



Research Institute of Radiology (RIR) Gomel City, Belarus



Regulatory and Practical Approach for Management of Food in Belarus

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ecological and economic evaluation
of the effectiveness of recovery
countermeasures

Cs-137 deposition densities in Belarus



1986

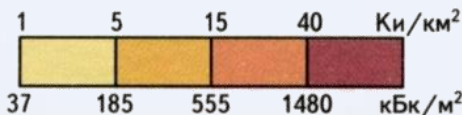
2016

2046

Cs-137 contamination

Ci/km²

kBq/m²

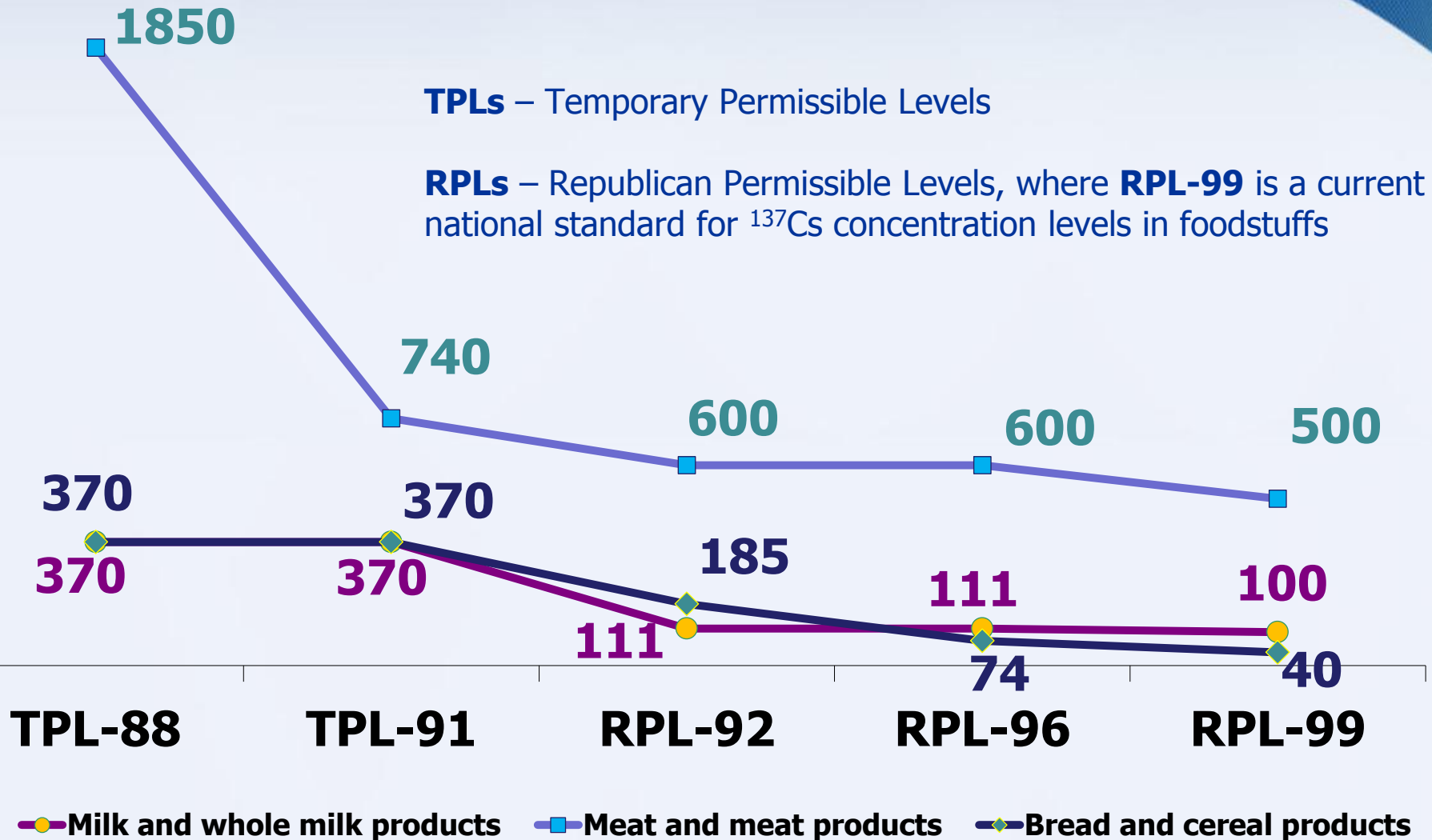


Revision of the national standards for Cs-137 concentration levels in foods, Bq/kg



TPLs – Temporary Permissible Levels

RPLs – Republican Permissible Levels, where **RPL-99** is a current national standard for ^{137}Cs concentration levels in foodstuffs



Basic elements of radiation protection system



Radiological examination of contaminated areas, settlements, farmlands and forests



Radiation control/monitoring of radionuclide concentrations in foods and feeds, raw materials, animal forages, and environmental objects



Development and practical implementation of the most effective protective measures in agriculture and forest management



Assuring correspondence of produced foods and raw materials with the regulatory standards



Information-sharing and awareness-raising activities on radiation safety among population of the affected areas



