | 1363 | | 1059 |
| Latvia | 0 | 0 | 0 | 0 | 427 | 1522 | | 2690 |
| Finland | 0 | 0 | 0 | 0 | 325 | 817 | | 1010 |
| Belgium | 536 | 933 | 652 | 618 | 0 | 865 | | 750 |
| Holland | 302 | 225 | 325 | 0 | 0 | 475 | | |
| Others | 5832 | 6569 | 7992 | 5822 | 6076 | 6845 | | 6113 |
| Total | 9477 | 12119 | 17835 | 12039 | 13769 | 20199 | | 17366 |

*Source : Suez Canal Annual Yearbook : 1986-97*

## 2.2 SOUTHBOUND IMPORT THROUGH THE SUEZ CANAL 1986 - 97

China remains the largest importer in the period 1986 – 97 and volumes more that tripled between 1986 of 2,3 million tonnes and the high of 1995 of 8,3 million tonnes. Japan has also seen overall increase in volumes in the period but is marginal compared to China.

**Mineral Fertilizers Shipments : Southbound Import Through the Suez Canal 86 - 97**

| | 1986 | 1987 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|
| China | 2344 | 4501 | 7334 | 3641 | 5306 | 8346 | | 6535 |
| Japan | 397 | 580 | 307 | 289 | | 512 | | 530 |
| South Korea | | | 226 | | 226 | 821 | | 273 |
| Hong Kong | | 161 | | | 300 | 81 | | 118 |
| Taiwan | 69 | | | 156 | | | | |
| Others | 6667 | 6877 | 9968 | 7953 | 7937 | 10951 | | 10410 |
| Total | 9477 | 12119 | 17835 | 12039 | 13769 | 20199 | | 17336 |

*Source : Suez Canal Annual Yearbook : 1986-97*

## 2.3 COMBINED EXPORT – IMPORT SCENARIO NORTH WEST EUROPE – FAR EAST

Stripping out the segment "others", total NWE Southbound export more than tripled from 3,6 million tonnes in 1986 to 11,2 million tonnes in 1997, whereas the FE importing nations saw an increase by 4 million tonnes from 2,8 to 6,9 million tonnes. Both exporting and importing regions thus track closely as can be seen by the table and graph below. One thus infer that over period, the markets are closely linked together, correlation (R2) being 0,946. The positive balance is assumed to be directed towards the Southeast and South Asian market.

**Mineral Fertilizers Shipments :**
**Southbound NWE – FE Export Import Balance**

| | 1986 | 1987 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|
| Total Exporting NWE | 3645 | 5550 | 9843 | 6217 | 7693 | 13354 | | 11253 |
| Total Importing FE | 2810 | 5242 | 7867 | 4086 | 5832 | 9248 | | 6926 |
| Balance | 835 | 308 | 1976 | 2131 | 1861 | 4106 | | 4327 |

*Source : Suez Canal Annual Yearbook : 1986-97*

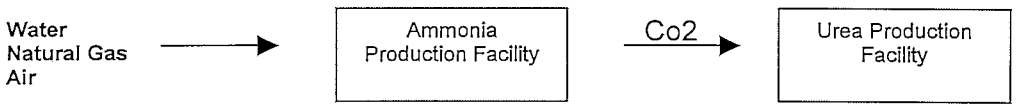
# 3 FERTILIZERS – MAIN TYPES

The basic aim of fertilizers is to enhance the crop yield from arable land, as crops need a number of mineral elements for good growth not necessarily present in the area, or depleted through mismanagement of the land over longer periods. Thus in terms of factor endowments, other things equal, fertilizers can compensate for previous grains import requirements as crop yields increases, but also note that increased use of fertilizers consequently indirectly will affect other shipping requirements.

The main plant nutrients are nitrogen (N) phosphorus (P) and Potassium (K).

## 3.1 FERTILIZER NITROGEN

Fertilizer Nitrogen originates from ammonia produced atmospheric nitrogen and hydrogen. The hydrogen is produced from steam mainly by use of natural gas. The process results in the release of carbon dioxide which can be combined with ammonia to produce Urea, a major fertilizer product. 97 % of nitrogen fertilizers are produced by ammonia.




## 3.2 PHOSPHATE FERTILIZERS

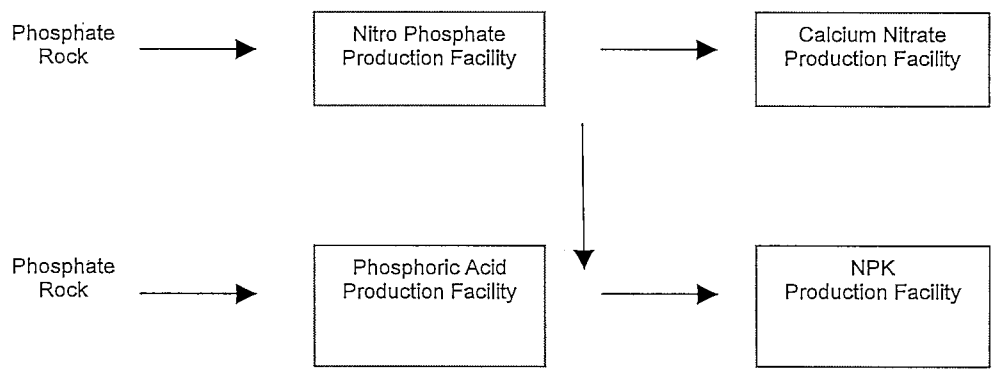
Phosphate Fertilizers are produced by reacting Phosphate rock with Sulphuric Acid. The acid can then be reacted with ammonia to produce ammonium phosphates. Other processes give superphosphates[1] or nitrophosphates and calcium nitrate.

[1] By definition of the Potash & Phosphate Institute the following terms applies :
*Normal superphosphate* (20 percent $P_2O_5$) is made by treating rock phosphate with a measured amount of lower concentration sulphuric acid.

*(footnote continues next page)*

Almost all phosphate rock is mined by strip mining. It usually contains about 15 percent $P_2O_5$ and must be upgraded to be used for fertilizers. Upgrading, in a process called beneficiation, removes much of the clay and other impurities, and raises the $P_2O_5$ content to 30 to 35 percent. Following beneficiation, the rock phosphate is finely ground. Although it can be applied directly as rock phosphate fertilizer, the P in it is slowly released and seldom benefits crops during the first two or three years after application. *Most of the rock phosphate is treated to make the P more soluble.* Fertilizer phosphates are classified as either acid-treated or thermal-processed. Acid-treated P is by far the most prevalent. Sulphuric and phosphoric acids are commonly used in producing acid-treated phosphate fertilizers.

Sulphuric acid is produced from elemental sulphur (S) or from sulphur dioxide. More than 60 percent of industrial sulphuric acid is used to produce fertilizers. Treating rock phosphate with concentrated sulphuric acid produces a mixture of *phosphoric acid* and *gypsum*. Filtration removes the gypsum, leaving "green" or "wet-process" phosphoric acid containing about 54 percent $P_2O_5$.




*Concentrated superphosphate* (triple superphosphate; 46 percent $P_2O_5$) comes from reacting wet-process phosphoric acid with rock phosphate.
*Ammonium phosphates* are produced by ammoniating phosphoric acid. Monoammonium phosphate (MAP) contains 10 to 12 percent N and 48 to 55 percent $P_2O_5$; diammonium phosphate (DAP) contains 18 percent N and 46 percent $P_2O_5$ (18-46-0). The difference is determined by controlling the amount of added ammonia.
*Ammonium polyphosphates* are usually fluid sources of P produced by ammoniating superphosphoric acid.
Nitrophosphates are made by reacting rock phosphate with nitric acid. Some sulphuric or phosphoric acid may be used along with the nitric acid to make the material more water soluble.
*Ammoniated superphosphates* are made by reacting normal or triple superphosphate with ammonia. They are available in different fertilizer grades and water solubilities.

