Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH

Study on the potential imports by Member States of agricultural products containing radio-caesium concentrations in excess of EC limits

Deliverable 2:
Final Report

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Berlin / Cologne, January 2008

Contract: TREN/H4/46-2006

Project	**311111, Cs-AgriProducts_DG-TREN-H4/46-2006**
Title	Study on the potential imports by Member States of agricultural products containing radio-caesium concentrations in excess of EC limits
Contract	**N^{o} TREN/06/NUCL/S07.65787 between EC, DG-TREN H4 and GRS**
Project starting date	**29.12.2006**
Actual start of project activities	**31.01.2007 (Kick-off meeting)**
Project end date	**28.12.2007**
Subject	**Deliverable 2: Final Report**
Revision No.	**00 / 30.01.2008**
File name	**DGTREN_H4-46_2006_FinalReport_Rev00_20080130.doc**

Content

List of abbreviations

ComR	Commission Regulation
CR	Council regulation
EC	European Commission
EU	European Union
EEA	European Economic Area
GO	Governmental Organisation
GRS	Gesellschaft fuer Anlagen- und Reaktorsicherheit(GRS) mbH
MPL	Maximum permitted level
MS	Member States
NGO	Non-governmental organisation
RASFF	Rapid alert system for Food and Feed (operated by DG-Health and Consumer Protection)
QA	Quality assurance
TSO	Technical support organisation

1 Executive Summary

Under the DG-TREN project TREN/H4/46/2006 „Study on the potential imports by Member States of agricultural products containing radio-caesium concentrations in excess of EC limits", the Gesellschaft fuer Anlagen- und Reaktorsicherheit (GRS) mbH, as Contractor identified agricultural products which might exceed the maximum permitted level (MPL) of radioactive caesium laid down in Article 3 of Council Regulation (EEC) No. 737/90. Products which may be presented for import into the European Union originating from areas contaminated as a consequence of the Chernobyl accident (in particular in Russia, Ukraine and Belarus) were taken into account. Based on this identification, the contractor made recommendations to the Commission directed towards an updated product list for the purpose of revising the Commission Regulation (EC) No. 1609/2000.

The project was divided into three technical tasks respectively devoted to Identification of radio-caesium concentrations in agricultural products produced in Russia, Ukraine, Belarus and other relevant third countries in the last twelve month **(task 1**), review and collation of the collected information about specific agricultural products considered, taking into account their potential for export to the European Union (**task 2**), provision of recommendations to the Commission on agricultural products that may still have a potential to exceed the MPL of radio-caesium laid down in Council Regulation (EEC) No. 737/90 and to be exported to the European Union and assessment of the likely duration of the potential to exceed the MPL of radio-caesium laid down in Council Regulation (EEC) No. 737/90 and the radiological significance of that potential for these agricultural products (**task 3**).

The project implementation was strongly directed towards the given objectives. The relevant third countries and the governmental and non-governmental organisations of these countries were identified in the very beginning of the project. Different sources of information were applied. A very valuable source of information regarding the contact details of involved and responsible parties was found in filled export certificates according ComR 1635/2006 that had been evaluated at the border control point Frankfurt (Oder) in Germany. This information gave the basis for distributing of questionnaires addressed to Governmental organisations, laboratories and producers / traders. The

contact information of all authorities / laboratories or producers or any other body being relevant in the scope of this project that had been contacted during the duration of this work were finally compiled in a MICROSOFT ® ACCESS database.

