
PRINCIPLE TRENDS IN DEVELOPMENT OF INDUSTRIAL BIOTECHNOLOGY IN THE RUSSIAN FEDERATION

Prof. Raif VASILOV

**Russian Biotechnology Society
Russian Bioindustry Association**

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RUSSIAN BIOTECHNOLOGY SOCIETY (2003-2010)

Russian Biotechnology Society (RBS)

is founded on October 29, 2003

Organization has 3025 members in 57 regional branches

Mission of the RBS:

Promotion of biotechnology and knowledge-based bioeconomy
in the Russian Federation

RUSSIAN BIOINDUSTRY ASSOCIATION (2004-2010)

Russian Bioindustry Association (RBA)

is founded on February 15, 2004

Organization has 56 members acting in different areas of bioindustry
(biopharma, biomedicine, agribiotech, food industry, forestry,
energy & fuels, white biotech)

Among RBA members: companies, academia and research institutes,
universities, investment funds, banks

Mission of the RBA:

Development of Industrial Biotechnology in the Russian Federation

RUSSIA: ECONOMIC PROFILE

- **Population:** 143.8 million (via UN, 2006)
- **Capital:** Moscow
- **Area:** 17 million sq km (6.6 million sq miles)
- **Main exports:** Oil and oil products, natural gas, wood and wood products, metals, chemicals, weapons and military equipment
- **GDP 2006 (US\$ bln. PPE)** 1,746 (GAGR 6.7%)
- **Inflation** 12.5%

