

# The Chernobyl Radiation Monitoring System in Belarus today.

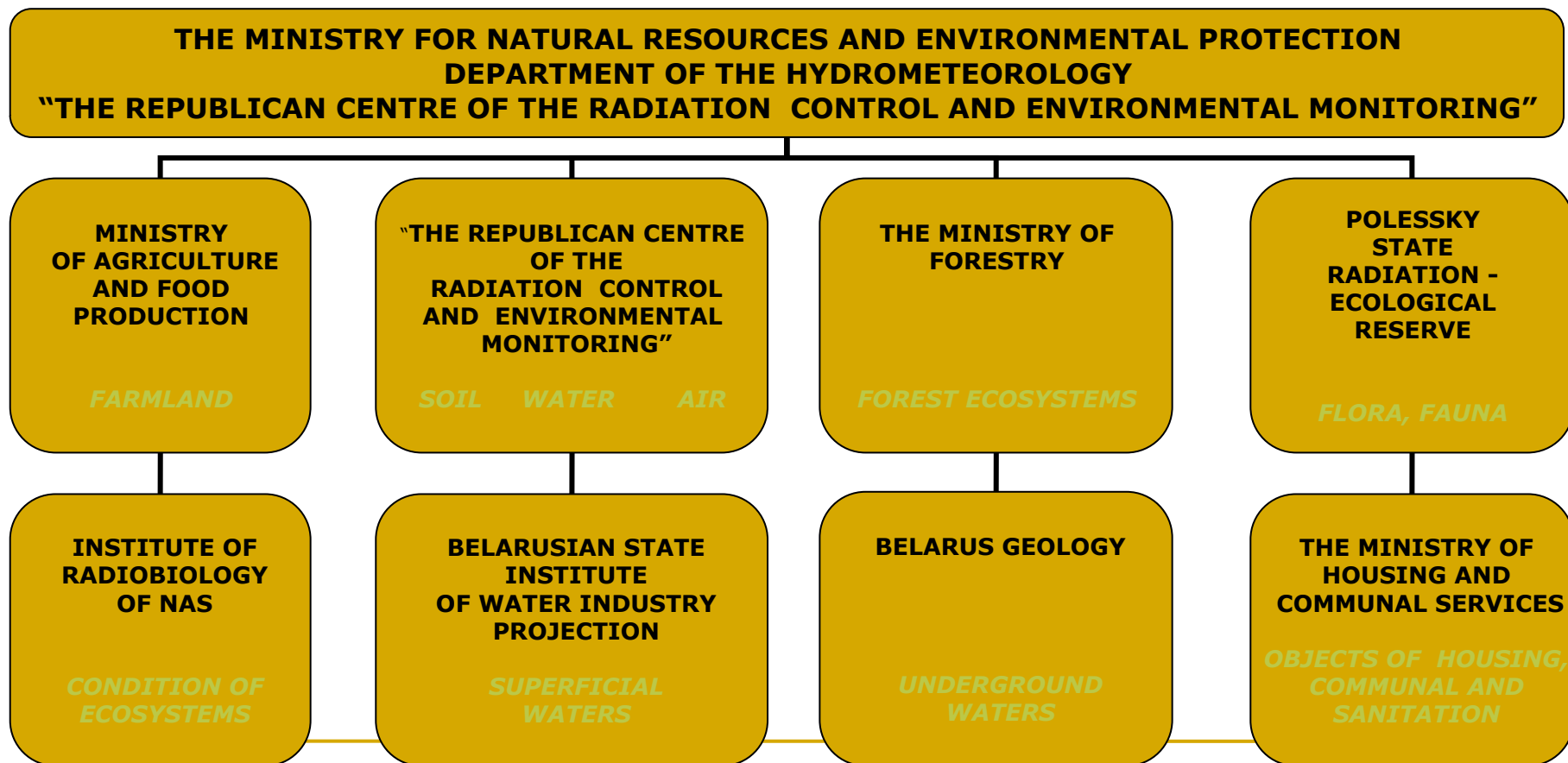
**Professor V.B. Nesterenko,**

**Expert-ecologist A.V. Nesterenko**

**Head of WBC laboratory V.I. Babenko**

The Institute of radiation Safety “Belrad”

# THE SYSTEM OF RADIATION MONITORING IN BELARUS



# Points of constant radiation monitoring of soil and air



# 1. Organisation of radiation monitoring of agricultural holdings and foodstuffs

Therefore the radiation control services were organised at –

- 27 enterprises of meat industry,
- 127 dairy enterprises,
- 114 enterprises of food industry,
- 61 enterprises of the Ministry of Grain Production,
- 56 enterprises of fruit and vegetable industry
- 1200 collective and state farms those territories had been contaminated by radionuclides
- 12 agricultural research institutes,
- 3 republican, 6 regional 117 local vet bacteriological laboratories, 188 stations for testing meat,
- 117 interregional laboratories, 6 regional stations for chemisation, 10 pedigree enterprises, 78 poultry-farms were used as places for the implementation of radiation monitoring.