For the identification of elevated radio-caesium concentrations on agricultural products the following methods were applied:

- Literature research
- Field mission at border control point Frankfurt (Oder), Germany
- Evaluation of the Rapid Alert System on Food and Feed (RASFF)
- Questionnaires
- Modelling of radio-caesium transfer from the environment into the food chain

The IAEA report “Environmental Consequences of the Chernobyl Accident and their Remediation: Twenty Years of Experience Radiological Assessment Reports Series /IAE 06/ gives a comprehensive overview over the accident itself and the radioactive contamination of the agricultural, urban, forest and aquatic environment. The focus lies on the three most affected countries Belarus, the Russian Federation and Ukraine. Another important literature source is the final report and the accompanying database of the so called French-German Initiative /DFI 06/. The database provides a tool for the reconstruction of the dispersion of radionuclides through the ecosystem and food chains and for the interpretation and prediction of their long-term behaviour. Furthermore, the “Atlas of caesium deposition on Europe after the Chernobyl accident” /EEC 98/ represents an authorised reference providing a detailed picture of the radio-caesium distribution pattern as a basis for the calculation of the radio-caesium concentration in agricultural products in case that no direct concentration data had been provided. A summary of general knowledge on the properties, geographic distribution, and sources of Cs 137 in the environment gives the NCRP Report No. 154 /NCR 06/ presenting a very extensive view on the behaviour of Caesium 137 in the environment.

Much information on the responsible Governmental Authorities, laboratories and traders in Belarus, Russia and Ukraine were obtained from the field mission at border control point Frankfurt (Oder). Due to their geographic orientation to the eastern border of Germany, most of the consignments of mushrooms from Russia, Belarus and

Ukraine need to be declared for free circulation in the EU at this border check points. The Office for Veterinary and Food control in Frankfurt (Oder) decided to have a sampling and analysis of 100 % of the goods (mushrooms) declared for free circulation in Frankfurt (Oder), i.e. a sample from each load of a truck is being analysed by a screening measurement at the custom office. During a field mission in Frankfurt (Oder) and discussion with the head of the Office for Veterinary and Food control in Frankfurt (Oder), GRS was able to get deep insight into the routine work of staff at the customs office. At the custom control office in Frankfurt (Oder), Germany, about 250 export certificates according CR 1635/2006 were evaluated.

According to the presentation of DG SANCO on the results of the evaluation of RASFF /RAS 07b/ 85 notifications on radioactivity in agricultural products were recorded since 1986, thereof 20 notifications in recent years from 2003 to 2007. The most notifications of 78 concerned mushrooms. Further 3 concerned blueberries and 4 times wild game. There is a tendency for decreasing number of notifications with respect to the level of radioactive caesium contamination of foodstuffs.

The questionnaires had been designed and sent to contacts for each country by ordinary mail, fax or email. Returned questionnaires were filled directly into a MS Excel spreadsheet by the addressee or in the document format. Questionnaires were distributed among all third countries according to Annex II of CR 1635/2006. Nevertheless, the number of returned filled-in questionnaires was limited and only submitted by Belarus, Norway, Turkey, Switzerland and Liechtenstein. According to the obtained results, especially in Norway some foodstuffs like mushrooms, sheep, goat, wild boar, moos and probably piscivorous freshwater fish still exceed the MPL. In case of Switzerland only in wild boar meat and in mushrooms, this limit could be exceeded. The contamination of the territory of Liechtenstein is very low and no excess of MPL is expected. That is the same for Turkey but restricted to the European part (west of Bosporus), while for the Asian part of Turkey no data are available.

Based on the maps of radio-caesium deposition pattern on the relevant third countries /EEC 98/ and by means of verified food chain models limits for the Cs 137 deposition in 1986 were defined for different foodstuffs. If these limits are exceeded an excess of the MPL must be assumed. This procedure was made for mushrooms, berries and nuts, wild boar, reindeer, roe deer and deer, moose, goat and sheep. The relevant countries were assigned according to the particular maximum Cs 137 deposition.

Based on our assessment of the transfer of radio-caesium from the soil into the food chain, the list of relevant agricultural products according to CR 1609/2000 is displayed in Section 5.2 of this report which contains products to which CR 737/90 will be applicable because they still have the potential to exceed the MPL as well as products for which its rejection or re-introducing is proposed.