Source: Economist Intelligence Unit

RELATIVE POPULATION DENSITY IN RUSSIAN FEDERATION



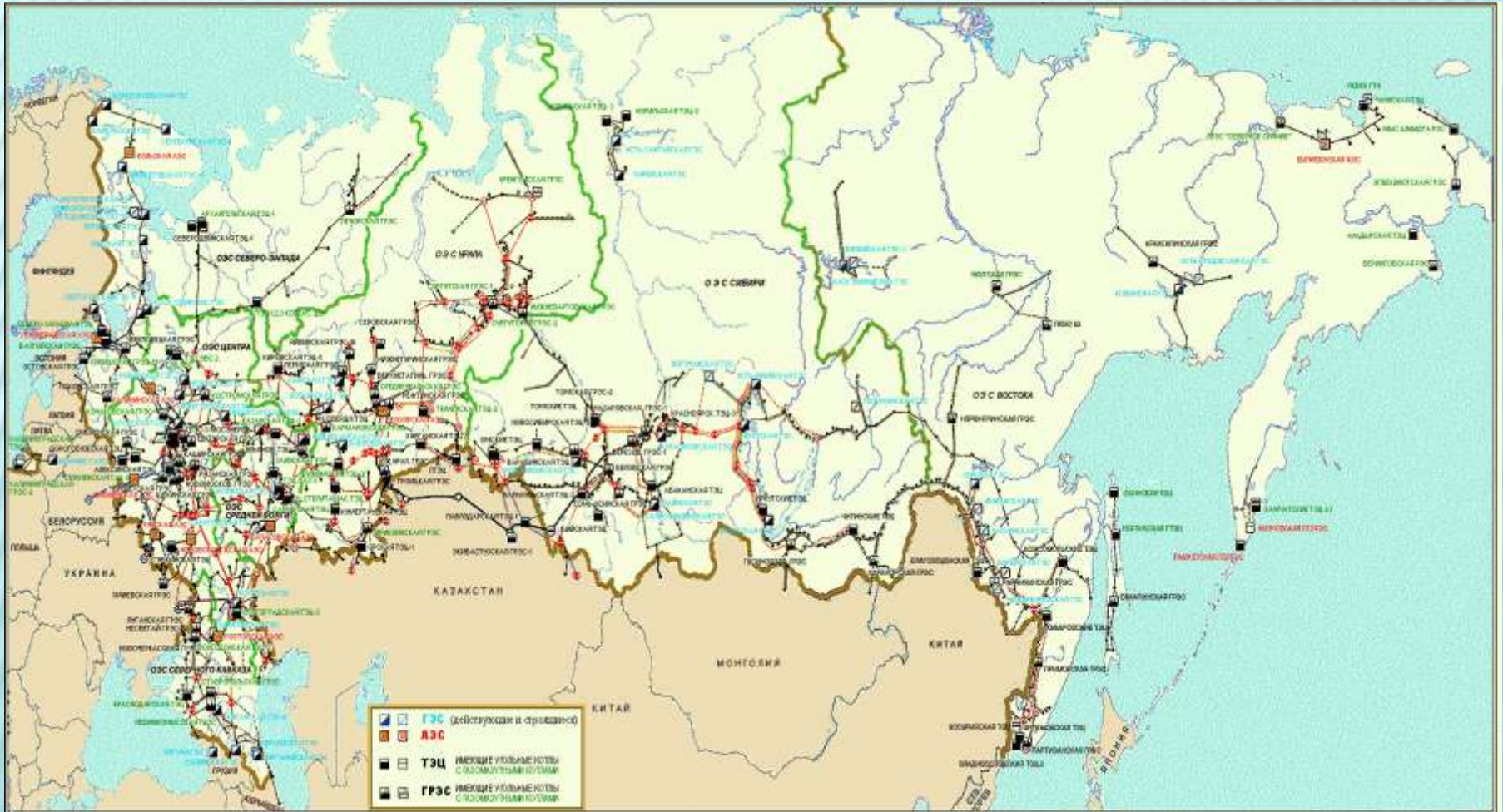
FORECAST OF POPULATION GROWTH FOR 21 CENTURY



SOME DATA ON RUSSIAN FEDERATION ENERGY SECURITY

- 2/3 of the territory of the RF is not covered by power distribution network
- 20 mln. people do not have a reliable electric power supply
- 11 thousand settlements have disappeared from the map of RF during last 13 years
- 13 thousand settlements are about to disappear
- Only 10 % of requests for electric power supply are satisfied

ENERGY MAP OF RUSSIA



SUMMARY

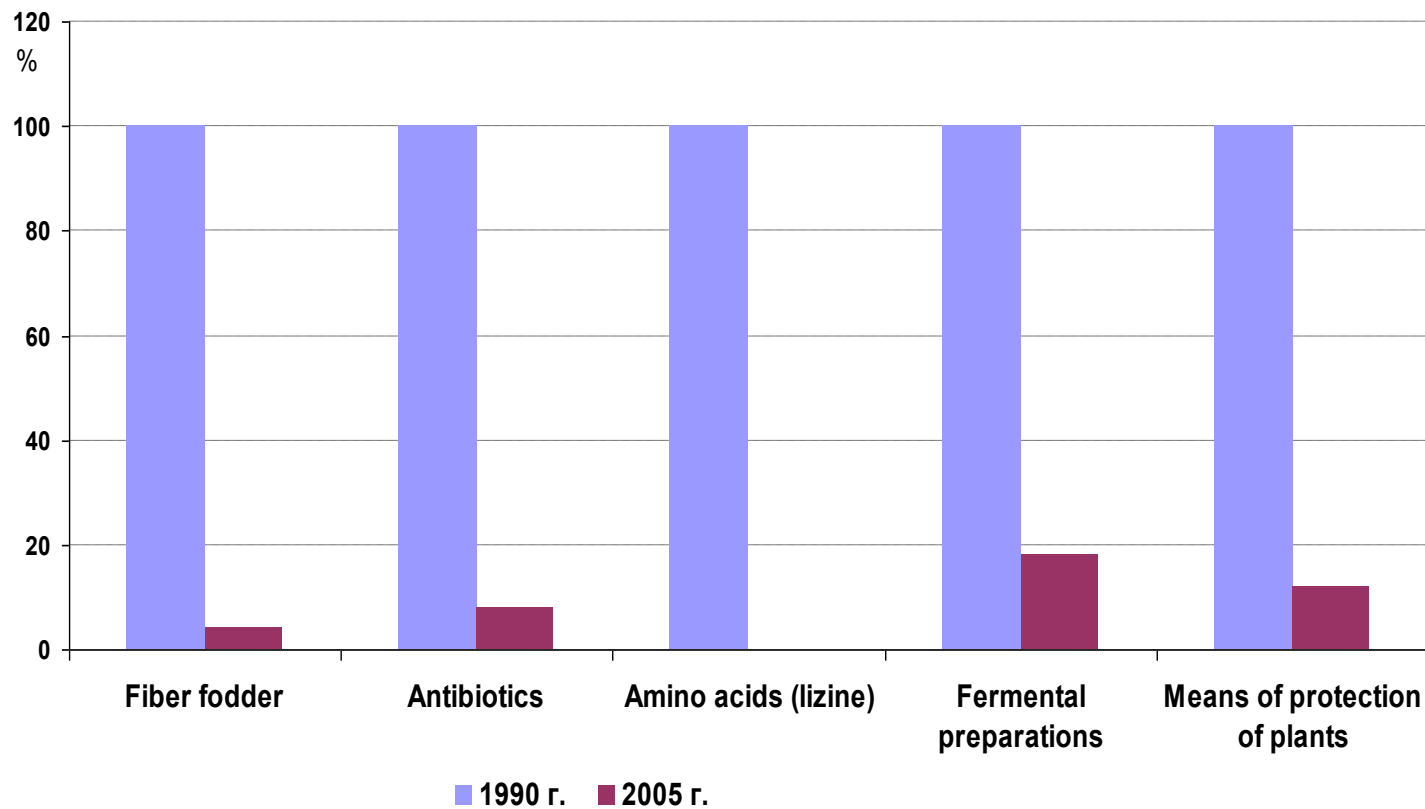
The biggest challenge for Russia in 21 century
is necessity for sustainable development of
huge territory with declining population and
under-developed infrastructure

This challenge can be answered
by development of the knowledge-based
bioeconomy including industrial
biotechnology