The whole radiation monitoring system counted 2122 places.

Having developed and produced over 1000 gamma-radiometers RUG-92 the Institute “Belrad” promoted the equipping of radiological services of MAP, the Ministry of Forestry, the Byelarusian Cooperation Union and LCRC with reliable devices with high sensitivity range for the monitoring of Caesium-137 concentrations in foodstuffs, water and environment.

In the southern part of Belarus the net of 370 LCRC was organised. The first 30 LCRC were open due to the financial support of the Peace Foundation of the USSR (A. Karpov) and the Byelorussian Peace Foundation (M. Yegorov).

The Chernobyl Committee appointed the Institute “Belrad” the head organisation creating and maintaining LCRC and consulting the population.

In such centres located at schools and at local administration buildings the population had a possibility to measure the radionuclide concentration in their foodstuffs and to get the objective information about the safety of the use them for food and about their culinary processing technique for radionuclide decontamination

**Temporary permissible levels (VDU-86, VDU-88, VDU-91), republican control levels (RKU-90) and republican permissible levels (RDU-92, RDU-96, RDU-99) for Caesium-137 concentration in foodstuffs and drinking water**

<b>Foodstuff</b>	<b>VDU-86</b>	<b>VDU-88</b>	<b>VDU-91</b>	<b>RKU-90</b>	<b>RDU-92</b>	<b>RDU-96</b>	<b>RDU-99</b>
Drinking water	370	18.5	18.5	18.5	18.5	18.5	10
Milk and whole milk products	370	370	370	185	111	111	100
Concentrated milk	7400	1100	1100	370			200
Butter	7400	1100	370	370	185	185	100
Cottage cheese and curd products	3700	370	370	185			50
Meat and meat products beef	3700	2960	740	592	600	600	500
mutton	3700	1850	740	592	600	600	500
pork, poultry and their products	3700	1850	740	592	600	370	180
Vegetable fat	7400	370	185	185	185	185	40
Adipose, margarine	7400	370	185	185	185	185	100
Potatoes, table greens	3700	740	600	592	370	100	80
Bread and bakery	-	370	370	370	185	74	40
Flour, cereals, sugar	-	370	370	370	370	100	60
Vegetables and edible roots	3700	740	600	185	185	100	100
Fruits	3700	740	600	185	185	100	40
Garden berries	3700	740	600	185	185	100	70
Wild berries and preserved food	-	-	1480	185	185	185	185
Tinned vegetables and fruits, juice,	-	740	600	185	185	185	185
Fresh mushrooms	-	-	1480	-	370	370	370
Dried mushrooms, dried fruits	-	11100	7400	3700	3700	3700	2500
Other foodstuffs and food additives	-	-	-	592	370	370	370
Herbs, tee	-	-	7400	1850			
Special products for children of all kinds, ready for use	-	1850	185	37			37

## Participation of the non-governmental Institute of Radiation Safety “Belrad” in overcoming the consequences of the Chernobyl accident in Belarus

1989 - the government of Belarus began to get the stuff of the non-governmental Institute of Radiation Safety “Belrad” to take part at commissions for the assessment of the radiation situation and ruling of radiation protection measures of the population.

1989 - 1990 - the complex commission of the Council of Ministries of Belarus (the chairman – professor V.B. Nesterenko) consisting of the specialists in radiation protection, agricultural radiology, forestry, medicine and sociology made complex investigations of the villages Chudyuny ( $> 147 \text{ Ci/km}^2$ ), Malinovka, Maysky of Cherikov district of Mogilyov region.

1990 - 1991 - the same commission investigated the living conditions and the possibilities of production of foodstuffs containing Caesium-137 in limits of the RDU-90 (republican permissible levels) in some villages of Narovlya district after strikes of the workers of Narovlya because of these causes

1991 - such commission on behalf of the government of Belarus made the complex investigations of the villages Olmany, Gorodnaya and other villages of Stolin district.

As a result of that work the net of 20 LCRC was organized in Stolin district, 5 of them were used when implementing the project ETOS.