## 3.3 POTASSIUM FERTILIZERS

Potassium was used as a fertilizer as early as the third century BC, in the form of manure and ashes. In North America, wood ash was being used as fertilizer by Indians when the first European settlers arrived. The term 'potash' comes from the pioneer practice of producing potassium fertilizer by leaching wood ashes and evaporating the solution in large iron pots. The residual product was called 'pot ash'. Large-scale commercial production of potash from potassium salts was established in Germany by the middle of the 19th century, and that country remained the world's principal supplier until the 1930s. The interruption of supply from Germany during World War I stimulated potash exploration in the United States; this resulted in discovery of the extensive deposits near Carlsbad, New Mexico, in 1921.

The discovery of potash in Canada (Saskatchewan) is linked to the western Canadian search for petroleum. In 1943, a core sample from an exploratory oil well near Radville, Saskatchewan, showed potash at a depth of almost 2 km. Exploration was stepped up over the next few years, and it soon became evident that one of the world's major potash deposits lay beneath southern Saskatchewan. By 1974, 10 potash mines were operating in with a total annual production capacity of nearly 13 million tonnes of potassium chloride.

Potassium occurs naturally in deposits of Potash in the earth. Most of the world reserves of K were deposited as sea water from ancient inland oceans evaporated, and the K salts crystallised into beds of potash ore being mined today. The source of most of the K used for plant food today is potassium chloride (KCl), which is also called *muriate of potash* or *potash.* The deposits are a mixture of KCl and sodium chloride (NaCl) that occurs in natural form, better known as common table salt and is a white crystalline water soluble solid (KCl) usually combined with other phosphorous, and or nitrogen based fertilizers, to produce various degrees of NPK nutrients. Nearly 95 percent of the KCl produced is used in agriculture.

Processing potash for the fertilizer market is relatively simple. The ore is finely ground and the flotation process recovers the potassium. Flotation, used to recover many minerals, is based on the fact that, when in aqueous suspension, mineral particles that are coated with certain chemicals will cling to rising air bubbles. The finely ground ore is fed into cells containing water and the appropriate chemicals, and air is forced into the bottom of the cells. The air bubbles rise to the surface coated with the desired mineral particles, while other associated minerals, such as common salt, fall to the bottom. The froth is skimmed off, dried

and screened to produce five grades of potassium chloride for the world market - granular, coarse, standard, special standard muriate and chemical.

# 4 WORLD FERTILIZER PRODUCTION CAPACITY

To determine the potential for further Russian exports of fertilizers and a further break – down of the industry and its export pattern, it is necessary to look on the overall supply and demand balance world wide. The nomenclature for background statistics do not fit shipping statistics and is a common problem encountered when analysing aggregated data. However, for this paper it sufficiently detailed to highlight the relevant trends as regards both supply and demand.

The International Fertilizer Association defines the regions to be West Europe (EU-EFTA), Central Europe (former COMECON excluding Former Soviet Union), Former Soviet Union, North America (US, Canada), Oceania as defined to include Australia and New Zealand, Africa and Near East Africa. The Near East Asia (The Middle East), South Asia (Pakistan, India & Bangladesh) East Asia is defined in two parts ; North East Asia constituting of Japan, South Korea and Taiwan, and South East Asia to constitute of Indonesia, Malaysia, Thailand and the Phillipines. Socialist Asia is defined to be China, Vietnam and North Korea. Time series are discontinued, but cover the years 1974, 1986, 1990 and 1996, sufficient to develop trends.

## 4.1 PRODUCTION CAPACITY BY TYPE.

### 4.1.1 AMMONIA

In terms of matching supply and demand data ammonia account for 97 percent of derived nitrogen fertilizers. It should thus be correct to use ammonia data for estimations intensity of nitrogen fertilizer use. As can be seen be the graphs above, Ammonia is both the largest and the fastest growing. Ammonia account for 63 % of capacity by 1996.

As natural gas is the basic ingredient, one should expect regions factor abundant in natural gas to be dominant producers. Cost of production is also important as large low cost regional surpluses opens for potential cross subsidises towards the fertilizer industry. It also favours production and transport of the product itself, as it would be inherently costly to set up long distance supply chains of the base raw material through pipelines, LNG or NGH transport.

However in markets already supplied by external natural gas for energy use, it should not be irrelevant to set up fertilizer production to capture some of the otherwise producer surplus.

**Ammonia Production Capacity 1974 - 96 : By Region Million Tonnes**

| | 1974 | 1986 | 1990 | 1996 | 96 % of total |
|---|---|---|---|---|---|
| Former Soviet Union | 10,22 | 21,98 | 22,11 | 20,74 | 18 % |
| East Asia | 4,83 | 5,51 | 5,72 | 6,77 | 6 % |
| Socialist Asia | 7,13 | 15,78 | 21,13 | 26,47 | 23 % |
| West Europe | 14,47 | 15,35 | 13,89 | 11,24 | 10 % |
| Others | 26,53 | 43,45 | 45,78 | 48,43 | 43 % |
| The World | 63,18 | 102,07 | 108,63 | 113,65 | 100 % |

*Source : International Fertiliser Association(Paris) 1998*

As can be seen from the table above, in terms of ammonia production capacity, the Former Soviet Union (FSU) contributed 18 %, Socialist Asia 23 %, East Asia 6 % and Western Europe 10 % in 1996. By single countries China accounted for 22 and Russia for 14,5 %, and were clearly the dominant producers. That conforms to the countries factor endowments in natural gas, arable land and its derived function of domestic food demand due to population size. For Russia the two first are more important, for China the two last. In terms of trade, it would thus be expected that both regions are reasonable self sufficient due to scale of capacity, but trade flows, if any, should move from Russia to China. This as Russia is relatively more endowed with the supply of both the resource and the arable land, China relatively less but contribute more demand by its population size.

By adding Western Europe and North East Asia the NSR area approach 50 % of world production capacity, which indicate that cross trade by volume in ammonia itself, need not be large as self sufficiency looks apparent. To this we shall return when evaluating the balance between supply and demand.

### 4.1.2 Phosphoric Acid.

Phosphoric acid is as previous mentioned obtained by a reaction between phosphate rock and normally sulphuric acid. As a fertilizer input it accounted for 19 % of world production capacity 1996. The trend over the last decades has been for countries relatively well endowed with phosphate rock to integrate along the value chain to produce the acid itself. As can be seen from the graph above, North America is the largest producer, 36 % of the world, and also retains growth during the period. FSU is the second largest and account for 20 %

and Africa for 17 %. Africa's share is has grown during the whole period both in market share and absolute figures and is a clear sign of integration along the value chain from raw material producer to exporter of semi-finished product. The Far East market share as indicated by East Asia and Socialist Asia is small compared to overall figures, 5 and 4 % respectively. One should however note that Chinas world share rose from slightly above zero in 1990 to 4 % in 1996 which is a clear indication of attention to this market.

**Phosphoric Acid Production Capacity 1974 - 96 : By Region Million Tonnes**

| | 1974 | 1986 | 1990 | 1996 | 96 % of total |
|---|---|---|---|---|---|
| North America | 8,89 | 11,86 | 11,86 | 11,77 | 36 % |
| Former Soviet Union | 1,8 | 6,14 | 6,31 | 6,51 | 20 % |
| Africa | 1,1 | 4,52 | 5,36 | 5,41 | 17 % |
| West Europe | 4,24 | 3,99 | 3,39 | 1,88 | 6 % |
| East Asia | 1,12 | 1,64 | 1,71 | 1,57 | 5 % |
| Socialist Asia | 0 | 0,06 | 0,16 | 1,42 | 4 % |
| Others | 2,5 | 4,27 | 4,52 | 4,21 | 13 % |
| The World | 19,65 | 32,48 | 33,31 | 32,77 | 100 % |

*Source : International Fertiliser Association(Paris) 1998*

The sharp increase in Chinese production could indicate that China either has become a significant net importer of Phosphate Rock, or developed indigenously sources. World-wide the major producing and exporting region of phosphate rock is Africa which account for 60 % of total seaborne trade in this segment. Morocco being the largest country followed by Togo, South Africa, Tunisia and Senegal. China do not however appear as a significant importer of phosphate rock by 1993 (Fearnley's Annual Report) which points towards domestic deposits.