The proposals for rejection concern:

- SECTION I (Chapter 1 und 2): live horses, horse meat and products, live domestic bovine, bovine meat and products, live poultry, poultry meat and products
- SECTION I (Chapter 4): dairy products and birds´eggs, natural honey

The proposal for re-introducing concerns:

- Piscivorous frehwater fish from lakes and ponds

Finally, an assessment of the likely duration of the potential to exceed the MPL for radio-caesium concerning the identified agricultural products which still have the potential to exceed the MPL is given.

Lessons were learned from this project, in particular from the point of view of gathering such information from a third party and for future evaluation within this sector of food control. This project can be seen as very efficient regarding the collection and updating of information about radio-caesium concentration in agricultural products. However it is essential that the activities can continue in a follow-up project, in order to complete the information provided and implement it on direct applications.

2 Background

2.1 The source of contamination

The explosion of RBMK-type reactor no. 4 on the 26th of April 1986 at the Chernobyl Nuclear Power Plant (ChNPP) and the subsequent fire in the reactor core led to a substantial release of radioactive material into the environment. The accident caused severe radiological consequences for the environment not only in the vicinity of the nuclear power plant but also in Belarus and Russia and even in a large distance via transboundary atmospheric transport throughout Europe, the Near – and Middle East.

The entire radioactivity released to the atmosphere totalled 12 x 10^{18} Bq. The radioactive cloud carried radionuclides such as Iodine 131 (half-life: 8 days), Caesium 134 (half-life approx. 2 years) and Caesium 137 (half-life approx. 30 years) to many European countries. The most affected countries were Belarus, the Ukraine and Russian Federation. Owing to its short half-live, I 131 has long since disappeared. In terms of activity, the release of Cs 134 was about 56 % of that of Cs 137. Because of the shorter half-life (2,06 a) of Cs 134, the level of deposited activity decreased by time rapidly in comparison with Cs 137. Now, about 20 years after the ChNPP accident, the residual contamination in terms of activity of Cs 134 is negligible (< 1 %).

The most intensive radio-caesium deposition could be found in the direct vicinity of the ChNPP, covering a “circle” with a diameter of about 60 km on the territories of Ukraine and Belarus. The deposition levels of radio-caesium in Ukraine, Belarus and Russia exceeded 1,480 kBq/m² whereas deposition levels of 40 kBq/m² were exceeded in several countries outside the former Soviet Union throughout Europe. The total amount of radio-caesium deposited on the land-mass of Europe was estimated to be about 64 PBq.

In 1986, immediately after the accident at the ChNPP, the short lived radioisotope I 131 contaminated soil and vegetation mainly by dry deposition. By contrast, the contamination level in Europe by the caesium isotopes was mainly caused by wet deposition due to rainfalls within the first decade of May 1986. The inhomogeneous distribution of the intensity of rainfall across Europe led to the known “spotty” contamination pattern. Since 1987, the transfer of radionuclides from the soil via roots into plant is the princi-

pal path of contamination of agricultural products. The special activity of soils and vegetation is influenced by the natural decay of the radioactive isotopes, their environmental behaviour with regard to vertical penetration into the soil as well as the soil species.

2.2 Administrative measures launched in the European Union

Yet in 1987, the Member States of the European Union have been able to react by a regulatory approach upon this accident as the Commission adopted Directives to fix basic safety standards on the protection of the population against radiation exposure since 1959 (OJ No. 11, 20.02.1959, p. 221/59 amended by CR 80/836/ Euratom and 84/467 Euratom, the ancestor of Council Directive 96/29 Euratom) but maximum permitted levels of radioisotopes differed a lot when comparing national regulations among each other. In addition, measurement methods and programmes for the detection of radioactive contamination where not harmonized at that time.

In a first response to the accident, the Council Regulation (EEC) No 1388/86 of 12 May 1986 /CEC 86a/ on the suspension of the import of certain agricultural products originating in certain third countries became effective. After quite short time, Council Regulation (EEC) No 1707/86 of 30 May 1986 /CEC 86b/ fixed the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power station.