Integrated radiation control system



State Control and Supervision (national level)



Intra-Industry Control
(on-site level)



Public Control
(community level)

Designed and implemented to exclude any excess of radionuclide concentrations in procured and produced commodities and raw materials

State Radiation Control and Supervision



is implemented by :



Ministry for Emergency Situations



Ministry of Health



State Committee on Standardization



Ministry of Natural Resources and Environmental Protection



Intraindustrial Radiation Control



is assured by :



Ministry of Agriculture and Food



Ministry of Forestry



Ministry of Housing and Communal Services



Belarusian Republican Union of Consumer Cooperatives





- is an effective way for the residents in the affected areas to develop necessary safety skills for everyday living and use of natural resources;

- contributes to higher credibility of the local residents towards the results of radiation measurements.





Agrotechnical and agrochemical techniques and their efficiency in reducing ^{137}Cs uptake by agricultural produce

Cs-137 transfer reduction

	during the first 5 years, up to	in the following periods, up to
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Crop Fields



Soil treatment (plowing up tillage, deep tillage)	5,0	1,5
Lime treatment	4,0	2,0
Application of organic fertilizers	2,5	2,0
Application of phosphate fertilizers	1,5	0,5
Application of potassium fertilizers	3,5	3,0
Optimization of nitrogen fertilization rates	2,5	1,5
Selection of crops with the lowest uptakes	30	5,0

Meadows



Root (radical) improvement	6,0	3,0
Surface (simplified) improvement	3,0	1,5
Selection of grass mixtures	3,0	2,0



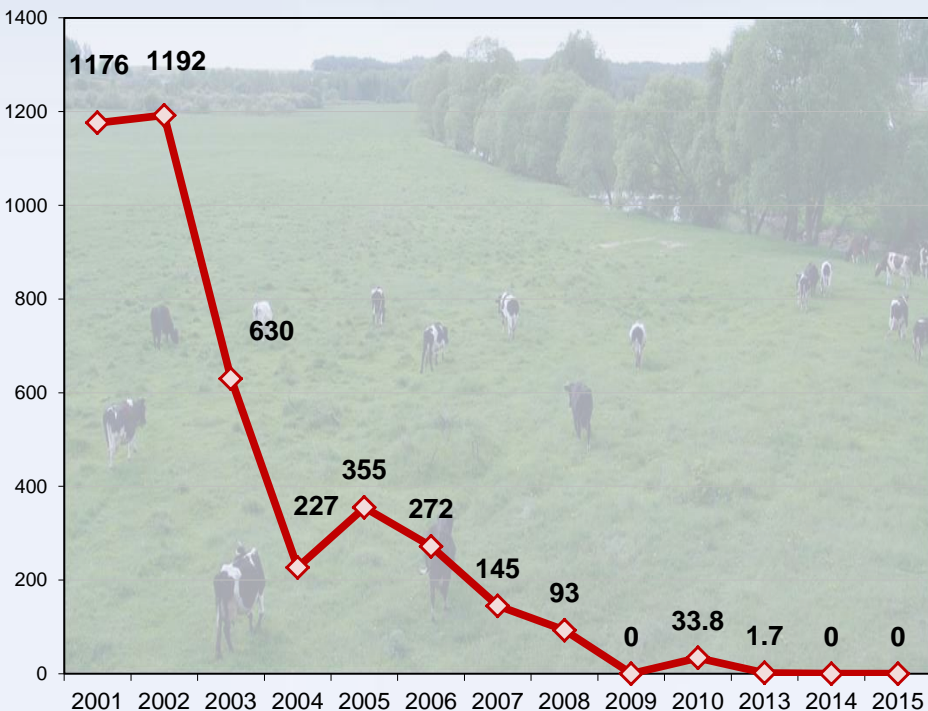
Complex protective measures in agriculture implemented in 2001–2015 in Belarus

Year	Liming, thous. ha	Additional fertilization, thous. tons		Improved pastures, thous. ha	Mixed fodders with ferrocynes, thous. tons
		P_2O_5	K_2O		
2001	35,6	24,5	84,1	10,4	1,7
2002	52,1	17,9	58,6	7,9	1,1
2003	48,9	13,6	64,3	8,1	1,2
2004	48,7	27,3	92,5	13,8	1,3
2005	44,0	30,3	109,4	15,6	1,4
2006	40,6	26,7	87,8	13,4	1,5
2007	29,1	24,3	83,9	5,1	0,7
2008	31,1	24,1	86,2	5,6	0,4
2009	29,5	24,6	83,9	5,1	0,6
2010	31,5	24,3	82,6	3,7	0,7
2011-2015	134,2	105,4	360,7	22,7	0,85

