

**Emergency, initial and consequent  
measures of radiation defense  
of the population and after-  
effects of radioactive  
contamination elimination on  
the example of Chernobyl  
disaster.**

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# **Emergency and rescue activities.**

**( Ministry of Defense, Civil Defense, Ministry of Public Health, executive power)**

# The actions of Civil Defense Forces and of chemical subdivisions of military forces.

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- - Intelligence of radiological situation by the chemical subunits in the first days after disaster.
- - Setting of engineer constructions on the perimeter of 100 Ku/km<sub>2</sub>, warning scriptures
- - Monitoring. Soldiers of urgent service in 10- and 30-kilometer zones are not involved in deactivation works.
- - Burning control in reactor in order to reduce radioactive emissions. Throwing down of sand and lead to the active zone with the help of helicopters.
- - Control of cattle herding in the first days in radius of 100 km.
- - Deactivation of populated areas by the forces of retired military people and Civil Defense of the Republic.
- - Washing and preventive radiation contamination inspection of automobiles and tractors working in 10- and 30-kilometer zones.

# Evacuated in the Republic in 1986:

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- by May 4            **50** populated areas – **11035** people
- by May 9            **28** populated areas – **6017** people
- by August 31      **29** populated areas – **7327** people

**107** populated areas with **24.700** people  
were evacuated during the year 1986

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# **Initial measures of Chernobyl disaster consequences elimination in BSSR**

**Decree of MC of BSSR**

**31.05.1986**

## The activity of ministry of a water management USSR and BSSR in 1986 after Chernobyl disaster:

### Conception to prevent rivers and canals water carrying out of the borders of the Republic of Belarus.

The amount of protective constructions built in June-October of 1986 in accordance with the conception:

- |                                  |                       |
|----------------------------------|-----------------------|
| ■ Dams                           | 107,2 km              |
| ■ ground walls                   | 3,3 km                |
| ■ canal coffer-dams              | 18 pieces             |
| ■ artificial lakes               | 5 pieces              |
| ■ reservoirs for sediment        | 14 pieces             |
| ■ filters (total length 4,5 km)  | 47 pieces             |
| ■ adsorbent (zeolite containing) | 62,300 m <sup>3</sup> |

## 11. Schedule of works on the left bank of the Pripyat

### 1.Initial works

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1.	To dam all the exits from the drainage system of the Pripyat. The highest level of the dams is the same that of anti high-flood dams.
2.	To accomplish anti high-flood dam construction
3.	To construct adsorbent dams in the river-bed of the Braginka to acquire water filtering experience
4.	To construct silt traps in the river-bed of the Pripyat

## Schedule of works on the left bank of the Pripyat

### 1.Initial works (continuation)

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5.	To organize systematic control of water contamination in the land-reclamation system and of the dynamics of water contamination .
6.	To investigate the effectiveness of different adsorbent materials
7.	To organize receiving of adsorbent materials of needed quality(contents and zeolite containing)



# Schedule of works on the left bank of the Pripyat

## 2. Project works

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1.	Specifying of the Pripyat and the Braginka hydrological data for the period June 1986-May 1987 (expenses, water speed, levels, etc.)
2.	Elaboration of the distribution scheme of weirs on the Braginka and channels, accumulating high-flood waters between the Pripyat and the Braginka.
3.	Elaboration of weirs projects

# Schedule of works on the left bank of the Pripyat

## 3. Researches

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1.	Specifying of soil and water radioactive contamination data on the left bank. Separately on the territory with surface waters flow in the Braginka and the Pripyat.
2.	Forecasting of radioactive contamination changes during the period June-October 1986 and June 1986 – April 1987(in general and in the spectrum of radio nuclides
3.	Examining of silt on the matter of radioactive contamination in the Braginka, main channels, and in the Pripyat – from cooling pond of the Nuclear power plant to the mouth of the river.
4.	Estimation of possible radioactive contamination changes in the course of time.

## Schedule of works on the left bank of the Pripyat

### 3. Researches (continuation)

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5.	Estimation of different sorbents effectiveness use and elaboration of requirements for sorbents filters – granulometric composition;- the duration of water contact with sorbents;- “capacity” of radioactivity repletion.
6.	Estimation of radioactive contamination of the soil in case of accumulation of high-flood flow of the Braginka on the territory between the Pripyat and the Braginka
7.	Calculation of contamination that can get into the Pripyat and into the Dniepr further on by the high-flood water from the surface of the territory between the river and anti high-flood dams.
8.	Estimation of actions effectiveness to decrease water basins contamination

# Hydro meteorological Service

(Republican centre of radiation control and monitoring was created on its basis. Now it is a Department in the Ministry of natural resources and environmental protection)