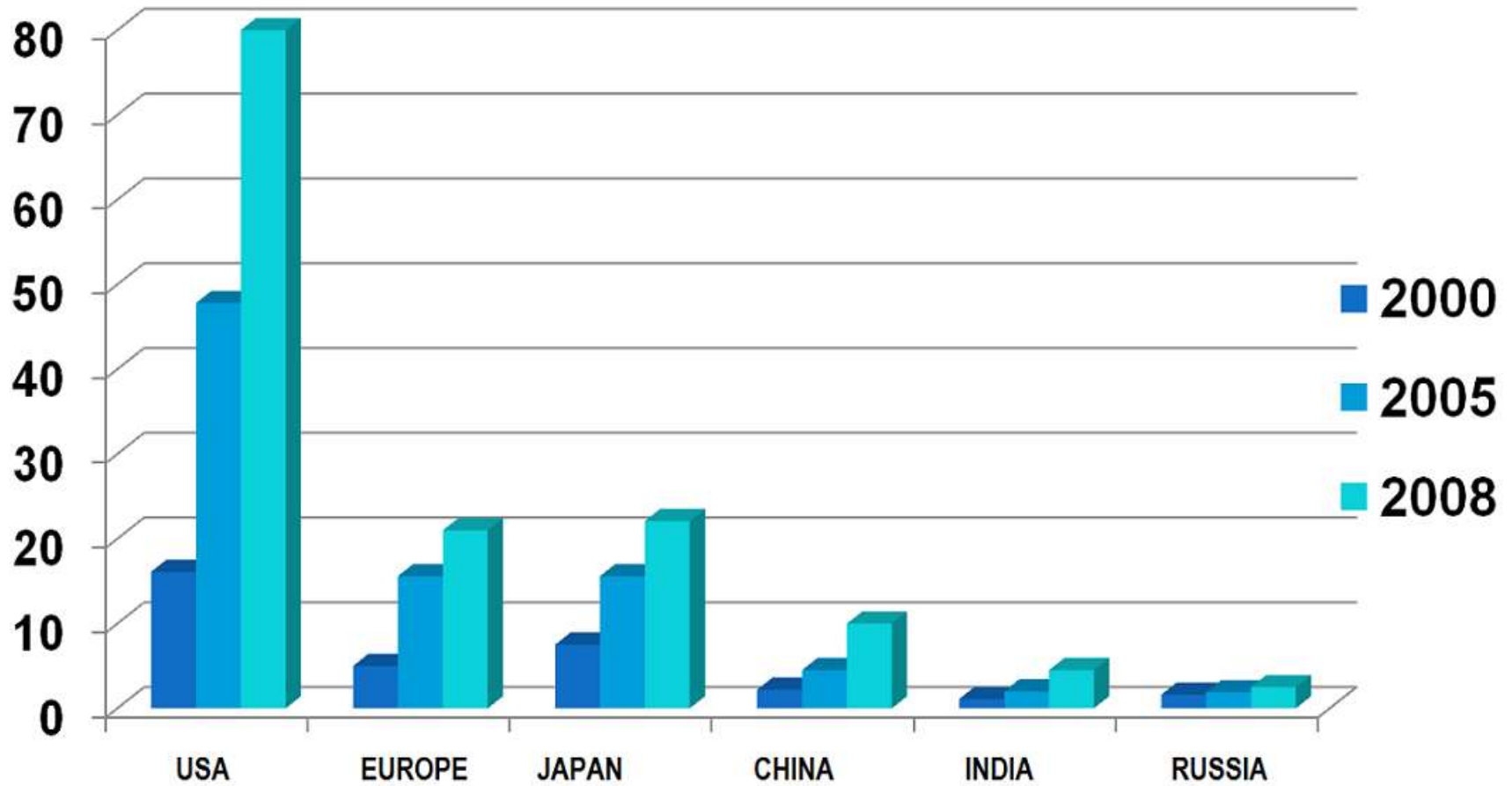
In 90's Russia lost the leading position in global bioindustry which the USSR held in 70's and 80's.

In fact Russia lost the biggest share of bioindustry that had been earlier developed.