1995 - the Institute “Belrad” began to organize the measuring basis as a kind of mobile WBC-laboratories for the determination of the Caesium-137 accumulation levels in children. Due to the help of the Chernobyl initiatives from Germany, Ireland, Norway, the USA and of the World Church Council 8 mobile laboratories were developed of the base of minibuses Ford, Mercedes, Volkswagen which had been presented to the Institute “Belrad” by the Irish Chernobyl Children Project and the Vienna city council.

To the end of the year 2003 over 200 thousand of WBC-measurements of children were performed at schools and kindergartens of the Chernobyl regions of Belarus. High Caesium-137 accumulation levels in children were revealed, their maximal value reached 4000 to 7000 Bq/kg of body weight (BW) of a child.

1996 - the Institute “Belrad” started the implementation of the program in association with the Chernobyl initiatives from Germany, England, France, Italy, the USA, Austria, Ireland, Belgium and Switzerland on WBC measurements of the Caesium-137 radionuclide accumulation in children and the 2 – 4 times intake a year of pectin food additives for the decontamination of the organism of children from radionuclides.

2000 - the Institute “Belrad” got the license of MPHS of Belarus permitting to produce and to use the food additive “Vitapect”.

To the end beginning of 2005 over 255 thousand of WBC-measurements of children were performed at schools and kindergartens of the Chernobyl regions of Belarus. High Caesium-137 accumulation levels in children were revealed, their maximal value reached 4000 to 7000 Bq/kg of body weight (BW) of a child.

# The radiation monitoring of foodstuffs of IRS “BELRAD”

- Since 1990. The institute of radiation safety “Belrad” carries out monitoring of the content of cesium - 137 in food stuffs for the population at **the public centres of radiation control (PCRC)** built at aboriginal councils, at schools, ambulatories. These PCRCs have been built in the largest villages of Chernobyl locales of Gomel, Mogilyov regions and one PCRC works in the Minsk region (in 70 kms from Minsk).
- The radiation control of a food stuff in a private sector is conducted also by regional stations of hygiene and an epidemiology
- Now in Belarus works 23 LCRC. Computer databank of the Institute "Belrad" contains more than 350 thousand results of the radiation control of foodstuffs. The establishment of excess of the contents of Cs-137 in food stuffs above republican allowable levels (RDU) is the basis for the prime control of children on WBC for definition of the contents of radionuclides in their organism.