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- Air monitoring, monitoring of rivers and soil lands before start of special chemical stations of Ministry of Agriculture, Ministry of water ways and Belgeology laboratories including emmitants probes taken by planes
- Elaboration of guidance with instructions of Hydro meteorological Service on the questions of nature monitoring in radiological aspects.
- Creation of data bank on the matter of populated areas, rivers and lakes contamination
- Monitoring of radioactive situation in cities and villages (radioactivity level is measured in 56 meteo stations on four radioactive dangerous directions: Smolensk, Ignalin, Chernobyl and Rovno)

# Ministry of Communal Economy

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- Water reservoirs protection
- Cleaning and protection of drinking water wells
- Organization of reducing the amount of dust on the cities' roads and streets
- Timely cleaning of the cities' and villages' streets from communal wastes
- Rain wells cleaning
- Perfection of filter constructions in the sewerage system
- Construction of water-supply system in the populated areas of Chernobyl contamination
- Construction and organization of places to bury the wastes of deactivation

# Ministry of Energetics

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- Ensuring of constant electricity supply
- Switching off the current and deconstruction of the electro transmission lines and electro equipment in the zones of estrangement
- Ensuring of electricity supply, construction of houses for migrants and all the other works on deactivation of the territory and electricity supply to military forces, forces of Civil Defense situated in the zone of evacuation, immediate and following migration

# Belgeology

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- • Search of the materials to bury the reactor after the accident in order to prevent future radioactive emissions.
- • Fulfilment of research works defining the level of contamination in the underground space – underground water of the 2<sup>nd</sup> and 3<sup>rd</sup> water-carrying levels
- • Participation in the works to choose and create the chinks to lower the level of ground water around the Nuclear Power Plant
- • Selection of the places to bury the wastes of radioactive materials deactivation, clayey minerals and other kinds of sorbents.

# Ministry of Public Health

**The Governmental Commission of the USSR  
to liquidate accident's  
consequences April 26,1986**

**Union Medical Commission  
May 1,1986**

Ukrainian SSR Ministry of  
Public Health  
Belarussian SSR

Ministry of Public  
Health

Russian SSR Ministry of  
Public Health

**Medical Institutions**

**Evacuation of the  
population from  
30-km zone  
(45000 people)  
April 27,1986  
90000 people during  
following days**

**Iodine distribution  
among the people  
evacuated from  
30-km zone during  
the first days  
In general- 5,3 mln  
people  
(1,6 mln children)**

**Maximum allowed  
irradiation dose is  
determined and  
controlled  
May 12,22,1986  
500 mSv per year,  
then-100mSv per  
year**

**Temporary norms  
of iodine  
concentration in  
milk and Cs  
concentration in  
main foodstuffs and  
water are set and  
followed  
May 3,6,30,1986**



# Actions of medical subdivisions in Belarus.

## Protective measures starting from April 29:

- **\*Evacuation of the population from 30-km zone** (24,7 thousand people, 33 medical institutions)
- **\*Radiation intelligence and deactivation control** (radiological laboratories in 6 regional Sanitary Epidemiological Stations were organized. The level of gamma exposure was measured to control air and soil)
- **\*Monitoring of foodstuffs and water** (determination of radio nuclides summary \_-activity and their isotope composition)
- **\*Control of the consequences after irradiation of thyroid glands among the population** (about 250 000 measurements of dose power were taken)
- **\*Control of internal irradiation of the population** (36000 people were examined with whole-body counters in 1986, 60000 people – in 1987)
- **\*Iodine distribution** (among evacuated population)

# Actions of medical subdivisions in Belarus.

- **\*medical inspection of the population** ( there were created 25 mobile medical brigades. More than 100 000 people of Bragin, Narovlya, Khoyniki districts were investigated in May-June. There were sent 1295 doctors, 1485 physicians with secondary education, 140 dosimetrists, 210 students of Medical Institutes, 370 drivers to take the investigation of the population).
- **\*Children and pregnant women were brought out of Gomel and Mogilev regions to sanatoriums** (104 200 children took part in sanitation and recovery programs out of the borders of Belarus, 47 200 children and 60 300 mothers with little kids – on the not contaminated areas of the republic).
- **\*July 1986, there was created a Republican list of people affected by the radiation in the result accident on Chernobyl Nuclear Power Plant.**
- **\*During the first months after the accident there was created a Research Institute of radio medicine and endocrinology with branches in Gomel and Mogilev. There were opened specialized dispensaries for prevention and treatment of diseases in Minsk, Gomel and Mogilev, specialized clinic in Aksakovshchina, regional endocrinology dispensaries and other specialized centers(oncopathology of thyroid gland) marrow implantation department, etc.**

**During the period since May 5<sup>th</sup> till December 9<sup>th</sup>, 1986 Belarussian Government worked out and ratified 32 legislative documents directed to take preventive measures.**

## **Ministry of trade and Union of customers**

- Supply of clean foodstuffs
- Removal of trade infrastructure(shops, canteens) from the zone of contamination
- Organization of the nourishment for accident liquidators.