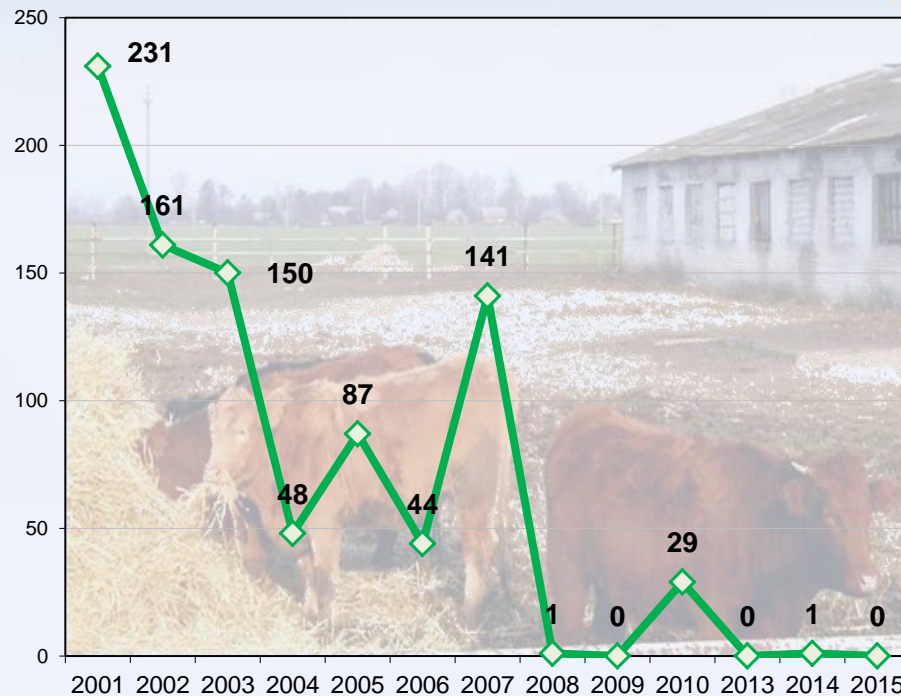
Efficacy of protective measures in farm enterprises



(public sector)



Milk production exceeding Cs-137 regulatory level of **100 Bq/l** in 2001-2015, *tons*

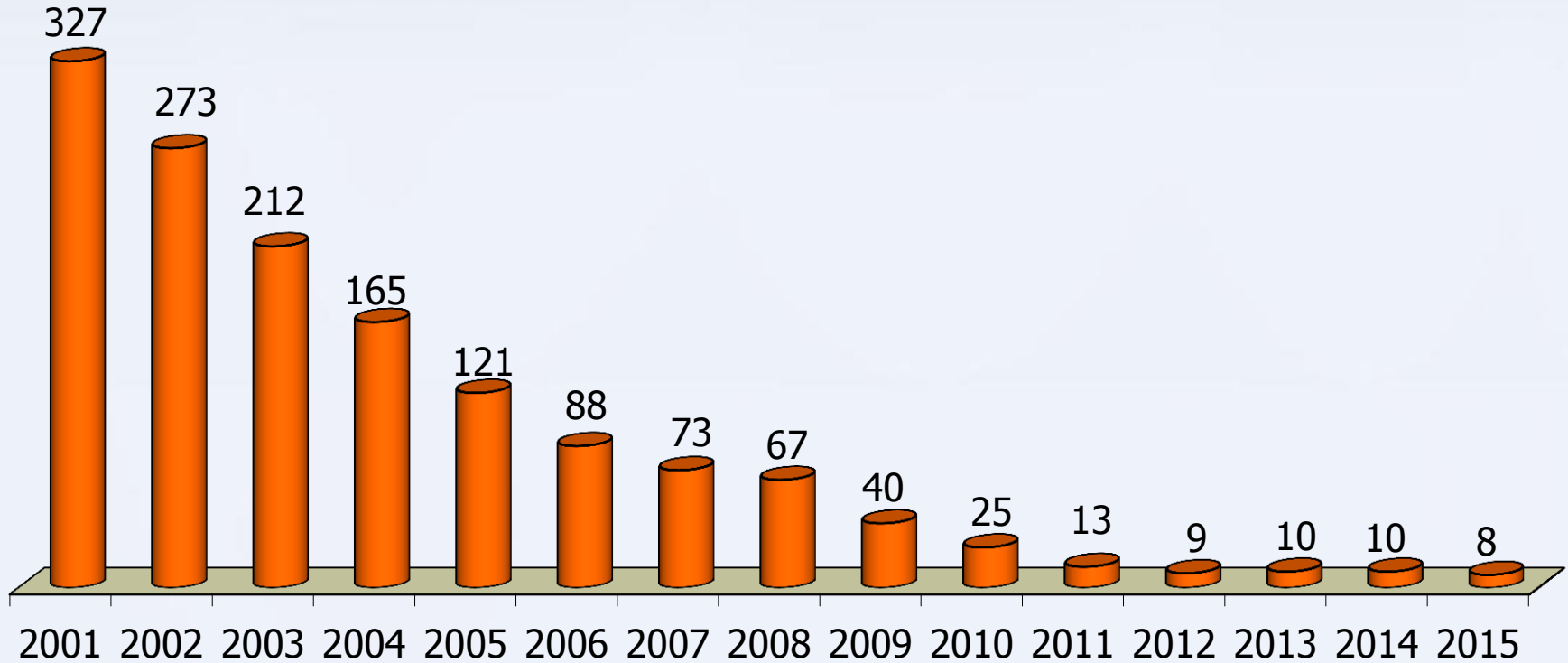


Rejected cattle due to Cs-137 contamination above the permissible level of **500 Bq/kg** in 2001-2015, *heads*



