

NPK FERTILIZER PRODUCTION IN RUSSIA :

CURRENT SITUATION AND OUTLOOK

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INTRODUCTION

In the 1970s substantial production capacities for NPK fertilizers based on nitric/sulfuric acid decomposition of phosphate raw material to obtain the product of the NPK 11:10:11 grade with its components ratio of $N:P_2O_5:K_2O = 11:10:11$ were constructed in USSR and in Russia. The production was based on French company "PEC" process, i.e. apatite (phosphate rock) decomposition with sulfuric and nitric acid mixture without calcium sulfate extraction. The water soluble P_2O_5 content in this product amounts to 50%. The total capacity of NPK 11:10:11 production facilities built in the USSR was 3,120,000 ts, with 2,120,000 ts in Russia.

At the same time production capacities based on French company "Speichim" process were being introduced. The technology is based on neutralizing ammonia with extraction phosphoric acid and leveling the ratio $N:P_2O_5$ by introducing ammonium nitrate. These units produce NPK 17:17:17 with its components ratio of $N:P_2O_5:K_2O = 17:17:17$. Their production volume in the USSR reached 5,180,000 t/y, and in Russia - 3,980,000 t. The maximum content of nutrients in NPK 17:17:17 is 51%, and water soluble P_2O_5 100%.

NPK 11:10:11 and NPK 17:17:17 were at that time the main complex NPK-type fertilizers in Russia and CIS. Later on, however, due to agricultural organizations being oriented to preferential use of high concentration types of fertilizers such as MAP (nutrients content up to 63%), the latter made the principal contribution to the production capacities growth. The MAP production capacity by the end of the 1990s, as compared to 1975, was 4 times increased and reached 1,270,000 t P_2O_5 . Constructing new production lines was accompanied by converting NPK 17:17:17 plants to MAP or nitric DAP units. Some of NPK 11:10:11 units were closed.

At the beginning of the 1980s, due to lack of sulfuric acid caused by shortage of sulfur in Russia, large capacities for producing NPK by nitric acid decomposition of apatite (phosphate rock) with calcium nitrate freezing out and its further conversion into ammonium nitrate and calcium carbonate were started. These capacities were built over the period 1980 to 1985 at three nitrogen fertilizer plants in Novgorod, Dorogobuzh and Rossosh. Five units of 550,000 t/y capacity each (total - 2,750,000 t/y) were erected based on Norsk Hydro technology (Odda process), using equipment of TEC company, Japan. These units produce the so-called NPK 16:16:16 with the water soluble P_2O_5 content of 75%.

The advantages of these units are as follows : sulfuric acid is not required and there are no phosphogypsum dumps. Phosphogypsum storage and utilization involve substantial difficulties and costs. Calcium nitrate recovered in these processes as a result of freezing out is converted to ammonium nitrate and calcium carbonate. The latter is used for liming soils and in construction. Another advantage of nitric acid decomposition of phosphate rock concentrate from Khibiny deposit is a possible recovery of rare earth elements and strontium. Total capacity of NPK 16:16:16 production is 2,750,000 t of the product (440,000 t P₂O₅).

By the end of the 1990s, of all complex NPK fertilizer plants in Russia, the following ones are in operation : 5 NPK 16:16:16 units (3 - at Acron, 2 - in Rossosh), one NPK 17:17:17 unit with its capacity of 600,000 t/y at JSC Nevinnomysskiy VTI, and one NPK 11:10:11 at JSC Novomoskovskaya AK Azot with its capacity of 419,000 t/y. The units in Nevinnomyssk and Novomoskovsk operate at 25% of their nameplate capacity on the average.

CAPACITIES

At present, the total capacity of the existing NPK fertilizer productions in Russia amounts to 4,169,000 tons of the product or 630,000 tons of P₂O₅. The NPK fertilizer share is 16.4% of the total phosphate fertilizers capacity. The NPK fertilizers produced by nitric acid decomposition (NPK 16:16:16) amount to 11.4%, 7% of which accounts for Acron Holding. MAP and DAP constitute the principal share in phosphate fertilizer capacities in Russia as well as in the rest of the world. Their share in Russia makes around 50% totally (Slide 1).