## **Ministry of Education**

- To bring children to sanatoriums and camps
- To help local executive Councils with evacuation, its initial and following periods

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**Following  
restoring measures  
(after 1990)**

# Initial zoning (1986-1987)

1	Less than 1 Ku/km <sup>2</sup>	Without limitations
2	1 – 5 Ku/km <sup>2</sup>	Periodical radiation control
3	5 – 15 Ku/km <sup>2</sup>	Strict radiation control
4	15 – 25 Ku/km <sup>2</sup>	Limitations on vegetable-growing, milk production and stock-breeding, sheep-breeding and potatoes growing
5	25 – 40 Ku/km <sup>2</sup>	Limitations on domestic stock-breeding for meat and laying-in of hay
6	40 – 100 Ku/km <sup>2</sup>	Zone of temporary evacuation. Agriculture is only for seeds and technical needs.
7	More than 100 Ku/km <sup>2</sup>	Zone of evacuation.

**State Agricultural Committee of the USSR**

AGREED  
Chairman of  
Interdepartmental Commission  
of scientific experts on radiology  
in agricultural production  
**N.A.Korneev**  
31.03.88

DECREED  
Chairman of  
Gosagroprom of USSR  
**V. Murakhovsky**  
23.05.88

**Guidance**

OF LEADING OF AGRICULTURAL ECONOMY  
IN CONDITIONS OF RADIOACTIVE CONTAMINATION ON  
THE PART OF THE TERRITORY OF RUSSIAN SSR  
UKRAINIAN SSR AND BELARUSSIAN SSR  
DURING THE PERIOD OF 1988-1990

**Moscow 1988**

■ Recommendations on the evaluation of the consequences of radioactive contamination of soil lands, radioactive affection of animals and leading of agriculture economy in these conditions.  
**MOSCOW, 1973**

**Peculiarities  
of leading of agricultural  
economy on the territory  
of radioactive contamination  
less than  $15 \text{ Ku/km}^2$**

Recommendations of State Agricultural Industry of  
the USSR During 1988 – 1990

## **Agriculture (less than 15 Ku/km<sup>2</sup>)**

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- Seeds planting on plough lands can be led without limitations according to the technologies of growing agricultural cultures accepted for the given soil-climatic zones. The mineral and organic fertilizers are applied in the amount that lets to get expected harvest.
- The surface improvement is held on pastures and hay-mowing lands situated on flood-lands. Phosphorus and potash fertilizers are applied in accordance with the decreed norms.
- The pastures and hay-mowing lands of dry valleys are to be improved both on the surface and also in the subterranean space according to the technologies recommended for concrete soil-climatic conditions with applying mineral and organic fertilizers in the doses 1,5 times bigger in comparison with accepted.



## **Stock – breeding (less than 15 Ku/km<sup>2</sup>)**

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- It is necessary to hold arrangement and protective measures in collective farms situated on given territory of radioactive contamination to get milk that can be securely used:
  - it is recommended to use hay of sown grass before melioration end on the pasture and hay-mowing lands used for feeding of milk cows during the period of indoor maintenance in 1988 – 1990;
  - if there is a need to use the hay from natural pastures in the ration of the animals, it is necessary to include it in the quantity of not more than one half of a day's norm and to add root-crops, tuber-bearing plants, potatoes and corn silage in the ration;
  - stall-camp system of maintaining the cattle is recommended during summer period of 1988 – 1990 together with the arrangement of "green conveyor" type feeding;
  - natural pastures and hay-mowing lands are to be used for labor and fattening cattle, milk cows with milk processing for butter.

## **Keeping of private subsidiary economies ( less than 15 Ku/km<sup>2</sup> )**

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- Vegetables and potatoes growing and gardening as well can be lead without limitations. It is necessary to provide farmers, workers and sovkhos employees with constant plots of land on the least contaminated with radio-Cs areas, for hay-mowing and herding of the cattle. The lands chosen for these purposes are to be cultivated at the account of the economies.

## **Radiation control of the production goods ( less than 15 Ku/km<sup>2</sup> )**

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- Veterinarian laboratories and subdivisions of the Service of chemical Defense hold selective control of agricultural food-stuffs produced in collective farms and subsidiary economies on the containing of radioactive substances.
- Main attention is paid to control the amount of radio-Cs in milk. If its amount is heightened it can be the reason to investigate the sources of outcome and to take measures to avoid the use of contaminated pastures, hay-mowing lands and already laid in feed-stuffs. The measures are taken by the heads of the economies according to the recommendations of the experts of veterinarian laboratories. The control of radio-Cs containing in the products of vegetating is held selectively.
- All the goods intended for export are passing obligatory testing followed by the information about factual containing of Cs-137 and Cs-134.