Efficacy of protective measures in farmsteads

(private sector)



Number of communities where Cs-137 contamination levels in milk from private backyards were above the national RPLs standards



Use of cesium binders

Ferrocyn

95% $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$
+5% $\text{KFe}[\text{Fe}(\text{CN})_6]$

Giese salt

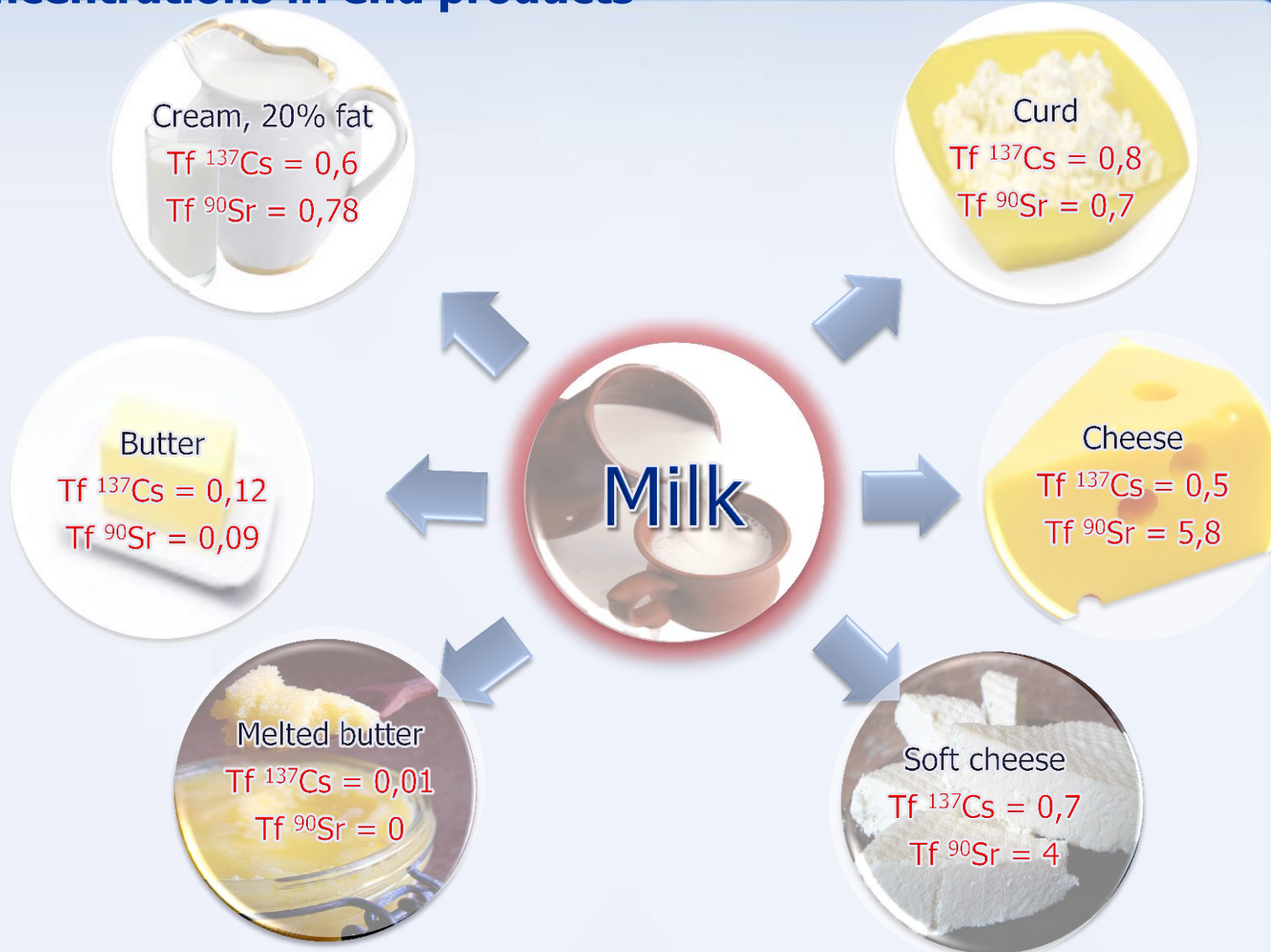
$\text{NH}_4\text{Fe}[\text{Fe}(\text{CN})_6]$

Nigrovich salt

$\text{KFe}[\text{Fe}(\text{CN})_6]$

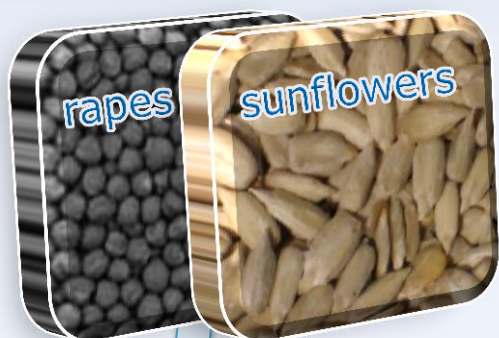


Effect of milk processing on ^{137}Cs and ^{90}Sr concentrations in end products



Tf is a ratio between radionuclide concentration in end product and radionuclide concentration in milk (Bq/kg)