# The radiation monitoring of children on WBCs

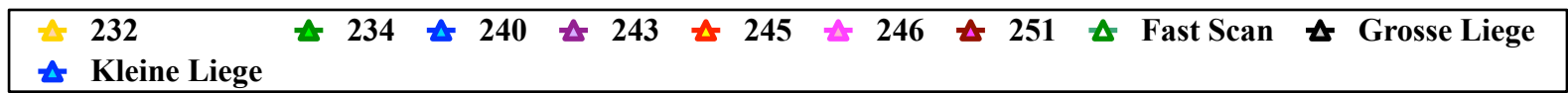
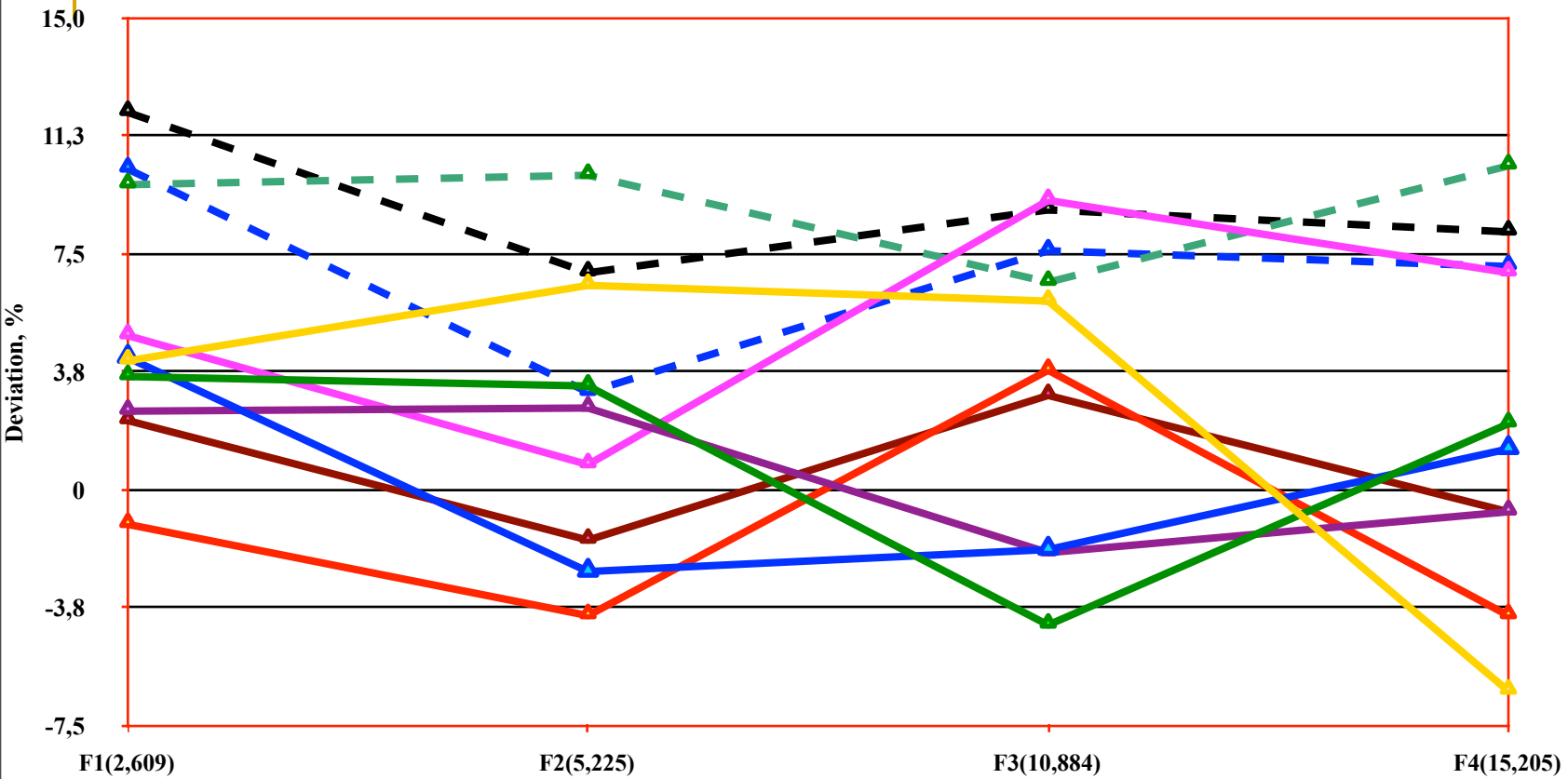
- The measurement is carried out by laboratory of spectrometry of human radiation of the Institute of radiation safety "Belrad", accredited on independence and technical competence by the system of accreditation and test laboratories of the Republic of Belarus (certificate of accreditation № BY/112 02.1.0.0385).
- The laboratory is equipped by eight complexes "SCRINNER-3M" (designed and produced by the Institute of human ecology, Kiev, Ukraine, software is modified by the experts of the Institute of radiation safety "Belrad").
- Each complex "SCRINNER-3M" passes annual mandatory metrology certification with issue of the certificate.
- The rules of jobs on measurement is determined by "the Methodical recommendations for realization of measurement of activity of incorporated gamma - radiation radionuclides in human body with the help of spectrometers of human radiation "SCRINNER" and "SCRINNER-3M" (МВІ.МН 1467-2000), approved by the State committee on standards of the Republic of Belarus, by «Norms of radiation safety NRB-2000» and by «the Basic sanitary regulations of job with radioactive materials and other sources of ionizing radiations of OSP - 72/87».
- To fulfillment of measurement is undertaken by the persons, studied methodical recommendations, passed course of training, passed the exams in the training center of the firm - manufacturer and received conforming certificates.
- The automated complex of spectrometry of internal human radiation "SCRINNER-3M" is intended for definition of activity of incorporated gamma-radiation radionuclides in the human body and for identification of dose burden.
- The complex determines activity of the following incorporated radionuclides: cesium - 137, cesium - 134, potassium - 40, radium - 226, thorium - 232, manganese - 54, cobalt - 60, iodine - 131 etc.
- Nowadays, the basic element, forming dose of internal irradiation, is the cesium – 137.
- Unit of measure - Becquerel per kilogram (Bq/kg).
- Except for the contents of radionuclides, the complex "SCRINNER -3M" allows to determine the contents of potassium in an organism of the person, which is extremely important for habitability of the person.
- The essence of determination of the contents of potassium in an organism in the following. a radioactive isotope, the potassium - 40 has constant weight significance among all isotopes of potassium (0,0119 % by weight). Determining the contents of radionuclides of potassium - 40 in an organism, the complex automatically on this weight significance calculates the general contents of potassium in an organism in grams, simultaneously expecting norm of the contents of potassium, personal for each person. The norm of potassium in an organism depends on sex, age and weight of the