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**Peculiarities  
of leading of agricultural  
economy on the territory of  
radioactive contamination**

**from 15 to 40 Ku/km<sup>2</sup>**

## **Agriculture** **( from 15 to 40 Ku/km<sup>2</sup> )**

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- It is necessary to apply mineral and organic fertilizers in the doses recommended before ( "Guidance for 1987" ) or in doubled doses according to zoning recommendations in order to collect vegetables and crops with the level of radio-Cs not higher than it is allowed. Lime materials are applied at 1,5 of the dose by hydrolytic acidity by the cycles of chalking.
- Roots improvement is held on the hay-mowing lands and pastures. The doses of phosphorus and potassium fertilizers that are applied annually are 1,5 times higher than the affirmed norms.
- Organic fertilizers of animal origin from the given zone are applied without limitations. Their use in the zone of contamination lower than 15 Ku/km<sup>2</sup> is forbidden.

## **Stock-breeding ( from 15 to 40 Ku/km<sup>2</sup> )**

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It is obligatory to fulfill the following measures during the production process of meat and milk on the lands with the density of radioactive contamination from 15 Ku/km<sup>2</sup> to 40 Ku/km<sup>2</sup>

- Not to use the natural hay-mowing lands and pastures for herding of milk-producing animals that produce milk to be wholly used. It can be allowed only after in-soil improvement. These lands can be used for herding of labor horses, young animals for fattening (before the end of fattening period ), milk cows with milk processing for butter.
- The maintenance of cows the milk of which is to be wholly used and used for sour milk products has to be only of stall-camp type. These animals are fed with silage, concentrated forage and hay of sown grass from the plough lands.

## **Stock-breeding ( from 15 to 40 Ku/km<sup>2</sup> )**

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- The containing of radio-Cs in the ration of animals must not exceed the set values, in this case the concentration of radio-Cs in foodstuffs will not exceed the norms.
- In case if the containing of radio-Cs in milk exceeds the norms, it is important to define the reasons and to take the decision about necessary measures to reduce milk contamination ( ration change, change of maintenance type ). They issue a guidance for 15 days about products direction of the given economy to process into butter. The check is repeated in 15 days. The decision about future use of milk is taken on the base of the check results.
- Veterinarian, preventive and anti-epizootic measures are taken in full volume and in set terms.

# **Radiation control of the production goods**

## **( from 15 Ku/km<sup>2</sup> to 40 Ku/km<sup>2</sup> )**

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- Radiation control of the agricultural products is carried out by the radiological departments of veterinary laboratory and chemical stations.
- Radiation control is carried out in the following ways:
  - temporary radiation control;
  - preventive radiation control.
- The products coming from the systems of State Agriculture, State Forestry, Ministry of Fishery and the population coming for storage, processing and realization through market trade, have to be temporarily controlled.
- The system of preventive radiation control includes the following measures:
  - local control checks (during the time of plants vegetation), to define the content of radio-Cs in the expected harvest.
  - control checks on the places where radio-Cs can be found in pasture feed-stuffs, green silage in summer period and also in the feed-stuffs laid for stall period.



## **Radiation control of the production goods** **( from 15 Ku/km<sup>2</sup> to 40 Ku/km<sup>2</sup> )**

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- They issue the recommendations for directing the following use of the harvest and the contents of productive animals ration. It is done on the base of data and analysis results.
- If the content of radio-Cs in the products of plant-growing exceeds the defined norms for its nutritional use, the harvest is directed for feeding the animals and they issue a guidance to take additional measures on this field in order to reduce the transition of radio-Cs from soil to plant.
- The products of plant-growing and stock-breeding received on the territory of radioactive contamination from 15 to 40 Ku/km<sup>2</sup> has not to be exported.

## **Keeping of private subsidiary economies (from 15 to 40 Ku/km<sup>2</sup>)**

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In order to reduce the transition of radioactive substances into the fruits, vegetables and potatoes in private gardens it is necessary to do the following things:

- to support the weak sour or neutral reaction of the soil by the periodical inserting of lime materials. To insert annually 2-3 kg of double super phosphate and 3-4 kg of chloride or potassium sulphate on 100m<sup>2</sup>. Lime materials and mineral fertilizers are to be plainly distributed on the surface of the soil, to dig over and plough again for the accepted depth.
- To lay in the clayey mineral-zeolite in the soil used for growing garden plants and potatoes (if this measure was not taken in 1987). Dry powder zeolite is spread over the surface of the soil and mixed well with its upper layer (with rake or harrow). Then the soil is ploughed over for the accepted depth. The doses of zeolite laying in are – 200 kg on 100m<sup>2</sup>.