Effect of technical processing on ^{137}Cs concentrations in end products, %



Oil



0



Cereals



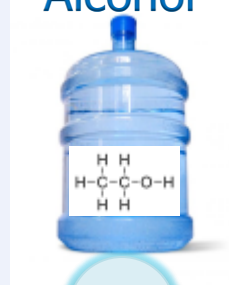
70

Flour



60

Alcohol



0

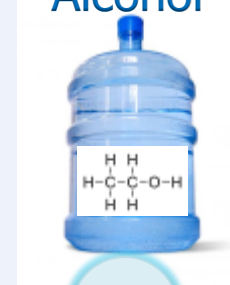


Starch



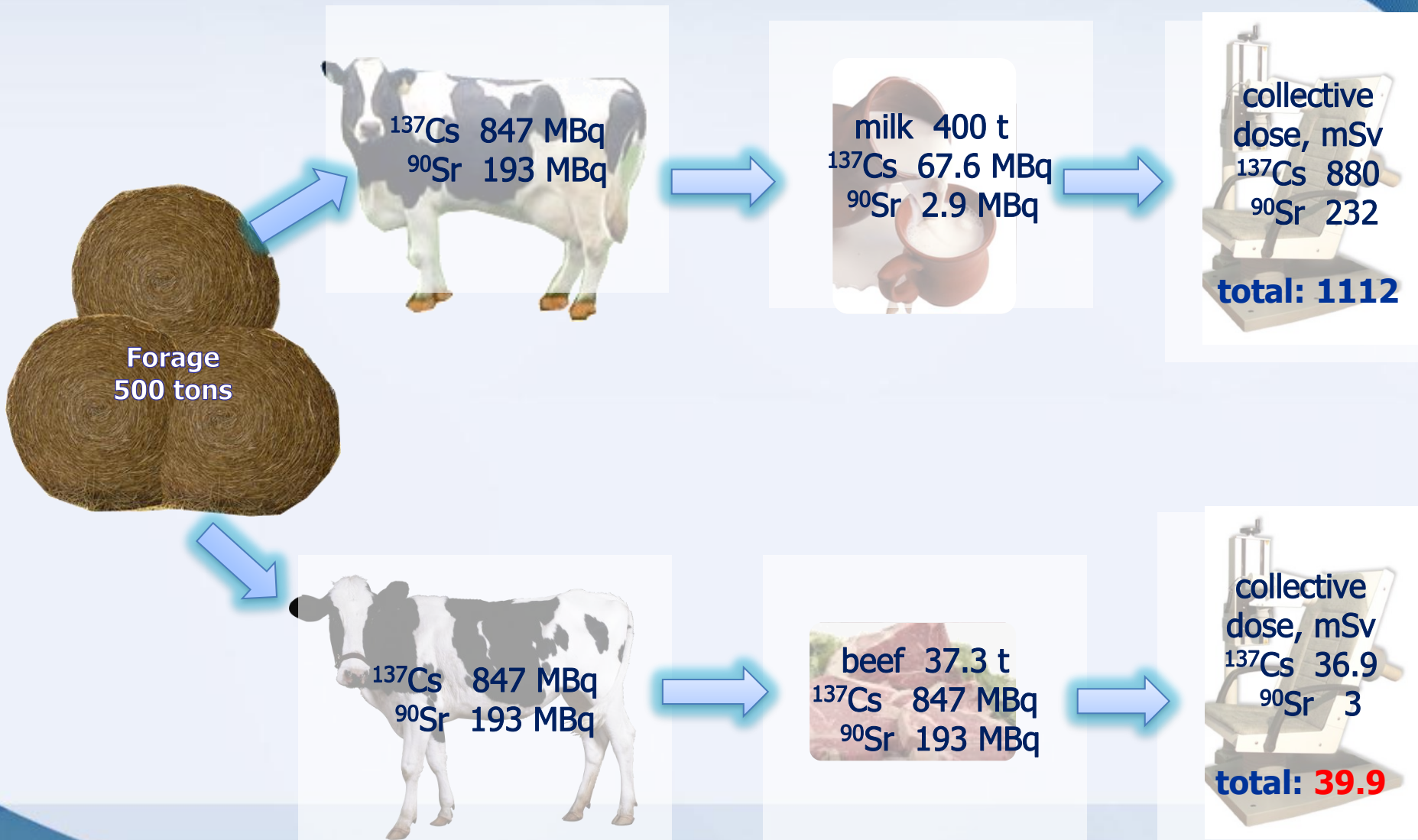
5

Alcohol



0

Reducing collective doses from ^{137}Cs and ^{90}Sr after transition from dairy to beef production