The most recent and currently in force one is named Council regulation (EEC) No. 737/90 of 22. March 1990 /CEC 90/, amended for a second time by Council regulation (EC) No. 616/2000 of 20 March 2000 /CEC 00/ with expiration date of 31 March 2010. It had been (and is) foreseen to revise the annexed list of products that might get excluded from the scope of this regulation after consultation of a Committee of Member States Representatives periodically from the very beginning on (Article 7, CR (EEC) No. 737/90). By means of successive regulations, the Commission established negative lists that exclude products from the regulation as well as positive lists of products to which the regulation is applicable.

2.3 Chronological evolution of regulation CR No. 737/90 with amending regulations

A list of products excluded from the application of Council Regulation (EEC) No. 737/90 was introduced already in this regulation (Annex I) → Agricultural products unfit for

human consumption. A list of products to which Council Regulation (EEC) No. 737/90 is applicable was introduced already in this regulation (Annex II and Article 3) → Milk and milk products and for specified foodstuffs intended for the special feeding of infants younger than 6 month.

With Commission Regulation No. 146/91 /CEC 91/ an update of the list of products excluded from CR 737/90 but focused on products suitable for the human diet and consumption was issued and, once again, the list of agricultural products excluded as mentioned in ComR 146/91 had been revised in ComR 598/1992 /CEC 92/, as well already set out of force.

A major change in the approach to the regulation by CR 737/90 took place in 1993 as ComR 598/1992 switched over to list just products to which CR 737/90 is applicable.

A revision of the list given by ComR 598/1992 came effective in ComR 3034/94 /CEC 94/ whereby the recent structure and content is obvious but some products like herbs or tea are still included. ComR No. 727/97 /CEC 97/ revised the ComR 3034/94, both being no longer in force.

The Commission Regulation (EEC) No. 1609/2000 /CEC 00b/ repealed ComR No. 727/97, giving precise information about kinds of live animals, animal products, vegetable products and prepared foodstuffs to which the CR 737/90 is applicable.

Beside the above mentioned revision of the list of products to which CR 737/90 is applicable or not applicable, the CR 737/90 itself had been amended two times in its duration of control by the Council Regulations CR 686/95 /CEC 95/ and CR 616/2000 /CEC 00a/. The latter CR concerned a modification in order to remain consistent between fresh and dried mushrooms that the MPL referred to in Article 3 of Council Regulation No 737/90 "…thereof are to be calculated for all concentrated or dried products on the basis of the reconstituted products as ready for consumption".

An excerpt from the list of products to which Council Regulation (EEC) No. 737/90 is applicable was established in CR 1661/1999 /CEC 99/, laying down detailed roles on the checks and sampling to be performed for mentioned products from a list of third countries, focused on fresh, prepared or preserved mushrooms. The Annex of CR 1609/2000 /CEC 00b/ is the latest updated list of agricultural products for which the MPL´s are applicable.

Detailed rules for the application of Council Regulation No. 737/90 on the conditions governing imports of agricultural products originating in third countries following the accident at the ChNPP are laid down in this Commission Regulation (EC) No. 1661/1999 and fixes a certain number of custom offices in the MS where mushrooms may be declared for free circulation in the EU. An export certificate must be issued by the exporter and signed by independent responsible authorities of the exporting country, certifying that the MPL according CR No. 737/90 are not exceeded. Efforts had been made (i.e. a recommendation by the Food and Veterinary Office (FVO) following a control visit to Bulgaria in order to assess the facilities and measures in place to control radioactive contamination in foodstuffs and in particular in non-cultivated mushrooms) to ensure the appropriate accuracy of the certified radioactivity levels.

By ComR 1627/2000 /CEC 00c/, ComR 1621/2001 /CEC 01/and ComR 1608/2002 /CEC 02/, this ComR 1661/1999 /CEC 99/ had been revised and amended.