## **Keeping of private subsidiary economies (from 15 to 40 Ku/km<sup>2</sup>)**

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- After the mentioned above measures vegetables, potatoes and root-crops are cultivated according to accepted before techniques and the harvest is used without limitations.
- The fertilizers, lime and clayey materials for private subsidiary economies of country people are bought and supplied by agricultural institutions (kolkhoz, sovkhoz, etc.) situated on the territory where they live.
- Poultry keeping of different kinds has no limitations on condition that the birds will be fed with clean feed-stuffs during 1-1,5 months before the time of slaughter. Meat of the birds is used without limitations. Feathers and down are washed in the solution of detergents and can also be used without limitations. It is allowed to keep hens for eggs.

## **Keeping of private subsidiary economies (from 15 to 40 Ku/km<sup>2</sup>)**

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- Breeding and fattening of pigs and cattle is permitted without limitations. But before 1,5-2 months of the time of slaughter they are to be of stall maintenance and to be fed with clean feed-stuffs, bought locally or brought from "clean" regions. Local feed-stuffs can be used for this purposes only after they have been checked in radiological laboratories. The content of radioactive substances in them has not to be higher the norms, determined for corresponding food-stuffs (grain, potatoes, vegetables, etc.)
- It is necessary to find pasture lands with the level of contamination not higher than 5 Ku/kg for cows herding of individuals. In case of their absence it is important to find the pieces of land where annual grass grows. Natural pastures (forest especially) are forbidden for herding milk cattle. If there are no clean feed-stuffs, accommodate for whole milk production, it is allowed to keep cows on "dirty" pasture lands but the use of milk in this case is forbidden. It is to be processed into butter. Sour milk products can be used without limitations for feeding the cattle.

## **Keeping of private subsidiary economies (from 15 to 40 Ku/km<sup>2</sup>)**

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- Wild fruits, mushrooms and forest berries, herds are allowed to be stored up in all the forest that don't have limitation signs and inscriptions. Laying in of hay and herding of individual milk cattle on the territory of forests is forbidden.
- It is allowed to use fish for food only from the rivers and lakes, the water of which can be used for drinking and animals watering.

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**Peculiarities  
of leading of agricultural  
economy on the territory  
of radioactive  
\_ontamination**

**from 40 to 80 Ku/km<sup>2</sup>**

# Agriculture

## (from 40 to 80 Ku/km<sup>2</sup>)

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The territory with the levels of radioactive contamination from 40 to 80 Ku/km<sup>2</sup> is used for strictly controlled leading of agricultural production.

- Fields with the determined levels of contamination can not be used for sowing and planting, they can be used for sowing plants of technical use and also for feed-stuffs production (root-crops and tuber-bearing plants, potatoes, corn for silage) for fattening cattle.
- All the hay mowing lands and pastures are to be improved and are used only for fattening cattle.

## **Stock-breeding**

**( from 40 to 80 Ku/km<sup>2</sup> )**

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- Not to pasture animals on natural unimproved pasture lands.
- In case of extreme necessity it is possible to pasture labour and fattening cattle of the first year of fattening. If the hay, stored up in this zone, is to feed milk cattle – the milk is to be obligatory processed for butter.
- It is strictly forbidden to pasture the cattle of individuals on the pasture lands of the given zone of contamination.



## **Radiation control**

**(from 40 to 80 Ku/km<sup>2</sup>)**

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- All the products, except of seeds, gathered on the given territory have to come through full radiation control. The seeds of agricultural plants and perennial herbs can be used without limitations.

# Keeping of private subsidiary economies

(from 40 to 80 Ku/km<sup>2</sup>)

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- The question of possibility to grow vegetables and potatoes in private gardens of subsidiary economies with the level of radio-Cs content from 40 to 80 Ku/km<sup>2</sup> is solved concretely for every city and village on the base of results of radiation control that was held in 1987. The data of the analysis are provided by the radiological departments of chemical stations. The decisions are taken locally together with the Ministry of Public Health. The products from these economies have to come through obligatory radiological control.
- Agricultural production on the territory contaminated with radio-Cs more than 80 Ku/km<sup>2</sup> is forbidden. The territory is to be planted with forest trees.

## **Forestry keeping**

**(from 40 to 80 Ku/km<sup>2</sup>)**

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- To keep the forestry in the conditions of radioactive contamination it is necessary to follow “Temporary recommendations of forestry keeping in the conditions of radioactive contamination” and “Norms of Cs-137 content in the products of forestry”(Moscow, 1988), decreed by the State Committee of Forestry.