SEABORNE TRADE IN PHOSPHATE ROCK 1993 – FEARLEYS ANNUAL REPORT

| Phosphate Rock | UK | Mediterrane | Other | Americas | Japan | Australia | Others | Total 1993 |
|---|---|---|---|---|---|---|---|---|
| Morocco | 1271 | 1863 | 1338 | 2145 | 119 | 290 | 1371 | 8397 |
| Other Africa | 980 | 488 | 894 | 982 | 272 | 64 | 1764 | 5444 |
| USA | 725 | | 152 | 306 | 580 | 388 | 1442 | 3593 |
| Pacific island | 0 | 0 | 0 | 0 | 0 | 570 | 63 | 633 |
| Others | 1776 | 1178 | 1334 | 166 | 355 | 335 | 3516 | 8660 |
| Total 1993 | 4752 | 3529 | 3718 | 3599 | 1326 | 1647 | 8156 | 26727 |

*Source : Fearnleys Annual Review 1994*

By Suez Canal Statistics (1997) Morocco ranks third after Russia and Latvia as a major Southbound exporter of fertilizers with 1,69 million tonnes. This segment probably is

beneficated "ready to use" rock phosphate fertilizer. Thus in terms of import, some of Morocco's semi-value added export produce likely arrives in China. By analysing Southbound Chemicals traffic (the segment to which phosphoric acid applies) through the Suez Canal, Morocco exports 2 million tonnes and is the largest exporter of high value added phosphate acid. However, China only imported 132 thousand tonnes. A reasonable assumption thus is that domestic Chinese production is focused on upgrading ground beneficated rock phosphate fertilizer and or on domestically mined Phosphate. India is the likely source for these cargoes.

Note also that Phosphate cargoes originating from other major producers, Togo, Senegal, South Africa, Jordan or Israel would not show up in Suez Canal Statistics as these cargoes move around the Cape Good Hope or through the Gulf of Aquaba. Other reliable shipping statistics do not indicate that China is a large importer of this product segment.

### 4.1.3 POTASH.

North America is the dominant producer of Potash alongside the Former Soviet Union. Both regions saw growth in production from 1974 to 1996, but stabilised on levels of 13,5 (39 %) and 12 (33 %) Million Tonnes by 1996. Western Europe account for 18 %, East & Socialist Asia for 4 % each. Socialist Asia production of potash has increase from 0 to 4 % of world capacity in less than 10 years.

**Potash Corporation of Saskatchewan**

| Mines | Region | State | Capacity |
|---|---|---|---|
| Allan | Saskatoon | Saskatchewan | 1 885 000 |
| Cory | Saskatoon | Saskatchewan | 1 361 000 |
| Lanigan | | Saskatchewan | 3 828 000 |
| Rockanwille | | Saskatchewan | 2 295 000 |
| Patience lake | Saskatoon | Saskatchewan | 1 033 000 |
| Moab | | Utah | 1 080 000 |
| New Brunswick | | New Bruinswick | 1 410 000 |
| Total | | | 12 892 000 |

*Source : Potash Corporation of Saskachewan (October 1998)*

Canada is the dominating producing country, and Saskatchewan State account for the majority of Production. Production is concentrated on the hands of one company, Potash Corporation of Saskatchewan. Two mines are located outside S State, one mine located in

Moab, Utah in the United States, whereas one mine is located in New Brunswick on the Atlantic Coast. Major mines are listed in the table above.

About 95 per cent of the potash produced in Saskatchewan is exported. About 55 per cent of Saskatchewan production is shipped to the United States, mostly to the northern part of the U.S. midwest. Another 40 per cent or so is shipped to countries around the world mainly through the port of Vancouver. In terms of transport requirements, approximately 10 000 railway hopper cars are used to move Saskatchewan potash to the U.S. market and to Vancouver. Transportation accounts for one third of the price of Saskatchewan potash at Vancouver to which must be added the further cost of overseas shipment. Canpotex handles export of potash from Canada, which is the major competitor for Russian exports.

In 1983 the first potash mine in New Brunswick at Sussex started production, and in 1985 Denison Potacan Potash Co, brought in a second mine. These mines 60 km from the ice-free port of Saint John supply both the fertilizer markets in Canada and the north-eastern United States.

# 5 WORLD FERTILIZER CONSUMPTION 1987 - 97

As for production the same nomenclature applies for consumption, and follows the cold war geographical delineation and regional definitions. Time series are available in unbroken chain and presented from the year 1987 and onwards. In general terms, overall fertilizer consumption peaked world wide in 1989, declined towards 1994 and increased slightly again towards 1997.

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| World | 134,70 | 139,94 | 145,48 | 143,37 | 138,56 | 134,40 | 125,46 | 122,43 | 125,78 | 128,65 | 133,36 |

*Source : International Fertiliser Association (Paris) 1998*

## 5.1 CONSUMPTION BY TYPE.

As can be seen from the graph above, both phosphates and potash have seen absolute decline from 1987 as segments and in market share, whereas ammonia increases in absolute terms and market share.

### 5.1.1 NITROGEN FERTILIZERS.

In terms of regions, it is notably Socialist Asia, South Asia, East Asia and the Former Soviet Union that is worth paying attention to. Socialist Asia, and then primarily China has seen phenomenal growth in consumption of nitrogen fertilizers, as has South Asia. Both have nearly doubled consumption over the11 year period. More startling however, is that the Former Soviet Union although maintaining high production capacity through-out the decline of the former "empire", has seen consumption dwindle from a world market share of 16 % to 2,9 % relatively and absolutely from 11,5 to 2,9 million tonnes. The other regional markets remain fairly stable in absolute terms.

NITROGEN FERTILIZER NUTRIENT CONSUMPTION - WORLD BY REGION, 1987 - 97

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Socialist Asia | 14,28 | 17,45 | 19,28 | 19,62 | 20,32 | 20,88 | 21,28 | 20,4 | 24,06 | 24,06 | 25,97 |
| South Asia | 7,65 | 7,67 | 9,3 | 9,69 | 10,26 | 10,41 | 10,98 | 12,29 | 12,94 | 12,94 | 13,44 |
| North America | 10,41 | 10,72 | 10,77 | 11,24 | 11,4 | 11,64 | 11,65 | 12,9 | 12,08 | 12,74 | 12,86 |
| East Asia | 3,75 | 3,91 | 4,11 | 4,14 | 4,35 | 4,09 | 4,38 | 4,5 | 4,64 | 4,72 | 4,82 |
| Former Soviet | 11,48 | 11,78 | 11,59 | 9,92 | 8,58 | 7,84 | 5,34 | 3,98 | 2,64 | 2,6 | 2,89 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Central Europe | 4,4 | 4,3 | 4,64 | 4,52 | 3,35 | 2,08 | 1,94 | 1,84 | 2,08 | 2 | 2,28 |
| Others | 19,69 | 19,97 | 19,93 | 19,98 | 19,14 | 18,58 | 18,17 | 18,65 | 18,95 | 19,05 | 20,23 |
| The World | 71,66 | 75,8 | 79,62 | 79,11 | 77,4 | 75,52 | 73,74 | 74,56 | 77,39 | 78,11 | 82,49 |

*Source : International Fertiliser Association(Paris) 1998*

By the graph below we see that the whole shortfall of FSU consumption is accounted for by the Asian increase, and thus we observe a gross shift in regional industrial and agricultural priorities. The net import and export side will be debated later, but it is obvious that Russia due to the slowdown of its economy after the break-up of the Soviet Union, has taken advantage of it excess capacity vs the previous supplied republics. To generate Foreign Exchange Russia has both reduced domestic consumption and re-directed a significant portion of production toward a market in growth.