In November 2006, the list of responsible custom offices for declaration of goods (mushrooms) to which ComR 737/90 is applicable and which needs to be accompanied by an export certificate proving that the goods comply to the MPL had been removed from the content of ComR 1661/1999 and the recently in force Commission Regulation (EC) No 1635/2006 /CEC 06/ had been released. Custom offices that allow declaration of the mentioned good (mushrooms) will be announced and published in the Official Journal of the European Union and were in its latest issue updated for the custom offices from the new EU-MS.

As the fundamental CR 737/90 will expire on the 31.March 2010, the Commission has to review and, if applicable revise the current list before that date. Particular challenges arise from the fact that since the eastern enlargement in 2004 member states from the former Soviet Union joined the EU and nowadays will join the Committee of Member States Representatives who will advise to the EC on how to review the list of agricultural products which might exceed the MPL of radio-caesium in Article 3 of CR No. 737/90.

3 Project implementation

3.1 Identification of relevant third countries

As agreed by the participants of the kick-off meeting in Luxembourg on 31 January 2007, the relevant countries are strictly limited to third countries as mentioned in Council regulation 1635/2006 /CEC 06/. These relevant third countries are:

Albania, Belarus, Bosnia and Herzegovina, Croatia, Liechtenstein, Former Yugoslav Republic of Macedonia, Moldova, Montenegro, Norway, Russia, Serbia, Switzerland, Turkey, Ukraine

Without doubt, Russia, Ukraine and Belarus which were the most seriously affected countries by the Chernobyl accident, are in the focus of our studies (see also Table 3-1 and Table 3-2). Nevertheless, all third countries had been included during the gathering of data. An update of the list of third countries in ComR 1635/2006 and possible reduction wasn't the aim and objective of this contract, but recommendations will be provided together with recommendation on the update of the list of agricultural products in Chapter 5.

Table 3-1: Total Cs-137 deposition in Europe after the Chernobyl accident (all values quoted to two significant figures) /EEC 98/