# Union Programme of Urgent measures during 1990-1992

## I term of restoring works

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- Evacuation of the people from cities and villages:
  - where there is no possibility to provide radiation protection
  - where people wish to come out of the regions with limitations for food-stuffs use
- The level of medical service and population sanitation is to be heightened. Special attention should be paid to children and youngsters who suffered after the disaster at Chernobyl NPP
- To take measures in order to make the radiation situation in contaminated areas stable.
- To take into account the radiological factor in the process of realization of the measures to lead agricultural production.
- To provide the population, living in contaminated regions with clean food-stuffs.
- The organization of systematic information for the population about the work done to eliminate the consequences of the disaster.
- Scientific base of the problems connected with the elimination of disaster consequences. Ensuring of normal living conditions in contaminated areas.
- To take measures ensuring radiation security in the zone of evacuation of Chernobyl NPP. To process and bury radioactive wastes, to prevent radioactivity distribution out of the borders of Chernobyl NPP zone.

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# **Restoration period**

- 1990-1992

State union-republican programme of emergent measures during 1990-1992 to eliminate the consequences of disaster at Chernobyl NPP.  
  
Moscow 1990

- 1990-1995

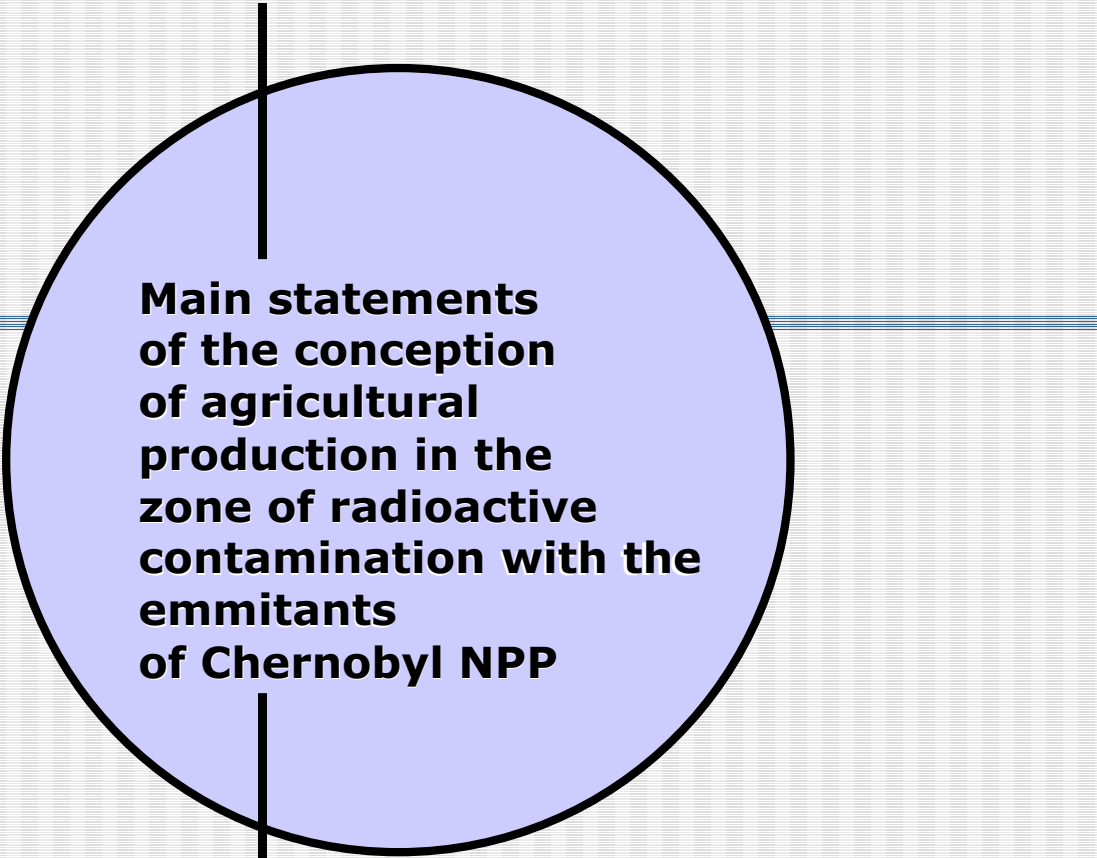
Emergent measures during 1993-1995 and priority directions of state program to overcome the consequences of Chernobyl disaster on the territory of the Republic of Belarus.  
  
Minsk 1993

State programme of the Republic of Belarus to minimize and overcome the consequences of Chernobyl disaster for 1996-2000. (main directions)  
  
Minsk

1996-2000 -

State programme of the Republic of Belarus to overcome the consequences of Chernobyl disaster for 2001-2005 and for the period till the year 2010.  
  