The world nitrophosphates capacities (NPK fertilizer based on nitric acid and nitric/sulfuric acid processes) are estimated at 20,000,000 tons of the product. The largest of them are concentrated in Western Europe (42.0%). CIS comes second (21.6%), with Central Europe being third (11.0%). Some substantial capacities are also available in India and China. But nevertheless the basic nitrophosphates capacities are concentrated in Western, Central and East Europe with their complex fertilizer application practice formed historically. Among the nitrophosphates producing countries, the first place is occupied by Russia which accounts for about 20% of world capacities. The second and third best are Romania and Norway. It should be noted that the world nitrophosphates capacities were mainly formed until the middle of the 1980s with practically no further constructing fertilizer capacities of such type. On the contrary, there is a marked complex NPK fertilizers demand reduction trend in the world. It mainly concerns fertilizers based on phosphoric acid.

Russia is also the largest exporter of nitrophosphates in the world. The share of Russia in world nitrophosphates export is estimated at 37% with the share of the largest Russian NPK 16:16:16 exporter, Acron Holding, being approximately 30% of the total nitrophosphates export. It should be noted that the above figures are based on estimation. (The world export data are approximate, as the international statistics does not single out nitrophosphates production and export data, indicating them in one line as “other complex fertilizers”).

PRODUCTION

The production of NPK fertilizers in Russia before 1984 was only represented by two products - NPK 17:17:17 and NPK 11:10:11. Their production reached the peak in 1978 and amounted to 2,300,000 tons. Later on, their manufacture was maintained at 1,500,000 tons to 1,700,000 tons. From 1985 on, their production was significantly reduced due to, as was already mentioned above, shutdown of a number of NPK 11:10:11 plants, in particular in Novgorod, and conversion of the majority of NPK 17:17:17 plants to MAP and nitric DAP production. NPK 17:17:17 and NPK 11:10:11 are still produced in small quantities in Novomoskovsk (NPK 11:10:11) and in Nevinnomyssk Vneshtreidinvest (NPK 17:17:17).

The triple fertilizers based on phosphoric acid are also produced at Cherepovets JSC "Ammophos", i.e. NPK 10:25:25 and NPK 13:19:19.

The main triple fertilizer in Russia is NPK 16:16:16 with its constituents ratio of $N:P_2O_5:K_2O=16:16:16$. NPK is produced at three plants in Novgorod, Dorogobuzh and Rossosh. In fact, Rossosh originally produced double 22:22 and 26:13 fertilizer grades due to some process difficulties. In recent years, the plant has also manufactured a triple fertilizer.

It should be noted that one more Russian plant introduced the nitric acid complex fertilizer process with freezing out calcium nitrate. The Kirovochepetsk Chemical Complex constructed a large scale NPK plant using its proprietary know-how. For a number of various reasons, however, the plant manufactures a double fertilizer – NPK 23:21:0 with its components ratio of $N:P_2O_5:K_2O = 23:21:0$.

The range of NPK fertilizers as produced in Russia is given in Slide 2. NPK 16:16:16 accounts for the principal share of about 86% in the NPK fertilizers produced.

The major share in the range of nitrophosphates produced in Russia, i.e. fertilizers based on nitric acid and nitric/sulfuric acid compositions production methods, belongs to NPK 16:16:16 – 76.6% (Slide 3). The nitrophosphates share in the total production of phosphate fertilizers has slightly increased since 1995, without exceeding 25% though. The major NPK 16:16:16 producer is Acron Holding. The holding's share in the total production of NPK 16:16:16 was 75% in 1999.

The production of NPK fertilizers in Russia has increased by 33% since 1995 (Slide 4).

The nitrophosphates production has increased by 40%, and NPK 16:16:16 by 45% (Slide 5).

NPK 16:16:16 comes fourth in the total output in Russia following such big tonnage products as ammonium nitrate, urea, potassium chloride.