Country	Surface area (10^3 km^2)	Area (in 10^3 km^2) with deposition in the specified range (kBq m^{-2} (Ci km^{-2}))											caesium-137 deposit [3]				
		0 - 1	1 - 2	2 - 4	4 - 10	10 - 20	20 - 40	40 - 100	100 - 185	185 - 555	555-1480	> 1480	Total		Chernobyl		
		(0-0.027)	(0.027-0.054)	(0.054-0.11)	(0.11-0.27)	(0.27-0.54)	(0.54-1.08)	(1.08-2.7)	(2.7-5)	(5-15)	(15-40)	(>40)	PBq	(kCi)	PBq	(kCi)	(% of Europe)
Austria	84	0.01	0.13	2.7	17	28	25	11	0.08				1.8	(49)	1.6	(42)	2.4
Belarus	210		30	46	50	22	16	21	8.7	9.4	4.4	2.6	15	(410)	15	(400)	23
Belgium	31	8.1	10	12	0.09								0.053	(1.4)	0.01	(0.26)	0.02
Croatia	56	0.07	10	6.2	29	11	0.03						0.37	(9.9)	0.21	(5.8)	0.33
Czech Republic	79			21	42	13	3.5	0.21	< 0.01				0.6	(16)	0.34	(9.3)	0.54
Denmark	45	5.4	20	19	0.80								0.087	(2.4)	0.016	(0.43)	0.02
Estonia	45	0.05	3.0	31	8.7	1.7	0.28	< 0.01					0.18	(4.7)	0.051	(1.4)	0.08
Finland	340	1.9	130	45	50	32	59	19					3.8	(100)	3.1	(83)	4.8
France	550	290	100	97	54	1.2							0.93	(25)	0.35	(9.4)	0.55
Germany	350	8.4	58	140	110	29	14	0.32					1.9	(51)	1.2	(32)	1.8
Greece	130	6.4	16	39	37	21	8.3	1.2	0.04				0.95	(26)	0.69	(19)	1.1
Hungary	93	2.9	25	31	29	5.2	0.23						0.37	(10)	0.15	(4.1)	0.24
Ireland	70	0.08	1.0	21	47	1.3	0.01						0.35	(94)	0.21	(5.6)	0.33
Italy[1]	280	140	42	37	37	15	7	1.3	0.05				0.93	(25)	0.57	(15)	0.90
Latvia	64	0.01	0.05	43	21								0.25	(6.8)	0.055	(1.5)	0.09
Lithuania	65		3.1	14	48	0.05							0.44	(12)	0.24	(6.5)	0.38
Luxembourg	2.6		0.09	2.4	0.12								0.008	(0.21)	0.003	(0.08)	< 0.01
Moldavia	34			0.04	13	19	1.9						0.4	(11)	0.34	(9.2)	0.53
Netherlands	35	6	19	9.1	0.64								0.062	(1.7)	0.01	(0.26)	0.02
Norway	320	14	76	68	89	44	23	7.1	0.08				2.5	(69)	2.0	(53)	3.1
Poland	310	0.44	110	120	71	10	3.5	0.52					1.2	(32)	0.4	(11)	0.63
Rumania	240	1.6	9.4	34	120	54	13	1.2					2.1	(55)	1.5	(41)	2.4
Russia (European part)	3800	3.3	300	1900	1100	250	180	44	7.2	5.9	2.2	0.46	29	(780)	19	(520)	30
Slovak Republic	49		0.01	9.3	32	6.8	0.61	0.02					0.32	(8.8)	0.18	(4.7)	0.28
Slovenia	20	< 0.01	0.03	0.14	2.5	8.1	8.7	0.61					0.39	(11)	0.33	(8.9)	0.52
Spain	500	390	100	0.51									0.38	(10)	0.031	(0.83)	0.05
Sweden	450	120	100	78	55	31	33	23	0.44	< 0.01			3.5	(94)	2.9	(79)	4.6
Switzerland	41		< 0.01	6.2	26	6.4	2.3	0.73					0.36	(9.8)	0.27	(7.3)	0.43
Turkey (European part)	24			0.35	23	0.04							0.16	(4.2)	0.10	(2.8)	0.16
Ukraine	600	0.26	14	140	240	120	43	29	4.3	3.6	0.73	0.56	13	(350)	12	(310)	18
United Kingdom	240	58	48	51	64	15	1.7	0.09	0.04	0.03			0.88	(24)	0.53	(14)	0.83
Reporting countries	9200	1100	1200	3000	2400	740	440	160	25	20	8.1	2.8	82	(2200)	63	(1700)	99
Europe	9700												84	(2300)	64	(1700)	100
World (Europe + 20%)															77	(2100)	

Table 3-2: Areas in relevant third countries with radio-caesium deposition in excess of specified levels /EEC 98/

Country	In 1.000 km²	
	> 40 kBq/m² *	> 1480 kBq/m²
Belarus	46	2.6
Norway	7.1	
Russia	60	0.46
Switzerland	0.73	
Ukraine	38	0.56

* The value of 40 kBq/m² correspond to a annual dose of not more than 1 mSv/a, a level that had been adopted by the most affected countries right after the accident to allow decisions on countermeasures and introducing privileges for the most affected population.

Albeit limited to a local scale, surface contamination with radio-caesium > 100 kBq/m² occurred in several countries outside former Soviet Union territory.

3.2 Identification of the involved governmental and non-governmental organisations

To address the data acquisition to the appropriate addressees, an updated list of contact points to regulatory bodies, private companies and individuals was believed to be indispensable and was immediately created and updated regularly during the project.