### 5.1.2 PHOSPHATES FERTILIZERS.

TOTAL PHOSPHATES CONSUMPTION BY REGION

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| West Europe | 5,28 | 5,25 | 5,15 | 5,04 | 4,49 | 4,19 | 3,75 | 3,67 | 3,74 | 3,62 | 3,70 |
| Central Europe | 2,82 | 2,59 | 2,62 | 2,54 | 1,50 | 0,60 | 0,64 | 0,61 | 0,58 | 0,65 | 0,69 |
| Former Soviet | 8,35 | 8,56 | 8,56 | 8,18 | 7,81 | 6,55 | 3,23 | 2,02 | 0,72 | 0,80 | 0,88 |
| East Asia | 1,95 | 1,97 | 2,06 | 2,08 | 2,18 | 2,12 | 2,15 | 2,29 | 2,20 | 2,16 | 2,10 |
| South Asia | 3,36 | 2,82 | 3,36 | 3,67 | 3,89 | 4,03 | 3,60 | 3,34 | 3,57 | 3,61 | 3,58 |
| Socialist Asia | 4,63 | 4,63 | 5,46 | 5,46 | 6,03 | 7,50 | 7,12 | 5,77 | 7,66 | 9,20 | 8,54 |
| Others | 10,48 | 10,92 | 10,63 | 10,61 | 10,56 | 10,24 | 10,67 | 11,20 | 11,03 | 10,90 | 11,56 |
| Phosphates | 36,87 | 36,74 | 37,84 | 37,58 | 36,46 | 35,23 | 31,16 | 28,90 | 29,50 | 30,94 | 31,05 |

*Source : International Fertiliser Association(Paris) 1998*

Phosphates markets sees a near identical regional development to nitrogen markets, but sees absolute reduction of 5,8 million tonnes vs absolute growth for nitrogen. The regional distribution of consumption shows a 90 % decline in the FSU, and both Central and Western Europe decline about 2 million tonnes each over the 11 years period. Socialist Asia near double its consumption, but South Asia and the others market remains stable. In light of the growth in the Indian fertilizer market, this is somewhat surprising, but even more accentuate the clearly defined cross trade between FSU and China in the fertilizer markets, where over capacity in the FSU is directed towards China deficit.

### 5.1.3 POTASH FERTILIZER CONSUMPTION.

Overall worldwide consumption trends down like Phosphates, a reduction of 6,3 million tonnes over the 11 year period. Consumption in the FSU is reduced by 82 %, but consumption in Socialist Asia nearly quadruples. However, North America is the largest consumer of Potash, quite naturally given the scale and location of Potash mines.

Transportation cost is high for the bulk commodity from its central location in mid west Canadian plains and the cost of transporting it is a major component of the ultimate market price. For Canadian export to the United States, transportation cost makes up about 50 % of the end users price. Other things equal, it is thus natural that the relative competitiveness of potash, given the close and large market of domestic Canadian and US grain production, is high in the local market. Mining capacity seems finite and there is clearly not enough incentives to invest in new Potash capacity versus other fertilizers.

**Vancouver Port - Exports to the Far East 1996 - 97**

| | 1997 | 1996 | Total |
|---|---|---|---|
| Grain and Feedstuff | 6 400 000 | 5 212 000 | 11 612 000 |
| Potassium Chloride | 2 559 000 | 1 466 000 | 4 025 000 |

*Source : Lloyds Shipping Economist 1998*

Bound for China & South Korea over Vancouver Port, exports of Canadian agricultural produce and fertilizers amounted to a total of 11,6 million tonnes of grain, and 4,025 million tonnes of Potassium Chloride.

*Source : International Fertiliser Association(Paris) 1998*

**Potash Fertilizer Consumption 1987 - 97**

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| North America | 4,78 | 4,91 | 4,75 | 5,08 | 4,87 | 4,90 | 4,99 | 5,09 | 4,94 | 5,08 | 5,19 |
| West Europe | 5,89 | 5,75 | 5,87 | 5,71 | 5,09 | 4,70 | 4,11 | 4,15 | 4,26 | 4,33 | 4,34 |
| Socialist Asia | 0,71 | 1,36 | 1,62 | 1,25 | 1,81 | 2,31 | 1,89 | 1,44 | 2,35 | 2,84 | 2,51 |
| South Asia | 0,99 | 1,04 | 1,21 | 1,34 | 1,50 | 1,52 | 1,03 | 1,05 | 1,30 | 1,34 | 1,22 |
| Former Soviet | 6,68 | 7,05 | 7,04 | 6,38 | 5,16 | 5,02 | 3,31 | 1,65 | 1,05 | 0,98 | 1,19 |
| East Asia | 1,52 | 1,71 | 1,90 | 1,85 | 1,90 | 1,84 | 1,92 | 1,97 | 1,07 | 1,17 | 1,11 |
| Central Europe | 2,77 | 2,63 | 2,55 | 2,16 | 1,50 | 0,62 | 0,49 | 0,49 | 0,55 | 0,57 | 0,59 |
| Others | 2,83 | 2,95 | 3,08 | 2,91 | 2,87 | 2,74 | 2,82 | 3,13 | 3,37 | 3,29 | 3,67 |
| World | 26,17 | 27,40 | 28,02 | 26,68 | 24,70 | 23,65 | 20,56 | 18,97 | 18,89 | 19,60 | 19,82 |

# 6 WORLD FERTILIZER BALANCE 1987 - 97

## 6.1 POTASH

As can be seen in the table below, when subtracting consumption from production by the nomenclature presented by the International Fertilizer Institute, we can at least deduct the regional picture for the years 1990 – 96. As the export form of potash do not differ greatly from the applied form of the fertilizer in import country, figures should be comparable. However, there is an unaccounted balance 9,8 million tonnes in 1990 and 15,8 million tonnes by 1996. This could partly be reduction as refining of potash eventually takes place in importing country, alternatively that import/consumption figures are deflated or hidden.

The Former Soviet Union had a positive balance of 6,5 million tonnes for export, which has increased to 10,7 million tonnes by 1996. North America, and then primarily Canada, ranks second with a balance of 8,8 million tonnes for which about 4 million tonnes is moved over the port of Vancouver. Socialist Asia has the largest deficit by 1,42 million tonnes.

**POTASH PRODUCTION – CONSUMPTION 1990 – 96**

| | F Sov Union | North America | West Europe | Latin America | East Asia | Near East | Oceania | Africa | Central Europe | South Asia | Socialist Asia | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 6,50 | 7,95 | 2,99 | 2,02 | -0,14 | -0,17 | -0,28 | -0,44 | -2,16 | -1,34 | -1,09 | 9,80 |
| 1996 | 10,75 | 8,76 | 2,06 | 1,86 | 0,40 | -0,18 | -0,38 | -0,40 | -0,57 | -1,34 | -1,42 | 15,82 |

*Source : International Fertiliser Association(Paris) 1998*

# 7 Russian (FSU) Fertilizer Consumption, Production and Export.

From the previous chapters we deduct that Russia is a, if not the, major producer of fertilizers in the world. From the regional imbalance that has developed over the last decade, it is obvious that the Former Soviet Union, and then primarily Russia, has developed into a major world exporter, and that China and South East Asia has been the importing region with major growth. A net decline in FSU nutrient consumption of more than 21,5 million tonnes, and an increase of consumption in Socialist Asia of 17,5 million tonnes, indicates the scale of the trade.

**Total Fertilizer Nutrient Consumption : Former Soviet Union 1987 – 97**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrogen | 11,48 | 11,78 | 11,59 | 9,92 | 8,58 | 7,84 | 5,34 | 3,98 | 2,64 | 2,60 | 2,89 |
| Phosphates | 8,35 | 8,56 | 8,56 | 8,18 | 7,81 | 6,55 | 3,23 | 2,02 | 0,72 | 0,80 | 0,88 |
| Potash | 6,68 | 7,05 | 7,04 | 6,38 | 5,16 | 5,02 | 3,31 | 1,65 | 1,05 | 0,98 | 1,19 |
| Total | 26,51 | 27,39 | 27,19 | 24,48 | 21,55 | 19,41 | 11,88 | 7,65 | 4,41 | 4,38 | 4,96 |

*Source : International Fertiliser Association(Paris) 1998*

This especially so as total production capacity in the FSU increased up to 1990, and only declined slightly to 1996. However, capacity and actual production do not necessarily match, and Russia's share of total FSU capacity is not presented in detail by IFA. From the Russian part of this project some percentages are given for single years, which as indicates the volumes. CNIIMF estimates that Russia account for 54 % of nitrogen, 47 % of phosphate and 51, 5 % of potash fertilizer capacity of the FSU capacity.