MANUFACTURE OF BASIC BIOTECH PRODUCTS

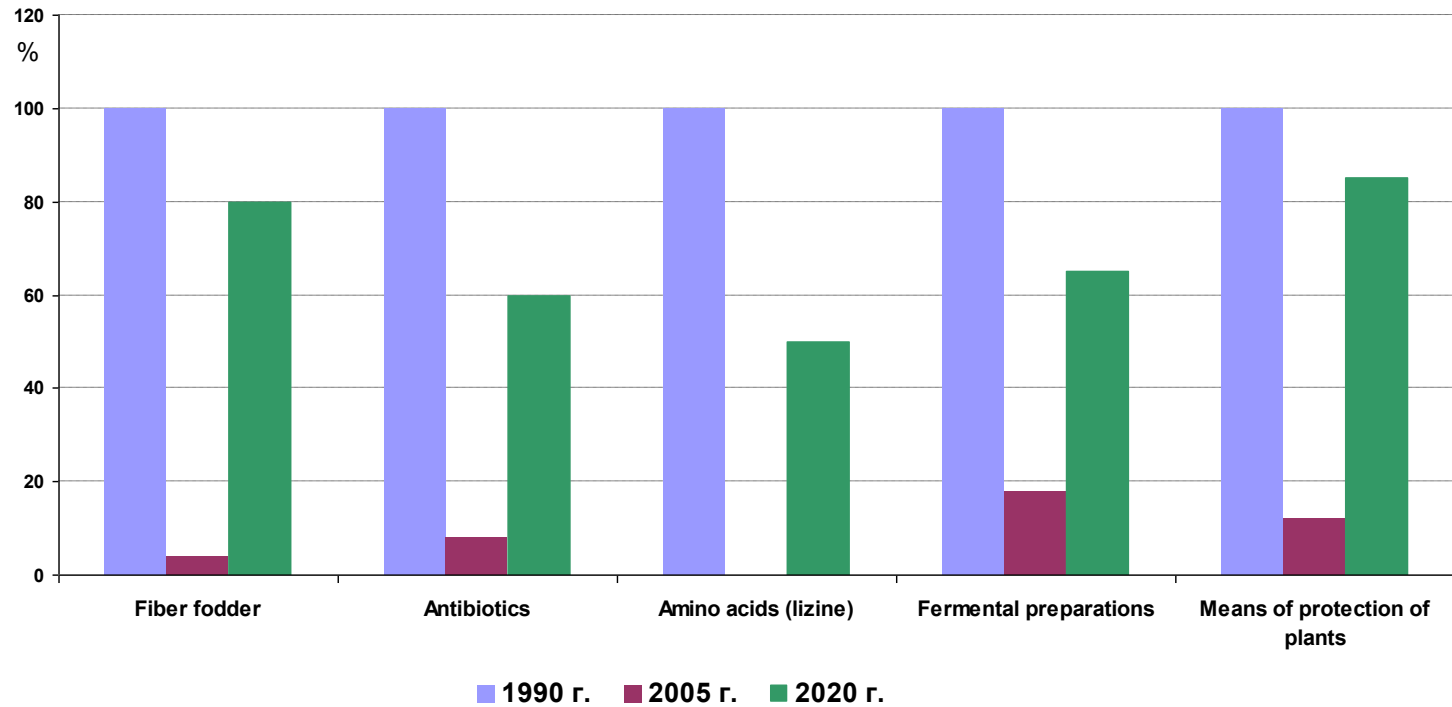


DYNAMICS OF THE GLOBAL BIOTECH MARKET (\$ BLN)



- × **RF does not have the adopted state strategy for biotechnology/bioeconomy**
- × **The strategy PHARMA-2020 has been approved**
- × **National Technology Platform on industrial biotechnology is under development**
- × **Number of regions of the RF have developed their own regional strategies and programs on biotechnology**

MANUFACTURE OF BASIC BIOTECH PRODUCTS



REGIONAL BIOTECHNOLOGY PROGRAMS

Implementing

- Republic of Tatarstan
- Chuvash Republic



Under development

- Kirov oblast
- Penza oblast
- Karelia Republic
- Tomsk oblast
- Novosibirsk oblast
- Kaliningrad oblast
- Belgorod oblast
- Voronezh oblast

Under consideration

- Kaluga oblast
- Tyumen oblast
- Nizhny Novgorod
- Saint Petersburg
- Moscow, Moscow oblast
- Krasnodar Krai
- Krasnoyarsk Krai
- Primorski Krai

PROGRAM ON BIOTECHNOLOGY IN THE TATARSTAN REPUBLIC

- Construction of the biopharmaceutical complex
- Implementation of modern biomedical technologies
- Creating a pharmaceutical cluster in Tatarstan
- Construction of biotech complexes for deep processing of grain with a total capacity of up to 1 million tons
- Mass implementation of modern agribiotechnologies

PROGRAM ON BIOTECHNOLOGY IN THE TATARSTAN REPUBLIC

Construction of biorefineries for production of biopolymers and components for the chemical industry

Construction of plants for biofuels production

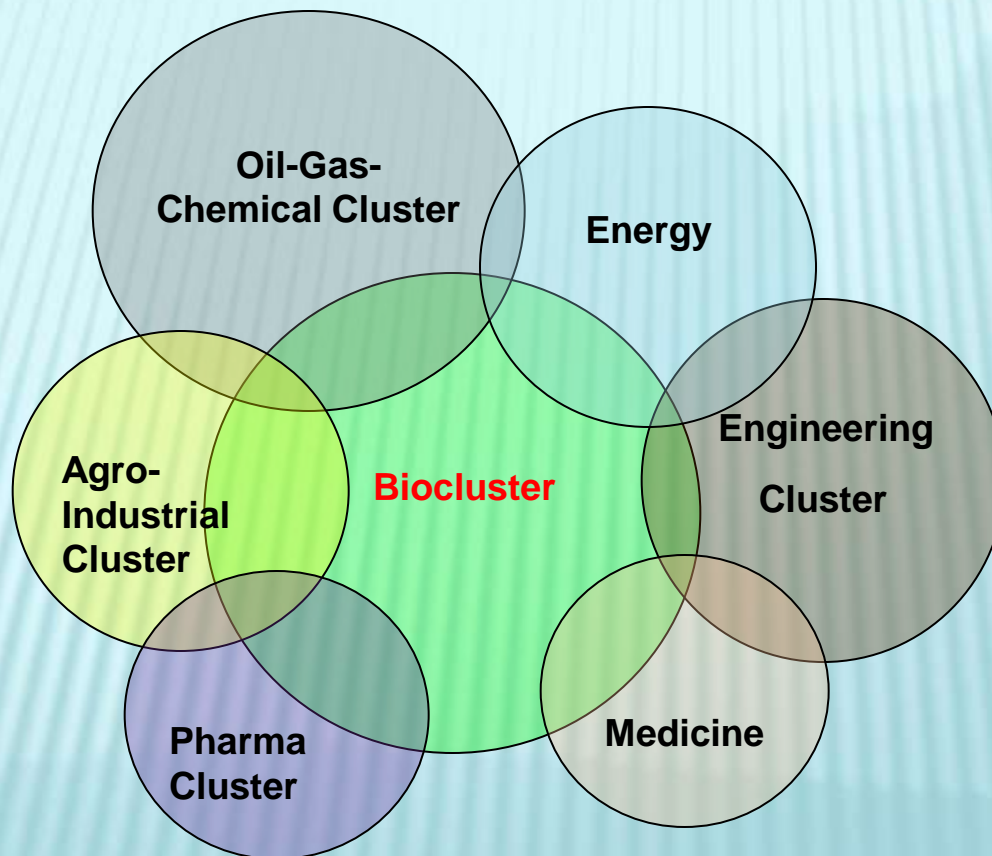
PROGRAM ON BIOTECHNOLOGY IN THE TATARSTAN REPUBLIC AS A BASIS FOR THE “GREEN” UNIVERSIADE