Total nitrophosphates capacities in Russia were 82% operated in 1999, whereas Acron Holding has been running its NPK 16:16:16 production plants at 100% capacity for a number of years.

DOMESTIC MARKET

As one may know, the Russian mineral fertilizer industry was from the very outset intended to satisfy domestic customers' demand. Exports were limited to the governmental activities. From beginning of the 1990s, and particularly after considerable advance in fertilizers prices in 1992 and 1993, a sharp decline in supplies of mineral fertilizers to the domestic market was evidenced. In the total 12.7 times fall-down of mineral fertilizers supplies, phosphate fertilizers supplies to the agricultural sector since 1988 (peak deliveries year), i.e. for 10 years, 22.4 times fell and reached the minimum floor level of 210,000 tons of P_2O_5 in 1998. Even doubled deliveries of phosphate fertilizers in 1999 did not sufficiently influence the general situation with domestic supplies that remained at a very low level (Slide 6). The Russian farmers cannot buy fertilizers at market prices so high.

The biggest suppliers to the domestic market are OAO Kirovochepetsk chemical plant, Acron Holding company and Novomoskovskaya AK AZOT that possess nitrophosphates production plants- NPK 23:21:0, NPK 16:16:16 and NPK 11:10:11.

The basic products supplied to the farmers in Russia in the last years are ammonium nitrate (about 60% of the total volume of supplies) and NPK 16:16:16 (10.6%) (Slide 7). The biggest supplier of NPK 16:16:16 is Acron Holding company.

MAP deliveries to the domestic market are carried out in minor quantities with no DAP supplies at all.

EXPORT

The striking feature of the past two years, from the August financial crisis of 1998, is the export growth of all kinds of mineral fertilizers in comparison with the pre-crisis time. It is mainly due to the devaluation of the ruble that caused rundown of costs for fertilizers production calculated in dollars and contributed to competitiveness on the world market. It is worth noting that in the phosphate fertilizers business rundown was not so sharp as with nitric fertilizers where the U.S. dollar price for natural was 3 times reduced. The U.S. dollar price for the main raw materials for phosphate fertilizers production - apatite concentrate- remained unchanged, as well as a price for railways transportation tariffs. Nevertheless, the costs for phosphate fertilizers production also lowered (on account of nitric constituent and energy carriers costs reduction). As a result, the export of NPK fertilizers in 1999 in comparison with 1998 increased by 23%, of which NPK 16:16:16 by 15%. The main portion in NPK export is taken by NPK 16:16:16.

Export of NPK 16:16:16 has increased by 1.6 times since 1994, and in 1999 amounted to about 2,000,000 tons (or approximately 293,000 ts of P_2O_5) (Slide 8).

By the scale, the export of NPK 16:16:16 can be compared with the export of such popular fertilizers as ammonium nitrate and urea. The share of the exported NPK 16:16:16 from 1994 has increased from 76.7% (1995) to 100% (1997-1998) (Slide 9). In the first half of 2000 the export of NPK 16:16:16 was reduced by 10.5%.

In 1999 81.2% of the total manufactured products were shipped to export, and in the first half of 2000 - 83.2%. The major exporter of NPK 16:16:16 is Acron Holding company. The main destinations of export of NPK 16:16:16 are Asian countries and, first of all, China. In the first half of this year deliveries to Asia have reduced (by more than 1/3), whereas deliveries to Western Europe and Latin America increased (Slide 10).

In the first half of 2000 the main destination of the export of NPK fertilizers was Asia – more than 60%. Export of NPK to Latin America amounted to 20% (Slide 11).