Minsk

2001-2005 -



**Main statements  
of the conception  
of agricultural  
production in the  
zone of radioactive  
contamination with the  
emmitants  
of Chernobyl NPP**

**Minsk 1990**

- Khusainov J.M. "Introduction word at the beginning of scientific conference"
- Prister B.S., Loshchilov N.A. "Leading of agricultural production in the zone of radioactive contamination on the territory of Ukrainian SSR"
- Nikitchenko I.N., Zenkov A.S., Antonenko A.E. "Main principals of stock-breeding in Belarus in the conditions of radioactive contamination of agricultural lands"
- Firsakova S.K., Zhuchenko J.M., Grebenshchikova N.V., Iljazov R.G., Zubritsky V.V. "About the state and purposes of scientific researches in the branch of agricultural radiology for agricultural production on the contaminated territories of BSSR"
- Parfenov V.I., Jakushev B.I., Martinovich B.S., Zabolotny A.I. "Influence of radioactive contamination on natural vegetative complexes of Belarus"
- Smejan N.I., Martsul I.N. "Contamination of soil lands of BSSR with radio nuclides, their forms and vertical migration in the main types of soil"
- Pankovets E.A. "Radio nuclides migration in trophic chain: soil-feedstuffs-animal-animal food products"
- Sushchenja L.M., Pikulik M.M., Vjazovich J.A., Litvinov A.N., Plenin A.E., Shevtsova T.M. "Radiological aspects of influence of the consequences after Chernobyl disaster on the state of BSSR fauna"



- Nagorsky I.S., Vasilevsky V.L., Lavrovsky V.I. "Soil processing in the zone of radioactive contamination"
- Afanasik G.I., Sudas A.S., Alekseevsky V.E. "The problems of melioration and use of soils contaminated with radio nuclides"
- Gaponenko V.I., Goncharova N.V., Nikolaeva G.N., Zhebrakova I.V. "The peculiarities of radio nuclides accumulation and their effect on the photo synthetic system of the plants in the result of the disaster at Chernobyl NPP"
- Prokopjev N.A., Dzhumok G.S., Luchko T.V., Koberets A.S., Zajkovskaya G.A. "The elaboration of the methods of radio nuclides removal from meat and milk raw materials"
- The resolution of scientific conference "Main statements of the conception of agricultural production in the zone of radioactive contamination with the emmitants of Chernobyl NPP"

## Conception of protection of the population living on the territory of the Republic of Belarus in case of radiation disasters at Nuclear Power Plants (1993)

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**The main criterion to take decisions about protective measures is the individual irradiation dose, forecasted from the beginning of the disaster till the moment of completion of radioactive track creation, that in average is 10 days**

- If the power of exposure dose for the given land is higher for more than 20mkR/hour, then there is a limitation of people's stay in open areas; they hermetize offices and living rooms (condensation of doors, windows, to turn off ventilation if there are no filters), iodine distribution begins and there is a ban imposed on the use of milk and leaf vegetables.
- If the power of exposure dose is 2,5 mkR/hour, the protective measures of the population include the following: not to stay in open areas, pre-school institutions, schools and educational institutions stop their activity, except of those that are necessary for life activity of the population. When there is a need to stay outside – protection of skin and breath organs

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- Evacuation of children and pregnant women is done if the expected dose after 10 days of the disaster is 10mSv. The decision to evacuate people is taken if the power of exposure dose is 5 mR/hour.
  - Evacuation of the rest of the population is done if the expected dose after 10 days of the disaster is 50mSv. The decision to evacuate people is taken if the power of exposure dose is 25 mR/hour.
  - Evacuation of children and pregnant women is done if the expected dose over thyroid gland is 200mSv.
  - Evacuation of the rest of the population is done if the expected dose over thyroid gland is 500mSv.

## Zoning of the territory of the Republic of Belarus by the level of radioactive contamination and the amount of dose influence over the population

Name of the zone	Equivalent dose, mSv/year	Density of contamination, KBq/m <sup>2</sup> (Kq/km <sup>2</sup> )		
		Cs - 137	Sr - 90	Pu - 238, 239, -240
Zone of inhabitation with periodical radiation control	Less than <b>1</b>	37-185 (1-5)	5,55-18,5	0,37-0,74
Zone with the right of migration	More than <b>1</b> but less than <b>5</b>	185-555 (5-15)	18,5-74	0,74-1,85
Zone of following migration	More than <b>5</b>	555-1480 (15-40)	74-111	1,85-3,7
Zone of initial migration	More than <b>5</b>	More than 1480 (more than 40)	More than 111	More than 3,7
Zone of evacuation	The territory around Chernobyl NPP where in 1986 the population was evacuated from			