**Reduction of environmental pollution due to the use of
biodegradable polymers**

Reducing emissions through the use of biofuels

**TATARSTAN
is going to be the most ecologically clean region of the
country**

POSITIONING OF THE BIOCLUSTER “TATBIOREGION” IN THE ECONOMY OF TATARSTAN REPUBLIC



CHUVASH REPUBLIC AS A BIO- REGION

Taking into consideration the peculiarities of the Republic's location, competitive advantages, socio-economic and innovative potential **the PRIORITIES** are as follows:

- **Biotechnology in agriculture and agribusiness,**
- **Biotechnology in food industry**
- **Biotechnology for alternative energy**
- **Biotechnology for environment and ecology**



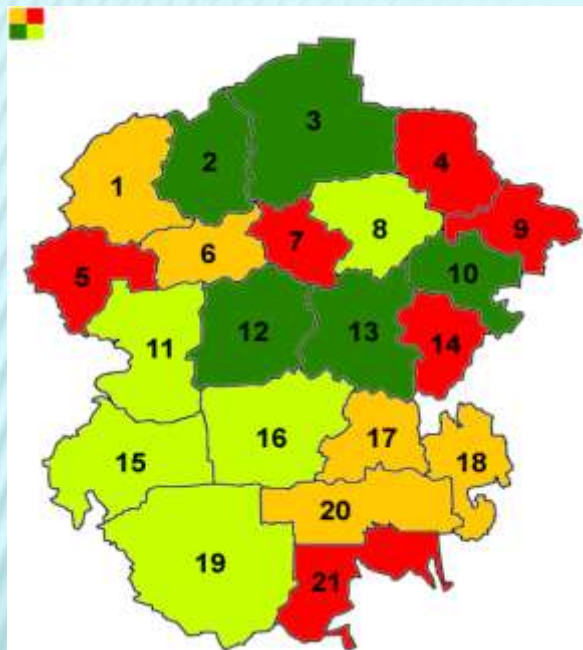
CHARACTERISTICS OF THE CHUVASH REPUBLIC



- Square – 18 343 km²
- Population – 1 278.4 mln
- Population density - 70.1 people per km²
- Density of **rural** population - **29.9** people per km²
- Number of administrative areas – 21

ANALYSIS OF RESOURCES AVAILABILITY AND EFFICIENCY OF THEIR USE

Integral rating of the Re areas



- High efficiency and high potential of resources involvement
- High efficiency and low potential of resources involvement
- Low efficiency and high potential of resources involvement
- Low efficiency and low potential of resource involvement

Areas of the Chuvash Republic

- | | |
|--------------------|-------------------|
| 1. Ядринский | 11. Шумерлинский |
| 2. Моргаушский | 12. Вурнарский |
| 3. Чебоксарский | 13. Канашский |
| 4. Марпосадский | 14. Янтиковский |
| 5. Красночетайский | 15. Порецкий |
| 6. Аликовский | 16. Ибресинский |
| 7. Красноармейский | 17. Комсомольский |
| 8. Цивильский | 18. Яльчикский |
| 9. Козловский | 19. Алатырский |
| 10. Урмарский | 20. Батыревский |
| | 21. Шемуршинский |

| Resource | Indicator of efficiency | Indicator of potential |
|----------------------------------|--|--|
| Area | Density of rural population | Was not involved in the integral raiting |
| Farmland, including : tillage | Share of the idle farmland | Area of the idle farmland |
| pastures and hay | Livestock population/Pastures area | Was not involved in the integral raiting |
| Forest resource | Coefficient of felling usage | Volume of felling |
| Livestock | Average milk yield | Area of pastures/ livestock population |
| Organic livestock waste | No mass processing | Number of cattle, pigs, birds in large livestock farms |
| Labor | Unemployment rate | Was not involved in the integral raiting |
| Finance | Share of own budget revenues | Was not involved in the integral raiting |
| Transport infrastructure | Was not involved in the integral raiting | Density of highways |