Governmental authorities

The following categories of Governmental authorities and national services or agencies in reference to the overall project aim and in charge with export of relevant agricultural were identified to include possible contact points:

- Nutrition / Health / Consumer Protection
- Veterinary Medicine

- Agriculture / Fishery
- Geology / Geochemistry / Biology / Biochemistry
- Statistics
- Environmental Protection / Water Management / Forestry
- Trade and Customs Regulations
- Economy and Finances
- Transport
- Radiation Safety / Radiology
- Meteorology
- Foreign / Interior Affairs
- Codex Alimentarius

Laboratories

Accredited and/or authorised laboratories in the relevant countries performing the sampling and providing the required analysis data for agricultural products foreseen for export in the EU MS were identified. These organisations carry out analysis of agricultural products in the relevant third countries and will be able to provide raw data on the radio-caesium content.

Non-governmental organisations and individuals

In order to gain contact details for national trade associations and representatives for individual companies in the relevant third countries, trade associations for the sector of interest had been evaluated. An examination of the list of approved establishments from third countries that own permission to import agricultural products into the EU was foreseen but found to be less promising than expected and cancelled.

3.3 Sources of information

A very valuable source of information regarding the contact details of involved and responsible parties was found in filled export certificates according ComR 1635/2006 /CEC 06/ that had been evaluated at the border control point Frankfurt (Oder) in Germany for the period between 01.10.2006 to 06.08.2007 (Detailed results of the site mission at the custom border control point could be found in Chapter 4.2. A total number of 148 certificates from Belarus, 61 from Russia and 32 from Ukraine had been evaluated. It is remarkable, that just a small number of producers (13 from Belarus, 14

from Russia and 9 from Ukraine) applied for such a certificate. Just a small number of laboratories (4 - 5 in Belarus, 10 from Russia and 5 laboratories from Ukraine) are responsible for analysis of foodstuffs. All these contact data extracted from the export certificates had been used for the questionnaire in full extent.

A consolidated meeting in Kiev with representatives from relevant third countries (at least Belarus, Ukraine and Russia) was held at the RISKAUDIT premises in Kiev. GRS took also the opportunity to meet representatives of relevant third countries during the 19th International Agricultural Exhibition-Fair "AGRO-2007" in June in Kiev. The following exhibitions were integrated in the AGRO-2007:

- 6th Specialized Exhibition for Livestock Farming and Veterinary Medicine "Animal'EX-2007"
- 4th Specialized Exhibition for Horse Breeding and Equestrian Sport "EquiWorld-2007"
- 2nd Specialized Exhibition "Mushroom Industry 2007"
- 1st Specialized Exhibition for fishing and fish farming "FISHEXPO-2007"

About 24 Countries were represented. Beside the Ukraine, the following relevant third countries participate: Russia, Belarus, Turkey, Moldova, Switzerland and Norway.

For known reasons the main interest was focused on producers, governmental organisations and laboratories of the Ukraine. Unfortunately, predominantly regional commodity exchanges of the administrative areas (Oblasts) of the Ukraine were represented on the fair; however only a few direct producers of foodstuffs. Thus, direct contacts with producers could be realized only sporadically. Only one laboratory and no governmental organizations were represented on the fair. Altogether, there were personal conversations with 16 food producers or producer's unions and with one Ukrainian food laboratory.

The contact information of all authorities / laboratories or producers or any other body being relevant in the scope of this project that had been contacted during the duration of this work were finally compiled in a MICROSOFT ® ACCESS database. The database will allow a reconstruction of the contact history, to find the identified contact person or, if applicable, to view information and data contributed to the project work.

An ACCESS database request sheet with respect to the basic contact data is provided in Appendix 1.

3.4 Methods applied for the identification of enhanced radio-caesium concentrations in agricultural products

3.4.1 Literature research

A huge number of publications is directed towards environmental contamination with radio-caesium as a consequence of the Chernobyl nuclear accident in 1996.

Many of these reports are either focused on the most affected areas of Ukraine, Belarus and Russia and the exclusion zone or give an overview of the overall contamination situation of some of the concerned third countries. While the reports mentioned at first are not of high priority for our purpose due to many restrictions of use and trade of agricultural products, the other group of reports, namely annual reports are believed to provide valuable information.