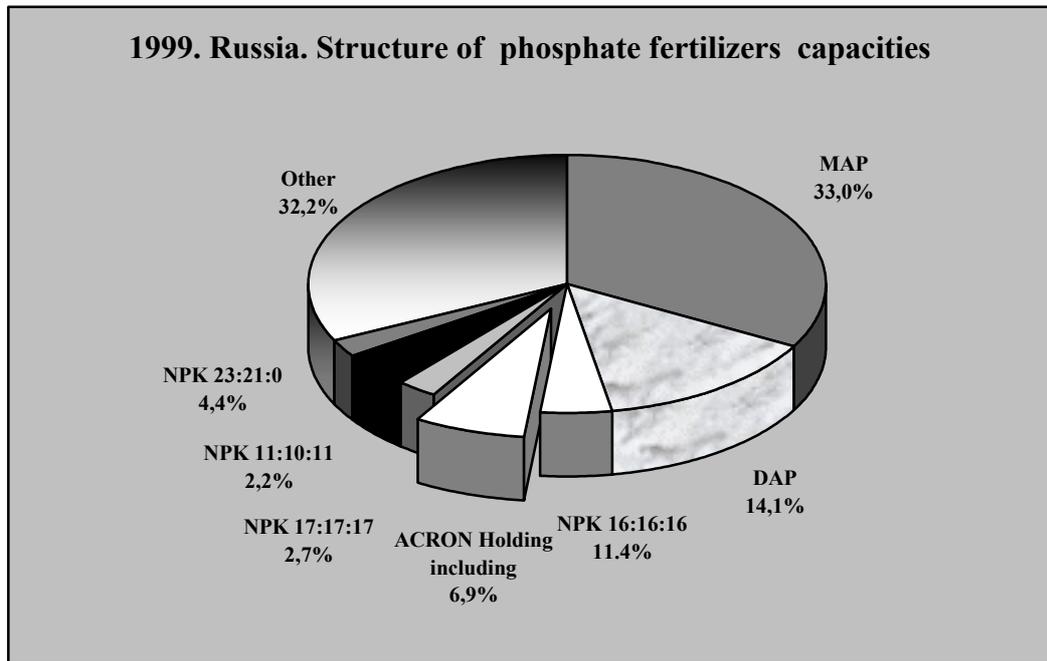
PROSPECTS

The domestic market in Russia is still in stagnation. Even a successful fulfillment of the scheduled deliveries to agriculture in the first half this year is not the evidence of the considerable change of the situation. It may be supposed that deliveries of fertilizers to the Russian domestic market in 2000 will remain at the level near to the average one during the last 5 years. Critical changes in the domestic market could be expected not earlier than in 10–15 years. At that time deliveries of mineral fertilizers are likely to be 5 to 6 times increased, on the whole.

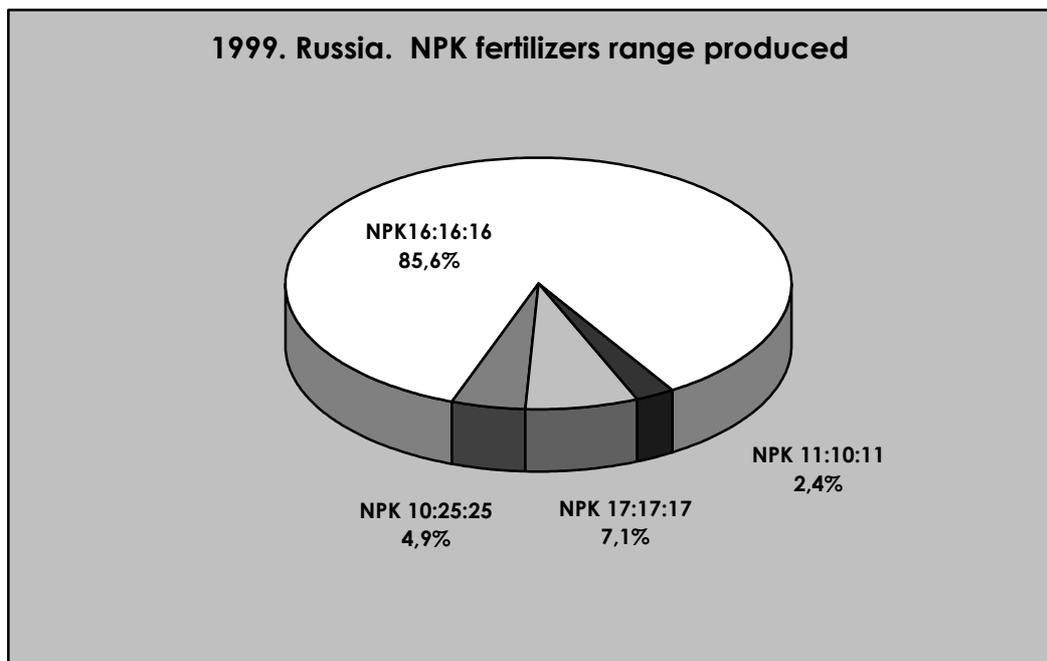
However, in order to ensure the well balanced ratio of N: P₂O₅: K₂O the deliveries level of phosphate fertilizers should be higher. Utilization of the production capacities of phosphate fertilizers industry now reached 60%, and becomes limited to production of sulfuric acid. Since the major volume of phosphate fertilizers is exported, it is evident that the growth of domestic deliveries will make the producers reduce the export.