From the table below the Russian capacity can be estimated to the following volumes for the respective fertilizer type; 11,2 million tonnes of ammonia fertilizers, 3,06 of phosphates and 6,05 million tonnes of Potash.

**Former Soviet Union Production Capacity**

| | 1974 | 1986 | 1990 | 1996 | 96 % of total |
|---|---|---|---|---|---|
| Nitrogen – Ammonia | 10,22 | 21,98 | 22,11 | 20,74 | 18 % |
| Phosphates | 1,8 | 6,14 | 6,31 | 6,51 | 20 % |
| Potash | 10,3 | 11,13 | 12,88 | 11,73 | 33 % |

*Source : International Fertiliser Association(Paris) – CNIIMF 1998*

| Russia Fertilizer Production Capacity | | | | | |
|---|---|---|---|---|---|
| Nitrogen - Ammonia | 5,52 | 11,87 | 11,94 | 11,20 | 10 % |
| Phosphates | 0,85 | 2,89 | 2,97 | 3,06 | 9 % |
| Potash | 5,31 | 5,74 | 6,65 | 6,05 | 17 % |

*Source : International Fertiliser Association(Paris) 1998*

Ukraine account for a significant portion of the remainder FSU production capacity (not Potash), but not for the raw material input necessary to deliver the finished product, whereas Uzbekistan has deposits of phosphates and Belarus both deposits and production of Potash.

In terms of actual production in 1997 of aggregated segments the split between Russia and Ukraine is as follows :

| Former Soviet Union, Major Fertilizer Producers in 1997 Tonnes (000) | | | | |
|---|---|---|---|---|
| | Russia | | Ukraine | |
| | 1997 | % of 1996 | 1997 | % of 1996 |
| Sulfuric Acid | 6 100 | 108 | 1 400 | 91,0 |
| Pure Calcified Soda | 1 700 | 114 | 367 | 98,0 |
| Pure Caustic Soda | 900 | 109 | 156 | 99.7 |
| Mineral Fertilizers (100% Nutrient equ) | 9 500 | 105 | 2 300 | 99.9 |

*Source : Russian State Custom Statistics Committee 98*

## 7.1 Russian Fertilizer Production, Actual 1997- 98

The estimates of percentages of Russian production *capacities* by CNIIMF for 1996 correspond to some degree to the *actual* production figures released by the Russian State Custom Committee (98). For the Year 1997 9,5 million tonnes of Mineral Fertilizers where producted, an increase of 5,2 % over 1996, which about brings back production to 1995 levels. For Synthetic Ammonia 8,7 million tonnes where produced, down 9,4 percent versus 1996 volumes. Sulphuric Acid is up 8,1 %.

| Russian Production of Fertilizers ( Chemicals and Petrochemicals) | | | | |
|---|---|---|---|---|
| Product Type | 1997 | 97 % of | 96 % of | Jan-Nov |
| Synthetic Ammonia | 8.7 | 90.6 | 99.8 | 8.1 |
| Sulfuric Acid | 6.1 | 108.1 | 83.1 | 5.6 |
| Calcified Soda | 1.7 | 114.0 | 79.5 | 1.5 |
| Caustic Soda | 0.9 | 108.6 | 75.3 | 0.9 |
| Mineral Fertilizers | 9.5 | 105.2 | 94.9 | 8.6 |

*Source : Russian State Custom Statistics Committee 98*

Production of fertilizer input and feedstock for the month of october - november 98 and corresponding volumes for 1997 are shown below, and both ammonia and mineral fertilizers show an increase over 97 monthly volumes. Thus it is obvious that the Russian fertilizer industry in terms of output has consolidated its position and maintains production volumes.

**Russian Production of Fertilizers (Chem & Petrochem) Oct – Nov 97 – 98 Tonnes (000)**

| Product | Oct 98 | % of Oct 97 | Nov 98 | % of Nov 97 | J- N 98 % J-N 97 |
|---|---|---|---|---|---|
| Synthetic Ammonia | 688 | 106,4 | 684 | 100.3 | 89,8 |
| Sulfuric Acid | 483 | 96,7 | 537 | 101.9 | 92,5 |
| Calcified Soda | 150 | 118,6 | 138 | 106.1 | 92,7 |
| Caustic Soda | 66,3 | 83,3 | 72,0 | 86,9 | 87,3 |
| Mineral Fertilizers | 804 | 112,1 | 793 | 93.6 | 97,7 |

*Source : Russian State Custom Statistics Committee 98*

## 7.2 Russian Export of Fertilizers - CIS non – CIS Countries by Type, Volume & Export Earnings 1ST Quarter 98

Exports from Russia in the first quarter of 1998 amounted to 17,6 Billion USD. In terms of market allocation, the area outside the CIS received net worth of 13,4 Billion or 76 %. To the markets within the CIS, allocation net worth of 4,2 Billion USD, or 24 %. This conforms to the larger picture of Russia having re-directing its exports towards markets with purchasing power after the break-up of the FSU, but a hard currency market share of 24 percent for CIS countries paid in is significant and worth noting.

Fertilizers deviates in terms of the overall markets allocation and as can be observed from the table below, only Calcium Phosphates as a commodity has a share approaching the overall. It is thus clear that new markets outside the FSU are the more important for the Russian Fertilizer Industry as we approach the new millennium.

Total export earnings in the first quarter of 1998for Fertilizers and related products accrued to 460,6 Million USD, annualised to 1,8424 Billion USD, or 2,6 % of Russian Export earnings. Of these mixed mineral fertilizer and potash are the more important.

| Russian Export of Fertilizer & Fertilizer Related Products, Million USD – 000 Tonnes 1rst Quarter of 1998 | | | | | |
|---|---|---|---|---|---|
| | 1st Quarter 1998 | | 1st Quarter 1997 | | |
| | Tonnes | US$ | Tonnes | US$ | % of 1997 (Volume) |
| Total Russian Exports | | 17611,9 | | 20609,7 | 85,5 |
| To Outside CIS | | 13424,3 | | 16493,0 | 81,4 |
| To CIS | | 4187,6 | | 4116,7 | 101,7 |
| Calcium Phosphates | 945,9 | 48,0 | 795,8 | 37,7 | 118,9 |
| Outside CIS | 735,2 | 34,0 | 511,0 | 21,1 | 143,9 |
| CIS | 210,7 | 13,9 | 284,8 | 16,6 | 74,0 |
| Ammonia | 565,4 | 42,9 | 834,6 | 106,7 | 67,7 |
| Outside CIS | 565,4 | 42,9 | 776,5 | 100,4 | 72,8 |
| CIS | | 0,02 | 58,1 | 6,3 | |
| Methanol | 165,7 | 17,7 | 197,1 | 22,9 | 84,0 |
| Outside CIS | 157,1 | 15,9 | 191,0 | 21,7 | 82,3 |
| CIS | 8,6 | 1,8 | 6,2 | 1,2 | 139,0 |
| Nitrogen Fertilizer | 1470,1 | 93,6 | 1929,8 | 225,7 | 76,2 |
| Outside CIS | 1367,2 | 83,9 | 1854,6 | 216,3 | 73,7 |
| CIS | 102,9 | 9,7 | 75,1 | 9,5 | 137,0 |
| Potash Fertilizer | 1101,5 | 99,4 | 1050,9 | 83,7 | 104,8 |
| Outside CIS | 1100,5 | 99,3 | 886,3 | 69,1 | 124,2 |
| CIS | 1,0 | 0,1 | 164,5 | 14,6 | 0,6 |
| Mixed Fertilizer | 1073,2 | 159,0 | 1088,3 | 172,1 | 98,6 |
| Outside CIS | 1073,2 | 159,0 | 1088,0 | 172,0 | 98,6 |
| CIS | 0,1 | | 0,3 | 0,2 | 28,9 |

*Source : Russian State Custom Statistics Committee 98*

## 7.3 Industry Sector Account Payables and Receivables

The sector to which the industry belongs, Petrochemical and Chemicals, are net debtors in terms of accounts receivable / payable. It deviates from both the Total Russian economy and the industry to which it belongs, 112 % payables in excess of receivables, where the industry operates at 60,4 % and the overall economy at 50,8 %. This is a bit surprising as the sector is significantly tilted towards stable hard currency export earnings, to which settlements should be easy. The sector account payables would be expected directed towards one or two levels up the supply (value) chain in terms of outstanding debt to petrochemical feedstock suppliers. Alternatively as outstanding taxes at Federal, Regional or Municipal levels. In terms of percentages, accounts receivables are 2,6 % of the national total and correspond to its share of exports. In terms of payables 3,6 % which is one percentage up on total, 38,5 % in relative terms.