## Norm definition of the levels of Cs radio nuclides content in food-stuffs after Chernobyl disaster (Bk/kg, Bk/l)

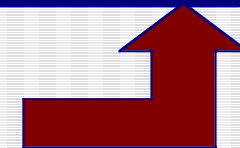
–	Name of the product	Temporarily	Temporarily	test objective	allowable	allowable	allowable
		allowable levels	allowable levels				
		86	88	90	92	96	99
1.	Drinking water	370	18,5	18,5	18,5	18,5	10
2.	Milk and whole-milk Products	370	370	185	111	111	100
3.	Skimmed and concentrated milk		1110				200
	Dry milk		1850		740		
4.	Cottage cheese and the products		370				50
5.	Processed cheese		370				50
6.	Cow butter		1110				100
7.	Beef, mutton and their products		2960	592	600	600	500
8.	Pork, poultry and their products		1850	592	600	370	180
9.	Potatoes		740	592	370	100	80
10.	Bread and bakery		370	370	185	74	40
11.	Flour, cereals, sugar		370	370	370	100	60
12.	Vegetable fat		370	185	185	185	40
13.	Animal fat and margarine		370	185	185	185	100
14.	Vegetables		740	185	185	100	100
	Root-crops		740		370		100
15.	Fruits		740	185	185	100	40
16.	Garden berries		740	185	185	100	70
17.	Canned vegetables, garden berries and fruits		740	185	185	74	74
18.	Wild berries (fresh and canned)		1850	185	185	185	185
19.	Fresh mushrooms		1850	370		370	370
20.	Dry mushrooms		11100	3700	3700	3700	2500
21.	Other products ready for use		–	592	370	370	370
22.	Baby food		370	37	37	37	37

**Norm definition of the levels of Cs radio nuclides content in main kinds of feed-stuffs after Chernobyl disaster (Bk/kg, Bk/l)**

–	Name of the product	allowabl	allowable	allowable
		e levels	levels	levels
		92	96	99
1.	Hay	1480	1480	1300
2.	Straw	370	370	330
3.	Mixed hay	720	600	500
4.	Silage	300	300	240
5.	Root-crops	370	200	160
6.	Grain, forage	370	200	180
7.	Green mass	185	185	165
8.	Coniferous, grass flour	1850	1000	900
9.	Grains	1850	1000	900
10.	Milk products )	740	740	600
11.	Fodder yeast	370	370	330
12.	Meat-bone flour	2220	1000	900
13.	Other kinds of feed-stuffs	1110	1000	900

- Protective layer of NPP
- Zone of accidental planning
- Zone of preventive protective measures
- Zone of emergent protective measures (evacuation from the territories where there is a danger of determined medical effects, as well as lethal cases and incurable illnesses)
- Zone of immediate limitation to use food-stuffs of local production
- Zone of long-term protective measures (there have to be instructions to follow, rules to take preventive measures, to reduce risk)

**According to Guidance of International Agency of Atomic Energy of 1998 on radiation protection in case of disasters at nuclear reactors**



# Zone of accidental planning

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- Zone of preventive protective measures
- Zone of emergent protective measures (evacuation from the territories where there is a danger of determined medical effects, as well as lethal cases and incurable illnesses)
- Zone of immediate limitation to use food-stuffs of local production
- Zone of long-term protective measures (there have to be instructions to follow, rules to take preventive measures, to reduce risk)



Temporary recommendations  
to project land-reclamation of  
the lands contaminated with  
nuclides of accidental emissions  
Chernobyl NPP.

Minsk, 1987

Recommendations to prevent  
radioactive contamination of ground  
waters on the lands that are involved  
in the process of land-reclamation in the  
zone of radioactive emissions at NPP.

Moscow, 1988

Hand-book  
to define the level of radioactive  
contamination of trees and bushes  
and the technologies of its utilization during  
reclamation works in the zone of  
radiation control

Minsk, 1989

## Recommendations

**To reduce  
the content  
of radioactive  
substances  
in plants.**

**MINISTRY OF EMERGENT SITUATIONS  
OF THE REPUBLIC OF BELARUS**

**MINISTRY OF AGRICULTURE AND NUTRITION OF THE  
REPUBLIC OF BELARUS  
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**ACADEMY OF AGRARIAN SCIENCES**

**GUIDANCE  
OF LEADING OF AGRICULTURAL PRODUCTION  
IN CONDITIONS OF RADIOACTIVE CONTAMINATION  
OF SOIL IN THE REPUBLIC OF BELARUS FOR  
1997-2000**

**Edited by Academician of Academy of Sciences of  
the Republic of I.M. Bogdevich**

**Minsk 1997**

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## **GUIDANCE**

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**Minsk 1993**

## **Project of the report on the researches done by Brest Branch of the "Institute of Radiology" in the terms of "SAGE" project during the period from October 1, 2002 till October 1, 2003:**

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- Conception of secure life activity of the population after a nuclear incident and the borders of allowed risk in planned preventive measures of radiation protection
- Emergent, initial and following measures of radiation protection of the population and the elimination of the consequences of radioactive contamination on the example of Chernobyl Disaster.
- Measures of long-term perspective during post-Chernobyl period in agricultural production and processing industry, public health and social sphere .