As far as NPK fertilizers are concerned, we believe that type of fertilizers will retain its importance in future. Having no competition with other compound fertilizers on the domestic and world markets, they occupy their stable niche in the regions of their traditional application (Russia, Europe, Asia). These fertilizers are sufficiently concentrated ones, and various flexible processes make it possible to manufacture products with different ratios of N, P₂O₅ and K₂O. In the situation of shortage of sulfuric acid the processes of nitric acid decomposition have no such limitations and can be used to meet demands of the domestic and world markets.

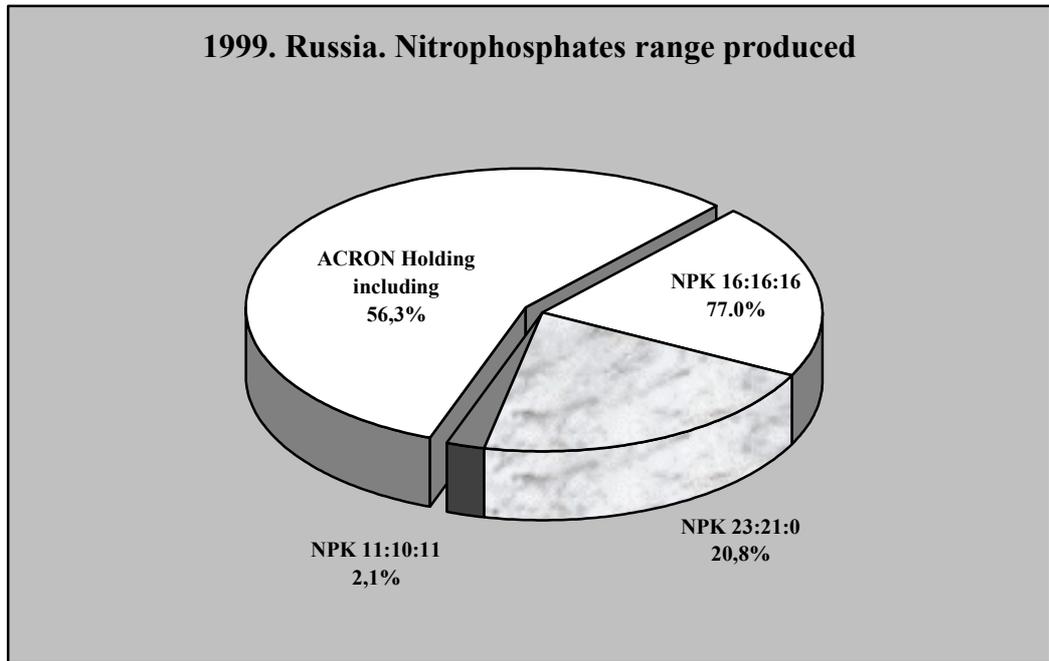