RESOURCE BASE OF THE CHUVASH REPUBLIC

Recycling of animal waste



Potential of biogas production based on the existing stock of cattle



■ Районы с наибольшим потенциалом
■ Районы со средним потенциалом
■ Районы с низким потенциалом

1.2 thousand cubic meters per year - the potential Biogas production from a unit of cattle

Growing biomass on unused agricultural lands



Potential of entry into circulation of the unused agricultural land



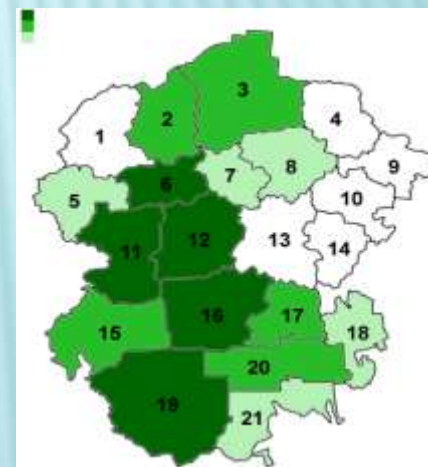
■ Районы с наибольшим потенциалом
■ Районы со средним потенциалом
■ Районы с низким потенциалом

62 thousand ha - the potential of inclusion unused agricultural land due to sowing of bioculture (rape, Jerusalem artichoke)

Recycling of timber waste



Potential of waste logging processing



■ Районы с наибольшим потенциалом
■ Районы со средним потенциалом
■ Районы с низким потенциалом

400 kg of pellets or 7200 MJ - the potential of thermal energy production from 1 ton of wood waste

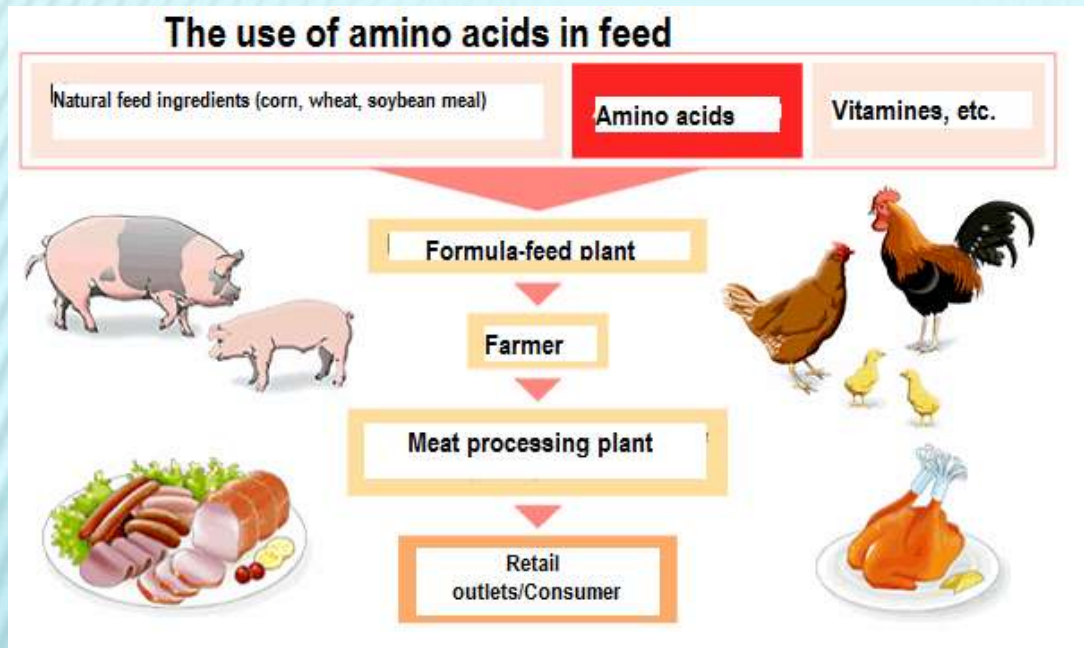
PROJECTS OF BIOTECH PRODUCTIONS IN THE CHUVASH REPUBLIC

| PROJECT | RAW MATERIALS | PRODUCTS | LOCATION | INVESTMENTS VOLUME (MLN RUBLES) |
|---|-----------------------|--|--|---------------------------------|
| Production based on crops | | | | |
| BIODIESEL | Rape | Biodiesel, rapeseed cake, glycerin, wheat* | Канашский район | 835 |
| LYSINE | Grain | Lysine, gluten, protein-vitamin-mineral supplements (PVMS) | Шумерлинский район | 2 798 |
| BIOETHANOL, ORGANIC ACIDS, PVMS | Jerusalem artichoke | Bioethanol, citric acid, lactic acid, PVMS | Цивильский район | 2 160 |
| Production based on waste processing | | | | |
| PELLETS | Wood waste | Wood pellets | Алатырский, Ибресинский районы | 147 |
| FEED ADDITIVES | Alcohol stillage | Fodder yeast concentrate | Марпосадский, Ядринский районы | 66 |
| BIOGAS | Отходы животноводства | Биогаз, твердые и жидкие биоудобрения | Все административные районы ЧР за исключением Янтиковского | 31** |
| TOTAL | - | - | - | 6 037 |