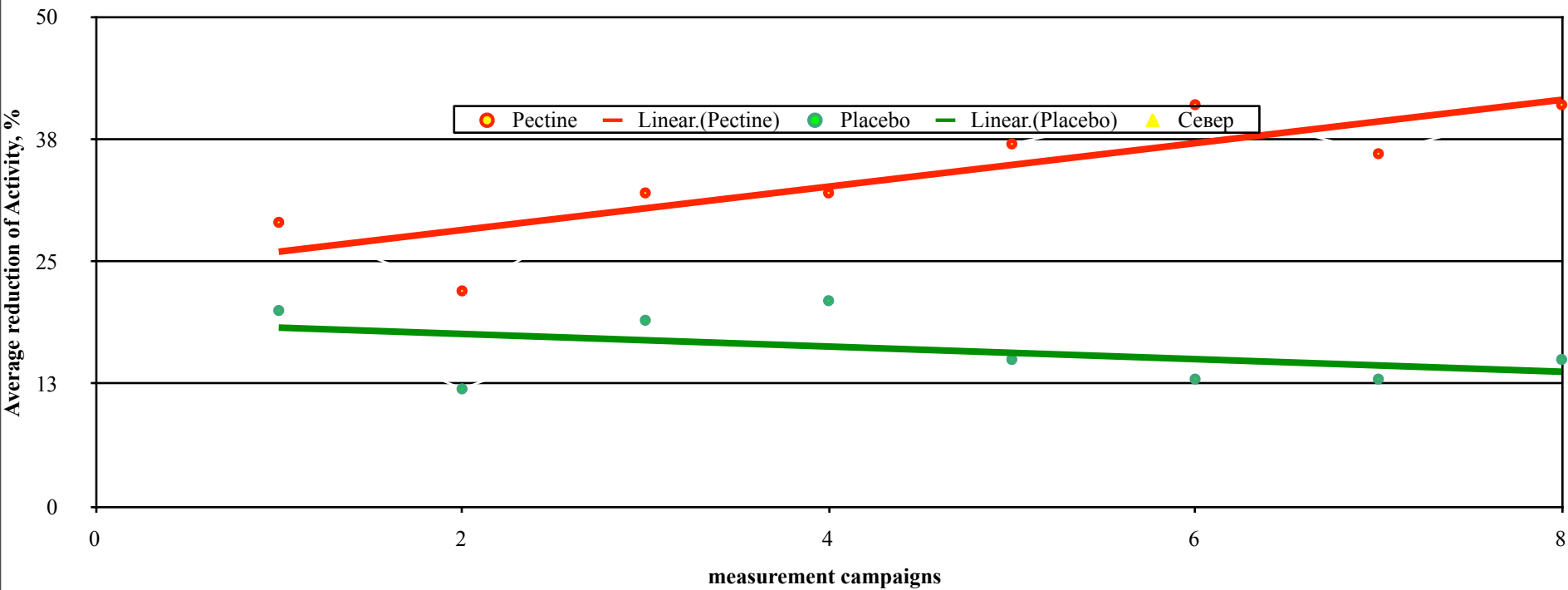
# The radiation monitoring of children on WBCs



## Results of intercalibration (October 28th-November 1st - year 2003 )



# Data on evaluation of efficiency of pectine preparation and Placebo. Based on WBC measurements in t



# Conclusion

1. For the more effective radiation protection of the population (within a radius of 300 to 500 km from the NPP) it is necessary for the family to have the constant update reserve of iodine preparations and to carry out the iodine preventive measures during the first hours after the accident.
2. In countries having their NPP and in contiguous countries the system of the monitoring of the environment and foodstuffs should be organised beforehand.
3. Around the NPP (about 100 km) the systems of automatic monitoring of the radiation state and the direct informing of the population about the emergent danger and recommendations on radiation protection activities should be created.
4. Beforehand, in all European countries:
  - the state systems for radiation control of foodstuffs and the local centres of radiation control of foodstuffs must be organised;
  - the net of mobile and fixed radiological laboratories with WBC should be created for the examination of the significant excretion of different social groups of the population in order to determine the Caesium-137 accumulation levels in inhabitants (especially in children);
  - there would be the reserves of the production of food additives for the decontamination of the organism from radionuclides,
  - there would be the developed guide for carrying on agroindustrial business in order to get clean agricultural products in conditions of the moderate radioactive contamination of soil;
  - the dynamic system of permissible levels of contamination of foodstuffs and agricultural products