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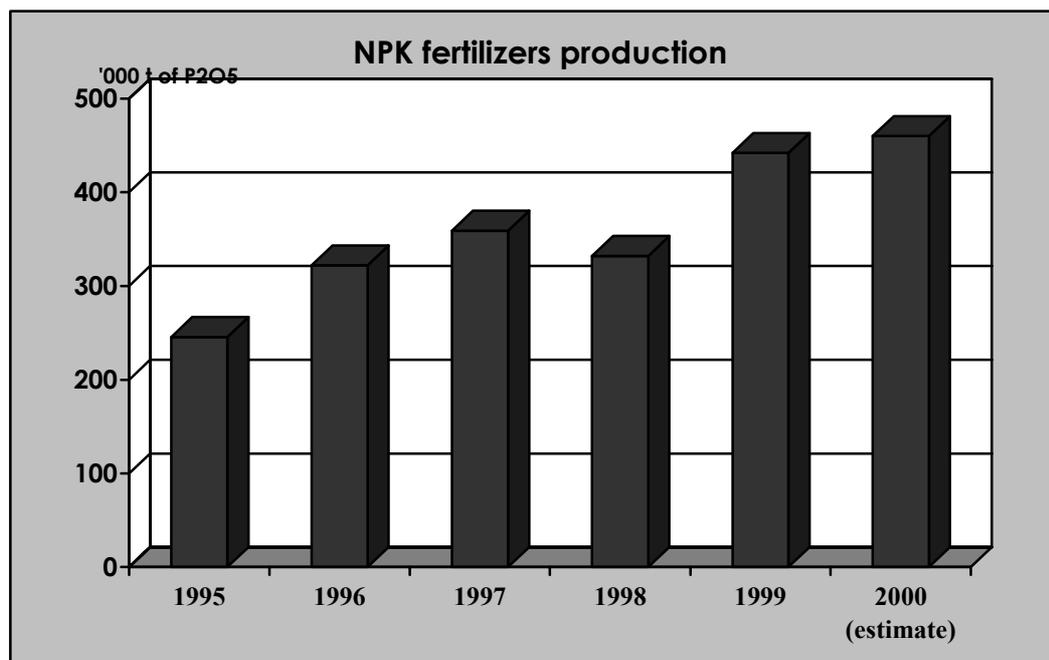
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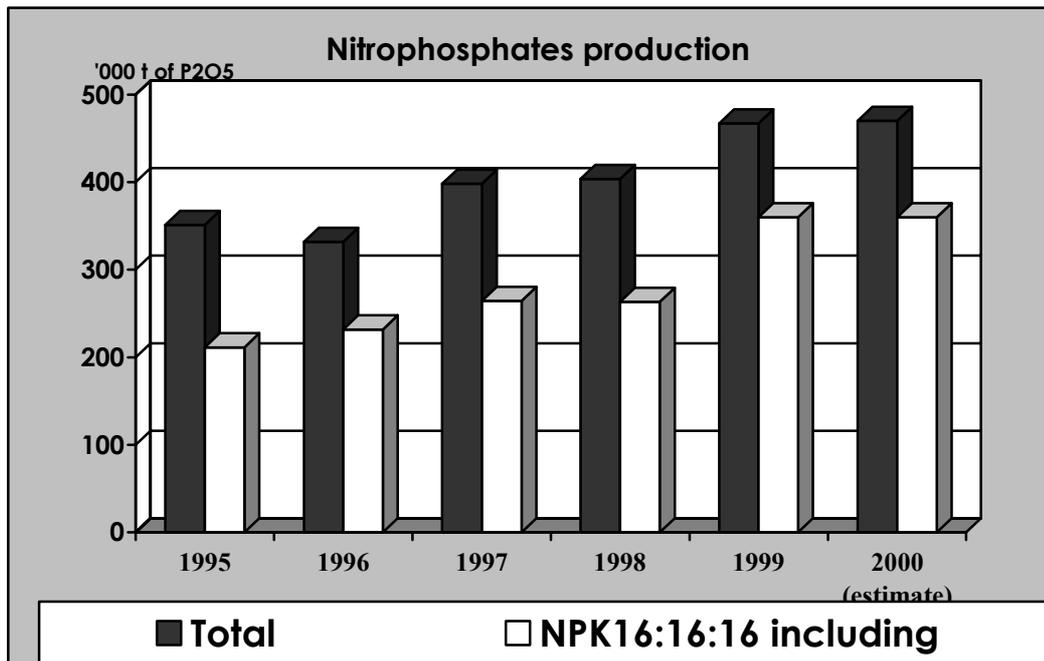
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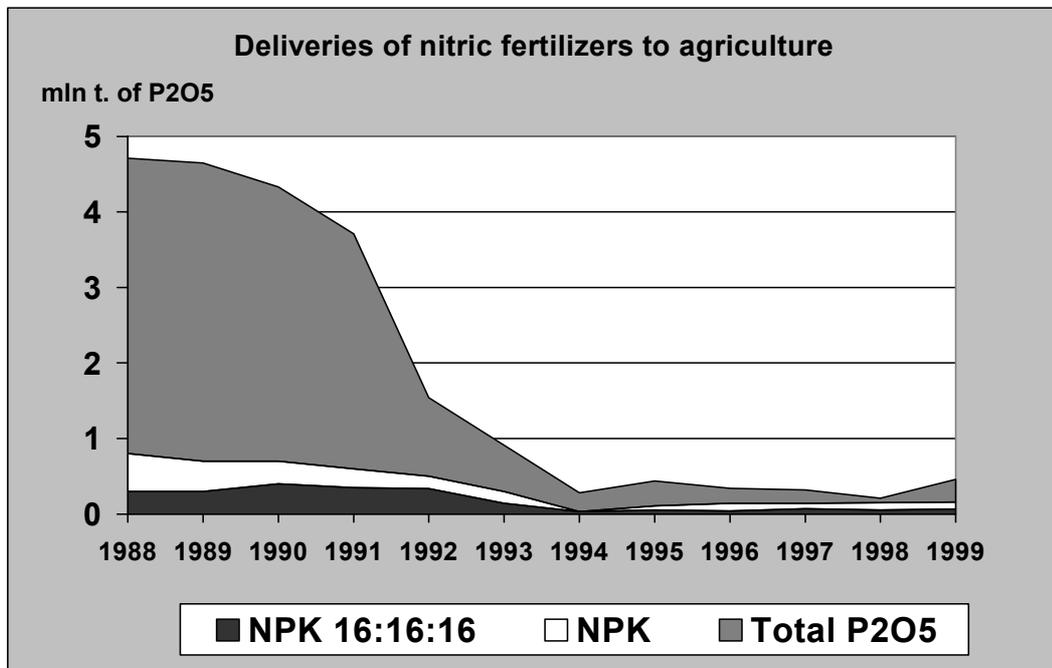
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Slide 5