* для поддержания урожайности рапса необходимо создание пилюнцы с севооборотом

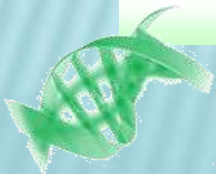
** оценка инвестиций на 1 установку по производству биогаза на 940 голов КРС

PRODUCTION OF FEEDING L-LYSINE MONOCHLORHYDRATE WITH MASS FRACTION OF MAIN SUBSTANCE > 98.5% AND PROTEIN SUPPLEMENTS



L-lysine monochlorhydrate

Lysine - one of the essential amino acids, which is used as a feed additive in animal livestock by submerged cultivation of microorganisms.



PRODUCTION OF FEEDING L-LYSINE MONOCHLORHYDRATE WITH MASS FRACTION OF MAIN SUBSTANCE > 98.5% AND PROTEIN SUPPLEMENTS

**A pilot plant of the biotechnological complex “BioPark” launched in Shumerlinskij area of the Chuvash Republic
First samples of lysine have been produced**

Production capacity:

- Lysine - 14,8 thousand tons per year;
- Protein and vitamin supplements - 23,8 thousand tons per year



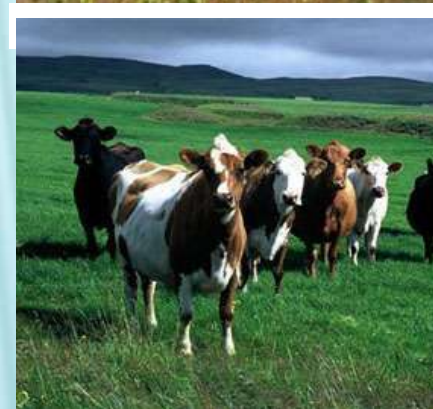
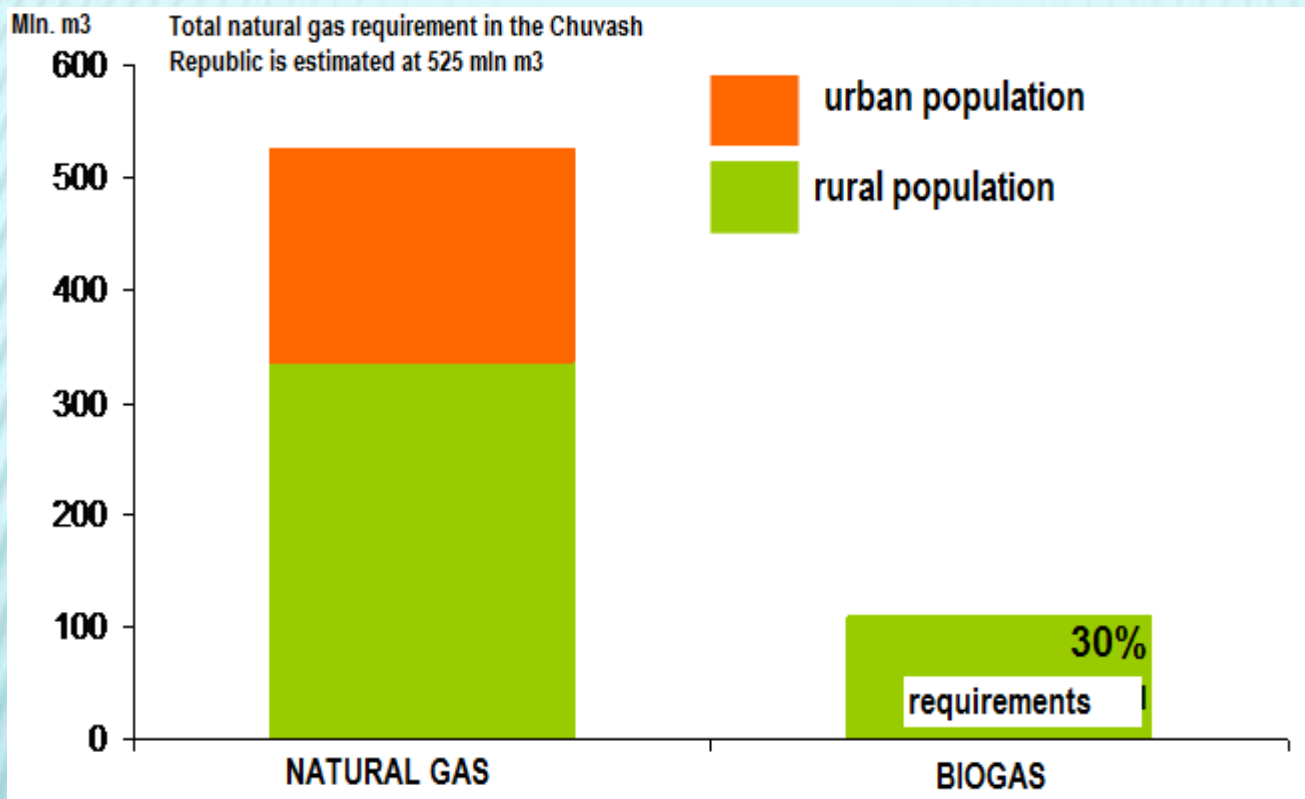
PROJECT