**The Russian Chemical & Petrochemical Sector – Accounts Payable & Receivables as of October 1998**

| Mln Rubles | Accounts Receivable | Accounts Payable | Payables in Excess of Receivables Total | As % of Accounts Receivable |
|---|---|---|---|---|
| Total | 1 444 582 | 2 178 502 | +733 920 | 50.8 |
| Of Which: | | | | |
| Industry | 711 500 | 1 141 541 | +430 041 | 60.4 |
| Chemicals and Petrochemicals | 36 984 | 78 399 | +41 415 | 112.0 |

*Source : Russian State Custom Statistics Committee 98*

## 7.4 Russian Export of Fertilizers To The Far & South East Asia by Type.

| | |
|---|---|
| Potassium Chloride | 2 178 700 |
| Carbamide | 1 989 000 |
| Nitroammophos | 879 650 |
| Ammonium Nitrate | 113 220 |
| Total Export to FE & SEA | 5160570 |

Russian export of fertilizers to the Far East and South East Asia by type is 2,17 million tonnes of potassium chloride (42 %), 2 million tonnes of carbamide (39 %) and roughly 1 million tonnes of other nitrogen fertilizers (19%).

## 7.5 Russian Export of Fertilizer by Port to The Far East & SEA

| | |
|---|---|
| Odessa | 2 038 400 |
| Ventspils | 1 343 900 |
| Murmansk | 741 000 |
| Novorossiysk | 621 970 |
| St.Petersburg | 415 300 |
| Total Russian Export | 5 160 570 |

*Source : CNIIMF 98*

The infrastructure of the Former Soviet Union depicts itself clearly with regard to ports of trans-shipment for Russian export to Asia. Odessa in Ukraine account for 2 million tonnes or 40 % of through-put, Ventspils in Latvia for 1, 35 million tonnes or 26 %, Murmansk for 740 000 tonnes or 14 %, Novorossiysk for 12 % and St. Petersburg for 8 % of exports. It is also clear that the Northern Sea Route is important for selecting Murmansk as a port for exports to the Far East. Ventspils is likely to meet competition from the new Russian terminal in Ust-

luga in the Finnish bay in distant future, but until completion, Ventspils and its specialised terminal, Kalija Park, is likely to retain its strong market position. For Murmansk both available ice – classified tonnage, storage facilities and in particular rail capacity on the Northern Railway are constraints. Most of the volume passing through Ventspils and St.Petersburg are potential Northern Sea Route cargoes.

From the Latvian view, Russian Fertilizer export and other commodities are significant for overall Dry Cargo generation. Of an annual estimated total cargo turnover of 35,3 Million tonnes in 1998, 13,51 Million tonnes can be attributed to Russian crude oil exports. Significant volumes of Russian oil product also move over Ventspils, estimated to between 5 -10 Million tonnes. From this we can deduct that the dry cargo share in Ventspils accrue to between 11,8 and 16,8 million tonnes of which fertilizer export of Potash alone amount to 4,4 Million tonnes, and 1,34 million can be ascribed to the Far East. Thus Russian volumes are critical both to Ventspils and total Latvian port turnover.

| Latvian Port Turnover 1998 | | |
|---|---|---|
| Port | Jan-Sept | Annualised |
| Ventspils | 26 500 000 | 35 324 500 |
| Riga | 10 040 000 | 13 383 320 |
| Liepaja | 1 800 000 | 2 399 400 |
| Salacgriva | 224 300 | 298 992 |
| Skulte | 61 100 | 81 446 |
| Others | 174 600 | 232 742 |
| Total | 38 800 000 | 51 720 400 |

*Source : Latvian State Custom Statistics Committee 98*

## 7.6 Russian Export of Fertilizer by Country to The Far East & SEA 1997

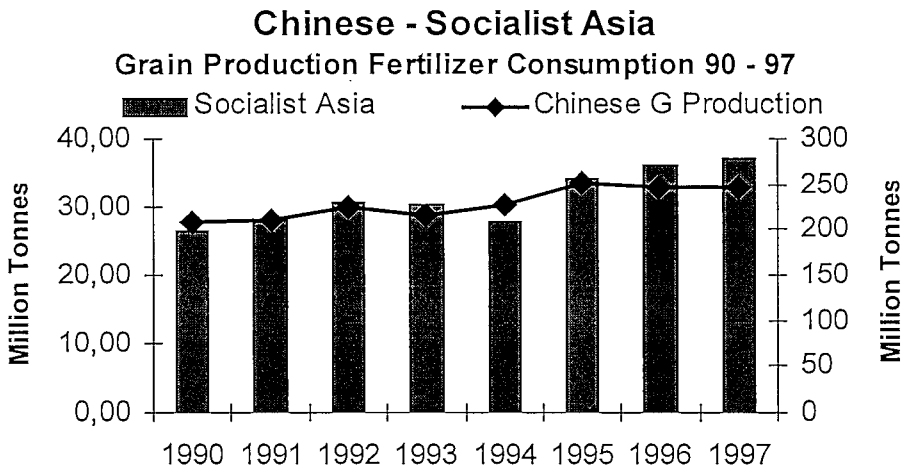
| | |
|---|---|
| China | 4 086 330 |
| Singapore | 683 900 |
| Malaysia | 325 320 |
| Indonesia | 40 000 |
| Japan | 20 000 |
| Taiwan | 5 020 |
| Total Russian Fertilizer Export to FE & South East Asia | 5 160 570 |

*Source : CNIIMF 98*

Total Russian Export to the Far East & South East Asia accrued to 5 160 570 million tonnes in 1997. China as predicted (Ramsland 1994) is clearly the largest importer and account for 4,1 million tonnes or 80 % of the export to the region. South East Asia account for about 19

% with Singapore destination for 683 000 tonnes (13 %) and Indonesia for 325 000 tonnes or 6 %. Japan and Taiwan received a shipload or two per year and are negligible.

## 7.7 CHINA AS AN IMPORT MARKET




China as the primary market for fertilizers must be expected to grow as long as grain production increases. The correlation between total fertilizer nutrient consumption for Socialist Asia, which the Chinese economy dominates, and China as a grain producer in million tonnes, is R2 of 0,87.

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|
| Socialist Asia TFN Cons. | 26,33 | 28,16 | 30,69 | 30,29 | 27,61 | 34,07 | 36,10 | 37,02 |
| Chinese Grain Production | 209 | 210 | 224 | 216 | 228 | 252 | 247 | 246 |
| Correlation | | | | | | | | 0,87 |

*Source : Clarkson Research dry Bulk Outlook July 98 (Chinese Grain Volumes)-IFA 98*

## 7.8 RUSSIAN EXPORT OF FERTILIZER TO FAR EAST & SEA 1997 BY REGION

| | |
|---|---|
| Berezniki – (Silivinit) | 1 764 400 |
| Togliatti | 653 700 |
| Nevinnomyssk | 633 470 |
| Solikamsk – (Uralkaly) | 602 400 |
| Moscow | 571 900 |
| Novgorod | 551 000 |
| Sverdlovsk | 349 000 |

| | |
|---|---|
| Meleuz | 34 700 |
| Total Russian Fertilizer Export to FE & South East | 5 160 570 |

The Oblast of Perm about 1 000 km to the North East of Moscow holds the largest deposits of potash and production facilities of potassium chloride. The two close cities of Berezniki and Solikamsk both have independent companies, Uralkaly located in Berezniki and Silvinit located in Solikamsk. JSC "Uralkali" has a total production capacity of 5,8 million tonnes, 3 mines, 4 concetration mills and granulation facilities. JSC "Silivinit" has a total production capacity of 4,2 million tonnes, 3 mines, 3 concentration mills and granulation facilities. The Belarus partner is located in Soligorsk and has a production capacity of 3,2 million tonnes, 4 concentrating mills and granulation facilities.