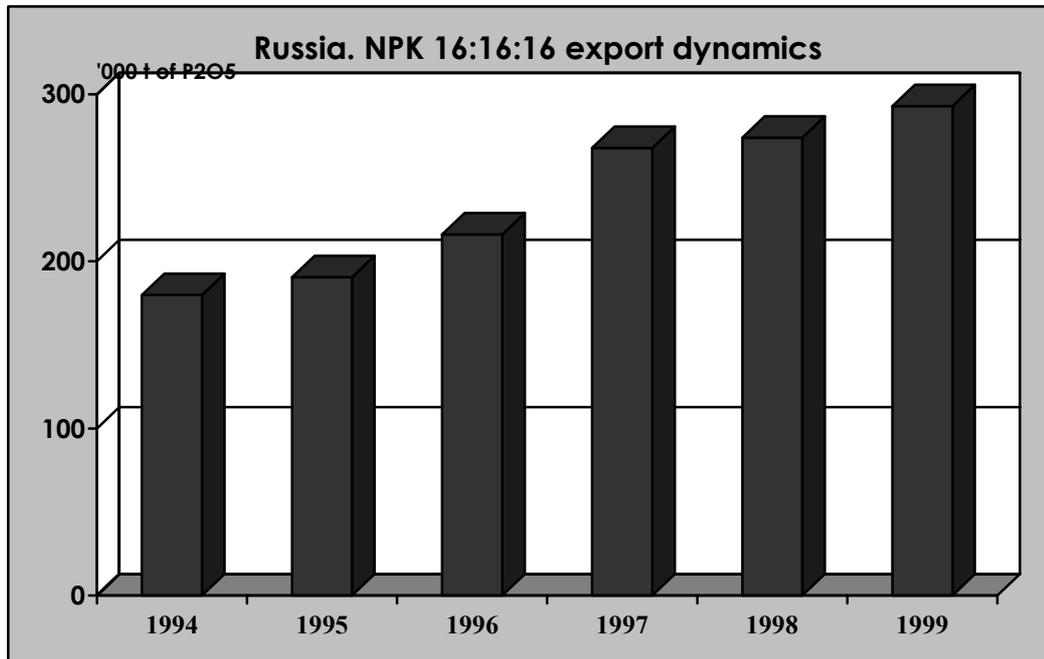
Slide 6



Slide 7

1999 г. Supplies of main types of mineral fertilizers to Russian agriculture	
Product	Volume of supply, '000 t of physical weight
<i>Ammonium nitrate</i>	2150
<i>N:P₂O₅: K₂O=16:16:16</i>	390
<i>Urea</i>	225
Potassium chloride	164
<i>N:P₂O₅:K₂O =23:21:0</i>	145
<i>N:P₂O₅:K₂O =10:25:25</i>	105
<i>N:P₂O₅:K₂O =13:19:19</i>	100
<i>N:P₂O₅:K₂O =17:17:17</i>	66
<i>N:P₂O₅:K₂O =11:10:11</i>	66
<i>TOTAL RUSSIA</i>	3670

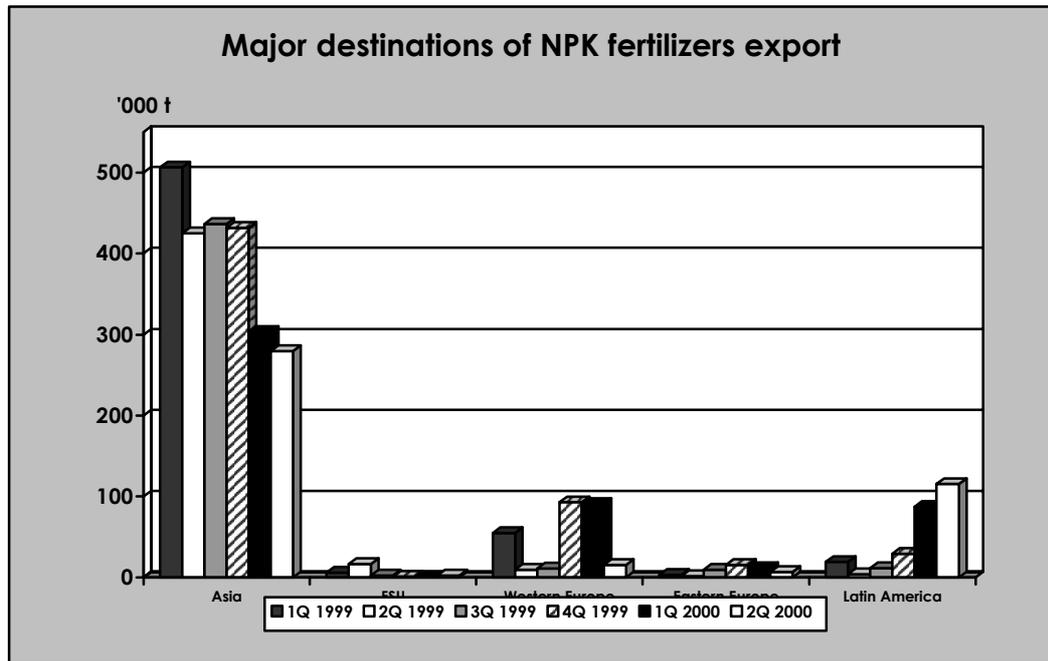
Slide 8



Slide 9



Slide 10



Slide 11