Reducing collective doses with alternative use of contaminated grains



Collective doses,
mSv

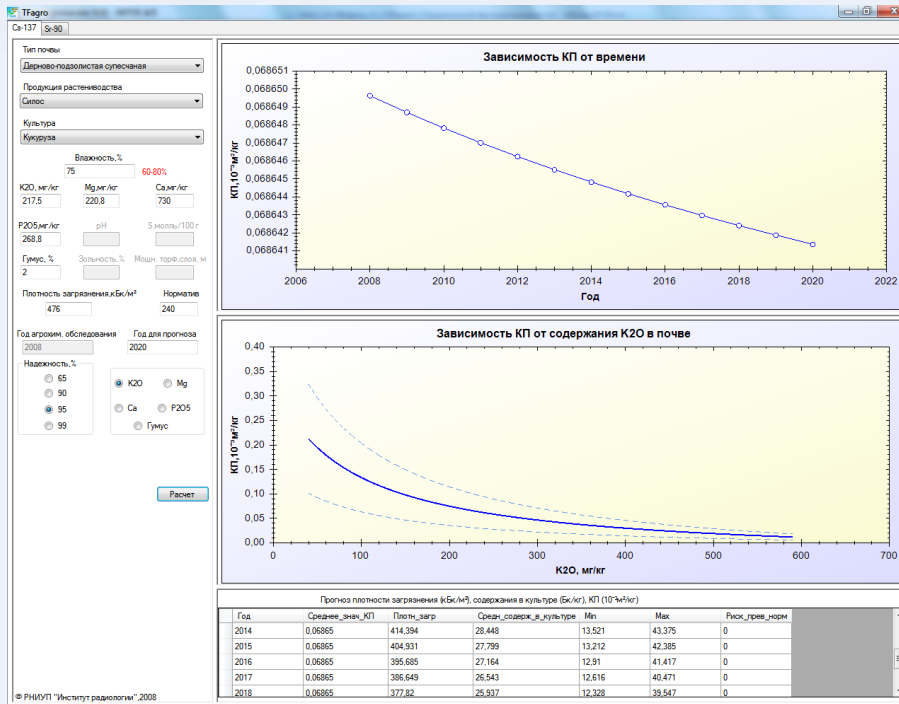


Software tools designed for clean yields production



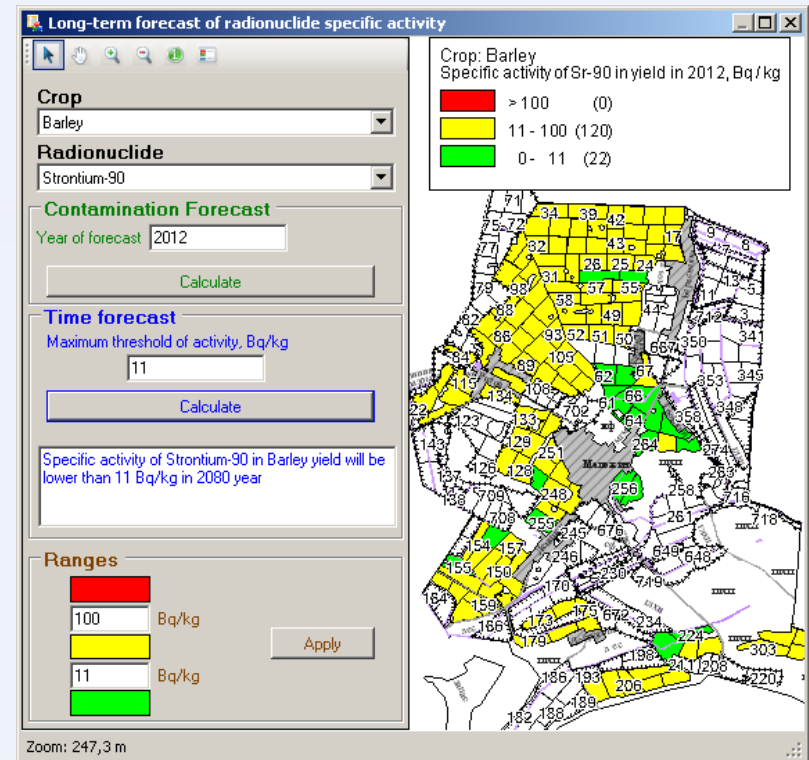
TFagro model

for long-term forecast of radionuclide transfer into agricultural products



AgroOptimization model

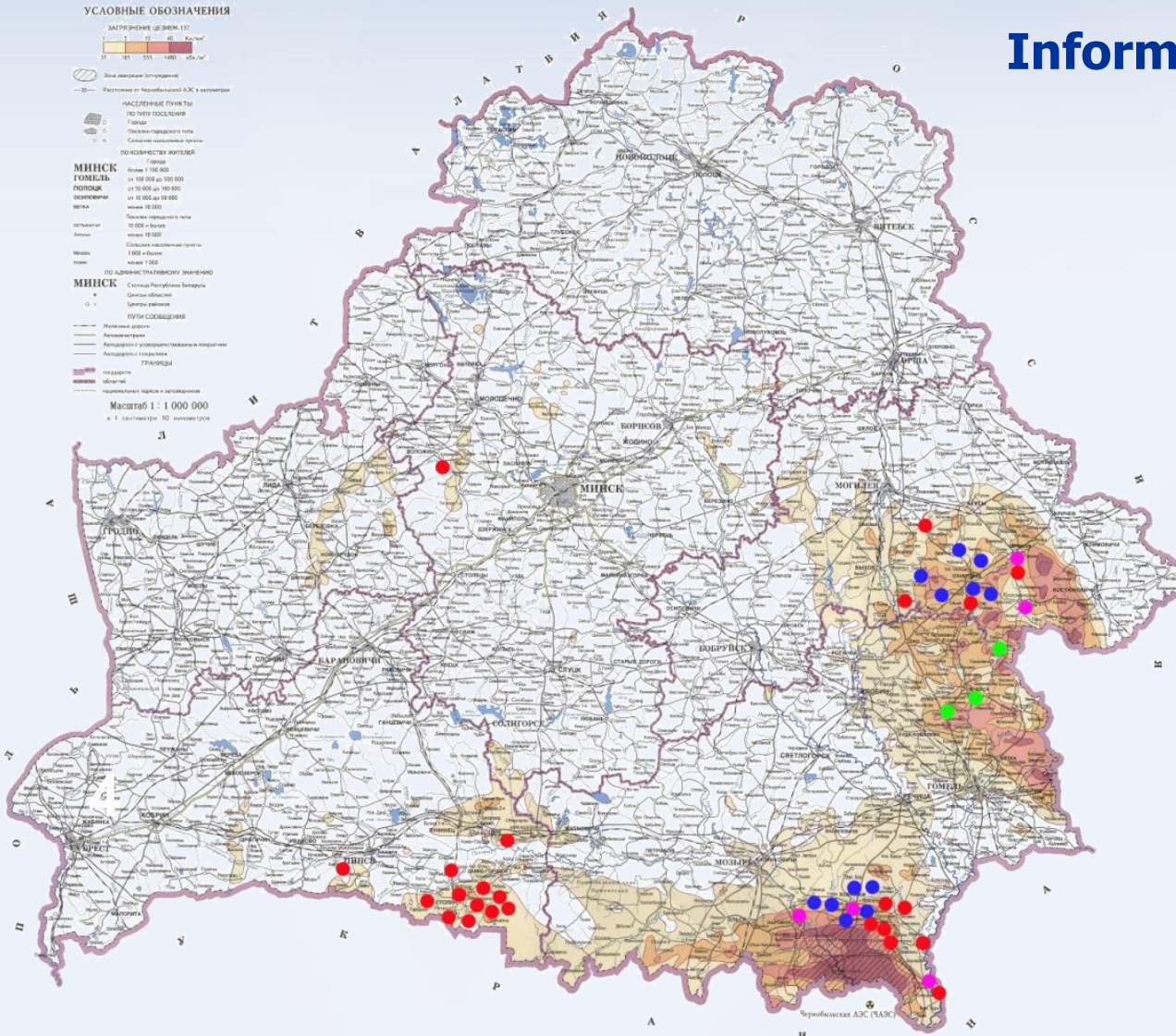
for optimized, efficient use of arable lands



Centers for practical radiological culture:



Information support





Information activities

with different target groups of population



Training programs for **professionals in healthcare & education** on the basics of radioecological culture and how to spread it among population



Outreach and awareness-raising work with the **residents of the affected areas** on the basics of radioecological knowledge and skills