To handle exports the two companies, together with PA Belarus formed International Potash Company to handle the export of potash, much the same model as Canpotex in Canada. The three producers control all the potash capacity in the Former Soviet Union, and by company information, 30 % of world production capacity. Combined they are the largest exporters of fertilizers in Russia, and according to company information, IPC exports accrued to 8,4 million tonnes in 1997. The company has offices in Perm, in Minsk and in Beijing the largest market. The company, and thus Russian potash export, is likely to focus on China as the main market, alongside India and Brazil, as the European Union has effectuated anti-dumping measures against Russian imports. A total of 5 000 hopper rail cars are necessary to facilitate the export and transportation to trans-shipment point from Perm.

A total of 2, 56 million tonnes of Russian fertiiizers were exported to the Far East and South East Asia in 1997[2]. Of a total production of in 1997 of 2,048 million tonnes, Silvinit trans-shipped 1, 74 million tonnes to FE & SEA which account for 86 %. Export is split between Ventspils and Odessa and thus only non-Russian transhipments. "Uralkaly" trans-shipped 602 thousand tonnes, and primarily exports over St. Petersburg, about 80 % of its exports,

[2] Compared to the import statistics, see section 2.3, Combined Export – Import Scenario North West Europe – Far East, the Far East imported a total of 6,92 million tonnes through the Suez Canal.

the remainder 20 % over Ventspils. In matrix form exports by producer and point of transhipment looks like this:

RUSSIAN FERTILIZER EXPORT - PORT OF TRANSSHIPMENT 1997

| | Odessa | Ventspils | Murmansk | Novorossiysk | St.Petersburg | Total |
|---|---|---|---|---|---|---|
| Berezniki | 607 600 | 1 156 800 | | | | 1 764 400 |
| Togliatti | 653 700 | | | | | 653 700 |
| Nevinnomyssk | 11 500 | | | 621 970 | | 633 470 |
| Solikamsk | | 187100 | | | 415300 | 602 400 |
| Moscow | | | | | | 0 |
| Novgorod | 381 900 | | 741 000 | | | 1 122 900 |
| Sverdlovsk | 349 000 | | | | | 349 000 |
| Meleuz | 34 700 | | | | | 34 700 |
| Total | 2 038 400 | 1 343 900 | 741 000 | 621 970 | 415 300 | 5 160 570 |

*Source : Russian State Custom Statistics Committee - CNIIMF 98*

Russian fertilizer production is thus concentrated in regional clusters. Internal production, transport and ports of trans-shipment is relatively logic considering the infrastructure left behind when the Union broke up.

From the previous it can be stated that Russian Fertilizers export as a segment is stable and import to the Russian economy. If we apply the 1997 export volume of fertilizers to the dry cargo export volume of the major ports[3], it amounts to 8,6 % for Novorossiysk, to 16 % for Murmansk and to 6,85 % for St. Petersburg, all significant market shares for the ports.

**Russian Port Turnover Jan - April 1998 Tonnes**

| | Januar - April 98 | | | Annualised | | |
|---|---|---|---|---|---|---|
| | Total | Dry Cargo | | Total | Dry Cargo | |
| Port | | Export | Import | | Export | Import |
| Novorossiysk | 3 475 000 | 2 399 000 | 1 173 000 | 10 425 000 | 7 197 000 | 3 519 000 |
| St.Petersburg | 2 735 000 | 2 017 000 | 718 200 | 8 205 000 | 6 051 000 | 2 154 600 |
| Murmansk | | 1 547 000 | 521 700 | 0 | 4 641 000 | 1 565 100 |
| Kaliningrad | 712 300 | | | 2 136 900 | 0 | 0 |
| Total | 17 952 000 | | | 53 856 000 | | |

*Source : Russian State Custom Statistics Committee 98*

[3] Based on annualised volumes for Russian sea ports january -april 98 (State Custom Committee 98).

# 8 CONCLUSION

This paper has tried to highlight the position and stability of the Russian Fertilizer Industry as a segment for trans-shipment between European Russia and the Far East. The industry is a major world producer, if not the most important. To focus on the industry as such based on the results of INSROP Phase I has been correct.

World consumption of nitrogen fertilizers has increased in the period covered, whereas the FSU shows gross decline. Production capacity has been kept and the major growth market has been Socialist Asia as mainly refers to China. Potash production decline world-wide, and the same consumption pattern as for nitrogen is observed, China account for the majority of the Russian decline. Phosphate capacity also declines world-wide. We observe that the segments of abundant factor allocation in Russia have experienced strong growth in Asia.

The high growth observed in China and Indian sub-Continent cannot be expected to grow infinitely, in particular as these economies integrate along the value chain to capture a larger share of the surplus. Higher real term energy prices in Russia could affect local prices of ammonia – nitrogen negatively as a function of natural gas price. However, the current development internally and the current world prices point to the contrary. A reduction of transport subsidies could reduce profitability as production is centrally located. A Depressed world market and the general lack of investment in the sector can also affect volumes negatively. As non-payment by domestic consumers is a problem the industry prone is prone if also export revenue also fails.

Thus one should expect consolidation in the Russian fertilizers industry, with some closure of older production capacity, and potentially some re-direction of exports. There is however no way around the long-term access of factors in terms of natural gas and condensates supply as input to ammonia production on the one hand, and potash production capacity as a function of accessible mines and reserves on the other. Thus Russia as a producer, and the cargo segment in general, should be expected to remain stable on the Europe Far East Trade. The export is split on a rough 50-35-15 basis between the Black Sea, Baltics and the North in Murmansk. Thus about 50 % of cargo generation is relevant for the NSR. A significant shift of cargoes out of the Black Sea should not be expected, as these shipments to a certain degree results from location of production internally in Russia, and part cargoes

also must be reckoned destined for the Indian sub-continent, not optimally served by the NSR.

HSVA

# Review of
# INSROP - Discussion Paper
# by Trond R. Ramsland
# on "The Russian Fertilizer Industry"

The presented paper by T.R. Ramsland on "The Russian Fertilizer Industry" covers well the statistics of Production, Production Capacity and Consumption for fertilizer such as Nitrogen, Phosphates and Potash focussed mainly on Russia as the producer and China as the main consumer.
The statistics are\most actuall (97/98) and support the conclusions drawn by Invanov in his INSROP - Report.

The present paper tries to predict the stability of fertilizer as a potential cargo for the NSR in the years ahead, which is a major criteria for establishing this cargo line.
The title "The Russian Fertilizer Industry" is a little bit misleading, because the paper talks about production and consumptions values/trends rather than about industry.

The last sentence on page 5 is misleading, because the increased competition will be between the Russian ports on one side and between the shipping companies on the other, and not - as it reads - between the ports and shipping companies.

The last sentence on page 6 needs further explanations: "Russia had (?) both, the incentive to and the disadvantage of developing the NSR.". What is this all about?

Chapter 8 needs some polishing in the English language especially the 3rd paragraph.

What means "the long term access of factors in Russia"? (last paragraph)

Alltogether a very valuable contribution to the evaluation of potential cargo volumes for the NSR.

J. Ulrich 22.2.99

**Department of Shipping, Trade and Finance**

**Professor Costas Th. Grammenos, OBE, DSc**
Head of Department
Pro-Vice Chancellor, City University

CITY University
BUSINESS SCHOOL

27 February, 1999

Claes Lykke Ragner
INSROP Secretariat
PO Box 326
N-1324 Lysaker
Norway

Dear Claes,

**Re: Project III.01.4: "The Russian Fertiliser Industry", by Trond R. Ramsland**

I have now finished reviewing the above paper and here is my reaction.