PLANT FOR LYSIN PRODUCTION

Production capacity: 20 000 tons of lysine per year



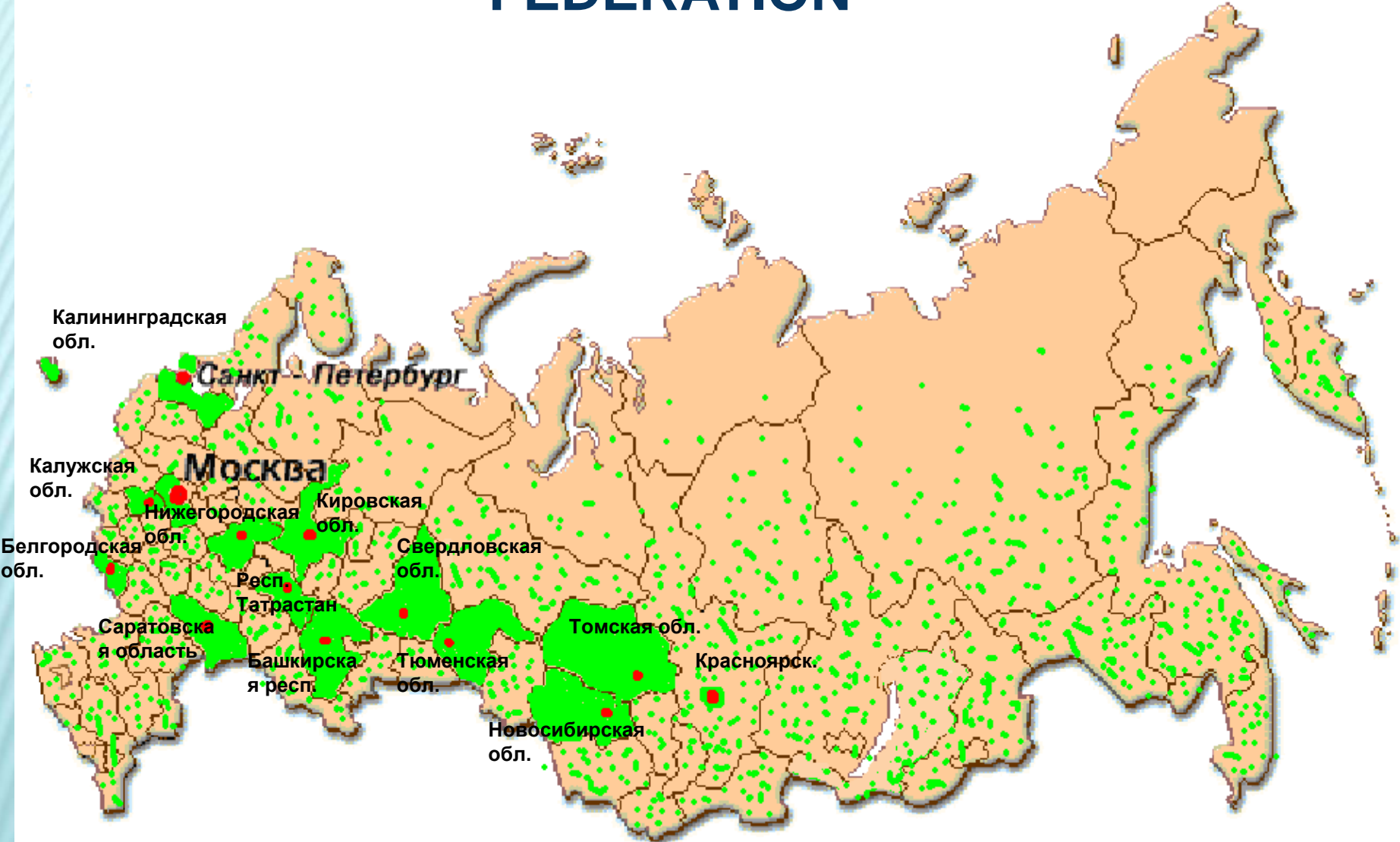
POTENTIAL OF REPLACEMENT OF NATURAL GAS BY BIOGAS IN THE CHUVASH REPUBLIC



The calculation is done for biogas production from the total Republic's resource of livestock organic waste



BIOREGIONS IN THE RUSSIAN FEDERATION



BACKGROUND FOR RUSSIA'S PROGRESS IN INDUSTRIAL BIOTECH

- Availability of sufficient fertile soils and fresh water for feedstock production
- Huge forestry resources
- Availability of Inexpensive power
- Trained cost-competitive manpower
- Favorable legal regulation including IP protection
- Availability of finance
- Government Support

Russian Biotechnology Society

Address: *Leninsky prospect 33, office 364, 119071 Moscow, RF*

Tel./Fax: *+7-495-648-09-13*

Tel.: *+7-495-662-95-91;*

E-mail: *obr@biorosinfo.ru www.biorosinfo.org*

Press Center:

Tel.: *8-926-412-08-27*

Fax: *+7-495-648-09-13*

E-mail: *media@biorosinfo.ru*



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