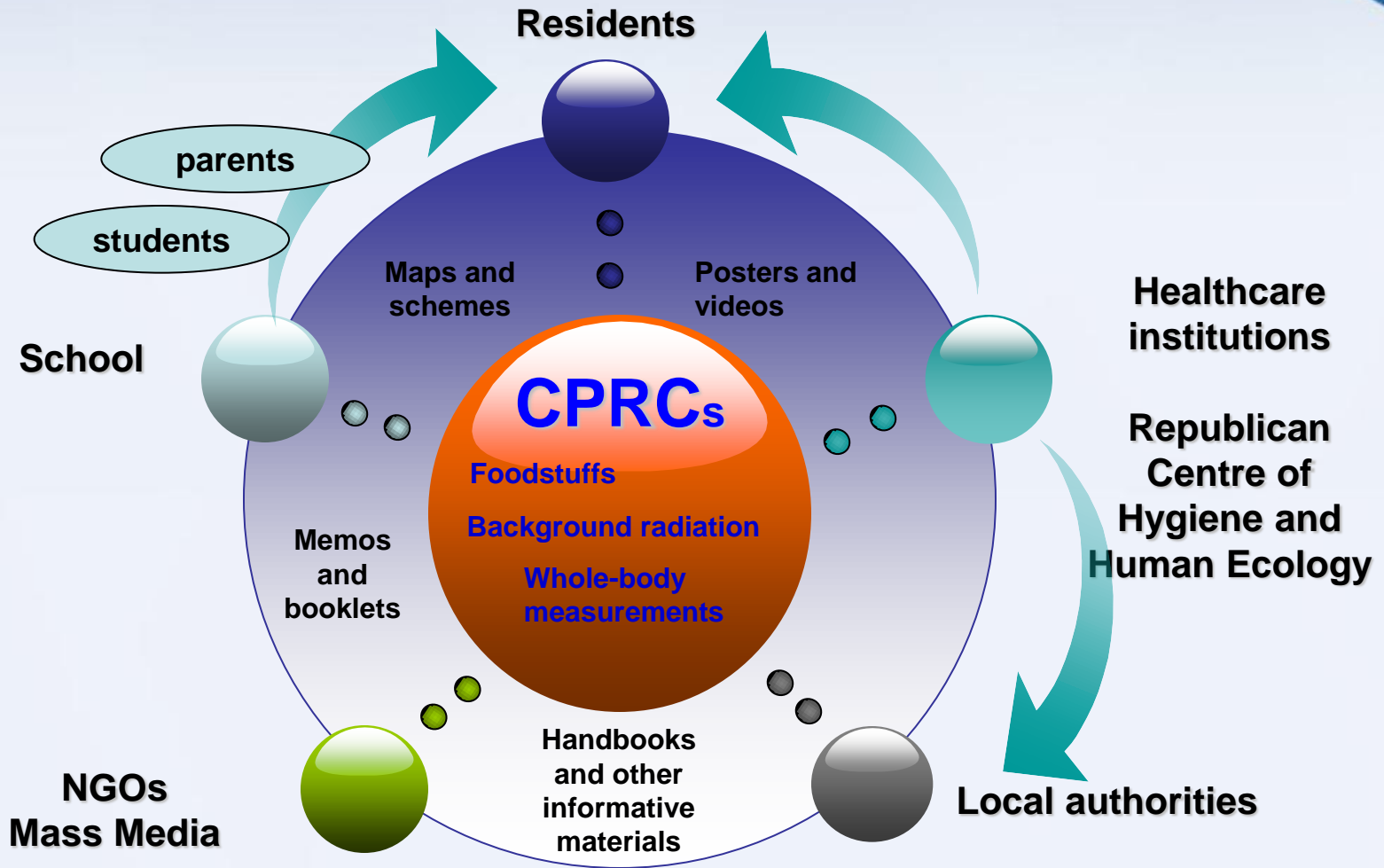
Teaching **students at local schools** about the basics of radioecology and how to measure radionuclide concentrations in foods and feeds, forest gifts and soil, ambient gamma radiation doses



CPRCs interaction network with local residents



and authorities



Information-sharing means and materials



МУЗЕЙ
ЧЕРНОВЫЛСКОЙ
КАТАСТРОФЫ

1 Зал
Дарин
из Чернобыльской АЭС

2 Зал
Доклады
поисковиков

3 Зал
Познаний

1. За несколько ... до катастрофы.
2. Хроника аварии.
3. Чрезвычайные реагирования.
4. «Чернобыльская» творчество.

Virtual museum of the Chernobyl Disaster

Distant consultation and information system

Russian-Belarus information web-portal

Recommendations and handbooks such as What you should know about radiation, Honey Production, Wild Berries and Mushrooms, A Handbook for a Hunter, Private-Farm Vegetables, Food of Forests, Cows and Goats, and many others



Пчеловоду на заметку
Собранный мёд подлжит радиационной контролю.
Допустимый уровень (но не норма!) содержания радионуклидов в мёде - 3700 Бк

Не следует размещать ульи и пасеки на территориях с плотностью загрязнения ^{137}Cs более 15 Ки/км² и в расстоянии ближе 5 км от них.

В этих условиях содержание радионуклидов в мёде невозможно.

В зависимости от степени загрязнённости территорий радионуклидами земель (рекомендации)

Рекомендации
по ведению агропромышленного производства в условиях радиационного загрязнения земель Республики Беларусь на 2011-2015 гг.

Охотнику на заметку
На территории с плотностью загрязнения ^{137}Cs более 15 Ки/км² охота запрещена.
Допустимый уровень (но не норма!) содержания радионуклидов в мясе животных - 3700 Бк.

ВНИМАНИЕ!
Собранные Вами грибы и ягоды нужно проверить на содержание радионуклидов.

Рыболову на заметку
Наиболее загрязнены радиоактивными веществами рыбы из загрязнённых водоемов, хищная донная рыба, карп, лещ, окунь, щука, сом, караси, плотва, язь. Мелкие водоемы содержат радиоактивные вещества в 10 раз больше.

ВНИМАНИЕ!
Корма для скота - зерно, сено, солома, силос, комбикорма, отходы производства кормов, мясокостная мука, рыбная мука, мясокостная и рыбная жмыхи, рыбные и мясные отходы, отходы производства кормов, мясокостная мука, рыбная мука, мясокостная и рыбная жмыхи, рыбные и мясные отходы, отходы производства кормов.

Для этого из разных мест стога сена и кормов отберите пробу в количестве около 1-го кг., для сена около 200 г., Молочных продуктов 0,5-1 л. Отнесите отобранную пробу на радиометристу МЦРК Вашей деревни.

Радиометристу: Павел Сивилев Мазалин, Тел.: 3-95-28 (г.Минск) 8-979-777-37-56 (моб.телефон)





Thank you for your attention!



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