The paper looks at potential cargo generation for the NSR by the Russian fertiliser export industry. It begins with an overall look at the world fertiliser situation, followed by a concise and informative part on the main demand/supply characteristics of the industry. The author then concentrates on the Russian fertiliser industry, analyses its current state and look at the geographical distribution of Russian export flows.

From the paper it is quite clear that the most relevant and interesting cargo flow from the point of view of the NSR is the one destined to China, which has recently shown the most impressive import growth in the particular commodity. Although the author does not foresee any change in the supply patterns from Russia (i.e. the ports from which fertiliser exports are channelled to the F. East) perhaps a closer look at the demand side (focusing on China) might be in order. Is there any reason to expect the Chinese to continue (or even intensify) importing from Russia? If yes, what is the reason (quality, cost, security of supplies or what else)? If import demand from China does increase is it likely that the flows will originate in the NSR (i.e. the Murmansk area) or are Baltic and Black Sea ports in a much better position?

Finally, another look at spelling and grammar would be in order, before the final version is submitted.

Overall, I found this an interesting and useful paper. Perhaps the author would like to take into account some of the suggestions herein, which would help make his final conclusions more comprehensive

Sincerely yours

Michael Tamvakis

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Dr. Joachim Schwartz
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**COMMENT TO THE REVIEW OF INSROP PROJECT III.01.4**

I concur to Dr. Schwartz review and the minor comments are incorporated into the text. I feel that the title do reflect the content, as the INSROP program in itself offer the explanation to that of the shipping economist approach. However, for those not yet comfortable with the program approaching industries and cargo bases from its long-term commercial applicability to the shipping market, a sub-title of fertilizers as a cargo segment on the Europe – Far East trade is added.

Sincerely

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Tamvakis, Michael
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## COMMENT TO THE REVIEW OF INSROP PROJECT III.01.4

To the questions raised of the demand side in China, this has been addressed to as regards the information and statistics available within the time schedule allowed.

To the degree China has a propensity to continue its imports from Russia, will largely depend on prices and availability. As refers to feedstock input concerning the major nutrient, nitrogen fertilizers, Russia will be competitive as refers to feedstock for the forseeable future. Larger scale natural gas supplies to China could tilt this balance as this author sees it. As refers to Russian natural gas the Kovyakta field in the Sakha Republic could be one source and the Sakhalin Area an other, where fertilizer production as a by-product to energy consumption could be both viable and likely. This would be the likely step if integrating along the value chain, as nitrogen fertilizers is the commodity that show the strongest growth in absolute volumes in Socialist Asia.

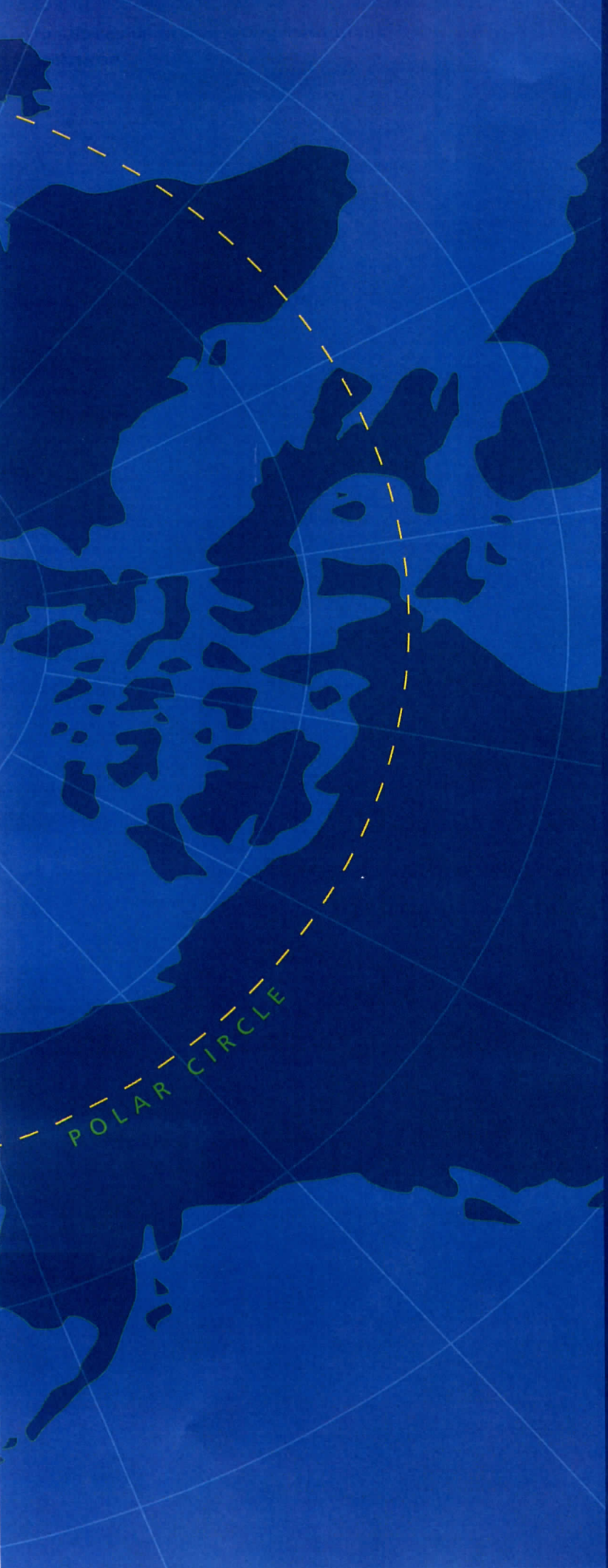
As refers to import of nitrogen fertilizers, this segment account for only 19 % of the Russian exports (section 7.4). In terms of location and production capacity, I refer to the enclosed table of the annualised fertilizer production capacity for 1998 (Goskomstat 1999). In terms of Nitrogen fertilizers, production capacity is tilted towards the central region, but Berezniki, Perm and Novgorod can use both the Baltics and Murmansk port as a viable solution for exports to China.

Regarding potash and potassium, Russia is a dominant long run producer alongside Canada, and secure and cost competitive supplier ( based on local Purchasing Power Parities 4:1 vs US/Canada). Uralkaly and Silvinit both export through all 3 different alternatives. An increase in potassium would imply use of the specialised ports, and the author cannot see that a significant change in the current pattern should take place (see page 27). In Murmansk, port capacity in terms of overall logistics would probably need to be upgraded to handle significant increased volumes, for which the investment climate in Russia do not allow. Kalija Park in Ventspils could probably handle extra volumes without any further investments, for which the NSR remain a competitive mode vs Suez.

As refers to indigenous production capacity based on condensates as feedstock the general pattern is that the market and establishment of petrochemical production capacity in Asia, and in particular in China, has been put on hold.

Thus there is no factors suggesting an alternation of the initial conclusions.

Trond Ragnvald Ramsland




**The three main cooperating institutions of INSROP**

**Ship & Ocean Foundation (SOF), Tokyo, Japan.**
SOF was established in 1975 as a non-profit organization to advance modernization and rationalization of Japan's shipbuilding and related industries, and to give assistance to non-profit organizations associated with these industries. SOF is provided with operation funds by the Nippon Foundation, the world's largest foundation operated with revenue from motorboat racing. An integral part of SOF, the Tsukuba Institute, carries out experimental research into ocean environment protection and ocean development.

**Central Marine Research & Design Institute (CNIIMF), St. Petersburg, Russia.**
CNIIMF was founded in 1929. The institute's research focus is applied and technological with four main goals: the improvment of merchant fleet efficiency; shipping safety; technical development of the merchant fleet; and design support for future fleet development. CNIIMF was a Russian state institution up to 1993, when it was converted into a stock-holding company.

**The Fridtjof Nansen Institute (FNI), Lysaker, Norway.**
FNI was founded in 1958 and is based at Polhøgda, the home of Fridtjof Nansen, famous Norwegian polar explorer, scientist, humanist and statesman. The institute spesializes in applied social science research, with special focus on international resource and environmental management. In addition to INSROP, the research is organized in six integrated programmes. Typical of FNI research is a multi-disciplinary approach, entailing extensive cooperation with other research institutions both at home and abroad. The INSROP Secretariat is located at FNI.