3.4.2 Field mission at border control point Frankfurt (Oder), Germany

A field mission had been carried out at the Custom Office in Frankfurt (Oder), Germany where products listed in Annex I of Commission Regulation (EC) No1635/2006 /CEC 06/ may be declared for free circulation in the European Community. At this entry point about 90 % of all mushrooms for European customers are controlled, the number of consignments amount to more than 1.500 supplies via truck per year. In many cases, not Germany is the country of destination but the goods will be on transit through central Europe and Germany with final destination in France, Spain or Portugal. Due to the specific way of transport of mushrooms from Eastern Europe via Frankfurt (Oder) by truck, the majority of consignments are declared there (either with final destination in Germany or for transit).

3.4.3 Evaluation of the Rapid Alert System for Food and Feed (RASFF)

CR 178/2002 sets the legal basis of the RASFF, laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying

down procedures in matters of food safety. In Articles 50, 51 and 52 scope and procedures of the RASFF are defined:

The purpose of the RASFF is to provide the control authorities with an effective tool for exchange of information on measures taken to ensure food safety. To assist the members of the network, information is classified under two different headings and published in weekly overviews and yearly reports on the internet platform of DG-SANCO.

- **Alert Notifications**

“Alert notifications are sent when the food or feed presenting the risk is on the market and when immediate action is required. Alerts are triggered by the Member State that detects the problem and has initiated the relevant measures, such as withdrawal/recall. The notification aims at giving all the members of the network the information to verify whether the concerned product is on their market, so that they also can take the necessary measures.”

- **Information Notifications**

“Information notifications concern a food or feed for which a risk has been identified, but for which the other members of the network do not have to take immediate action, because the product has not reached their market. These notifications mostly concern food and feed consignments that have been tested and rejected at the external borders of the EU (and the EEA).”

- **News Notifications**

“Any type of information related to the safety of food or feed which has not been communicated by a Member State as an "alert" or an "information" notification, but which is judged interesting for the food/feed control authorities in the Member States, is classified and made available as a news notification.”

3.4.4 Questionnaires

Three different questionnaires for producers, laboratories and governmental institutions had been issued. That fitted the best to the specific requirements of this sector. The templates of the questionnaires are attached as Annexes to the separate Management Report.

The following structure of the questionnaire was agreed to be flexible enough to cope with the problem of time-consuming filling-time to answer the questions. The entire structure and content of the questionnaires which were addressed to laboratories, governmental authorities and producers/traders is apparent from the above mentioned Annexes.

Governmental authorities

1	Organisation Data
2	Relevant national legislation
3	Nation-wide food and feed monitoring and countermeasures
4	Organisation / structure of the competent authority
5	Work results
6	Regulatory control of export of agricultural products to the EC
7	Steps in scheme of sampling, analysis and certification
7.1	STEP 0: Accrediting of the laboratory
7.2	STEP 4: Certification of compliance with the EC legislation

Laboratories

1	Laboratory Data
2	Organisation of the laboratory
3	Laboratory work
3.1	Sampling procedure
3.2	Sample identification and packing
3.3	Transport of the sample to the laboratory
3.4	Sample receipt and sample preparation
3.5	Measurement of the sample
4	Steps in scheme of sampling, analysis and certification
4.1	STEP 1: Request for export certificate
4.2	STEP 2: Issue of the certificate

Producer / Exporter / Trader

1	Company Data
2	General
3	Steps in scheme of sampling, analysis and certification
3.1	STEP 1: Request for the certificate
3.2	STEP 3: Presentation of the certificate to the competent authority

The questionnaire included some questions that may allow cross-checking the answers given. They deal with the steps in scheme of sampling, analysis and certification.

The process schema of sampling, analysis and certification of safety of agricultural products intended for export into the EC according the EC regulation 1635/2006 is ex-

pected to follow the fixed and controlled flow-chart. This scheme was given to any of the addressees at Governmental authorities, laboratories and producers (Figure 3-1)

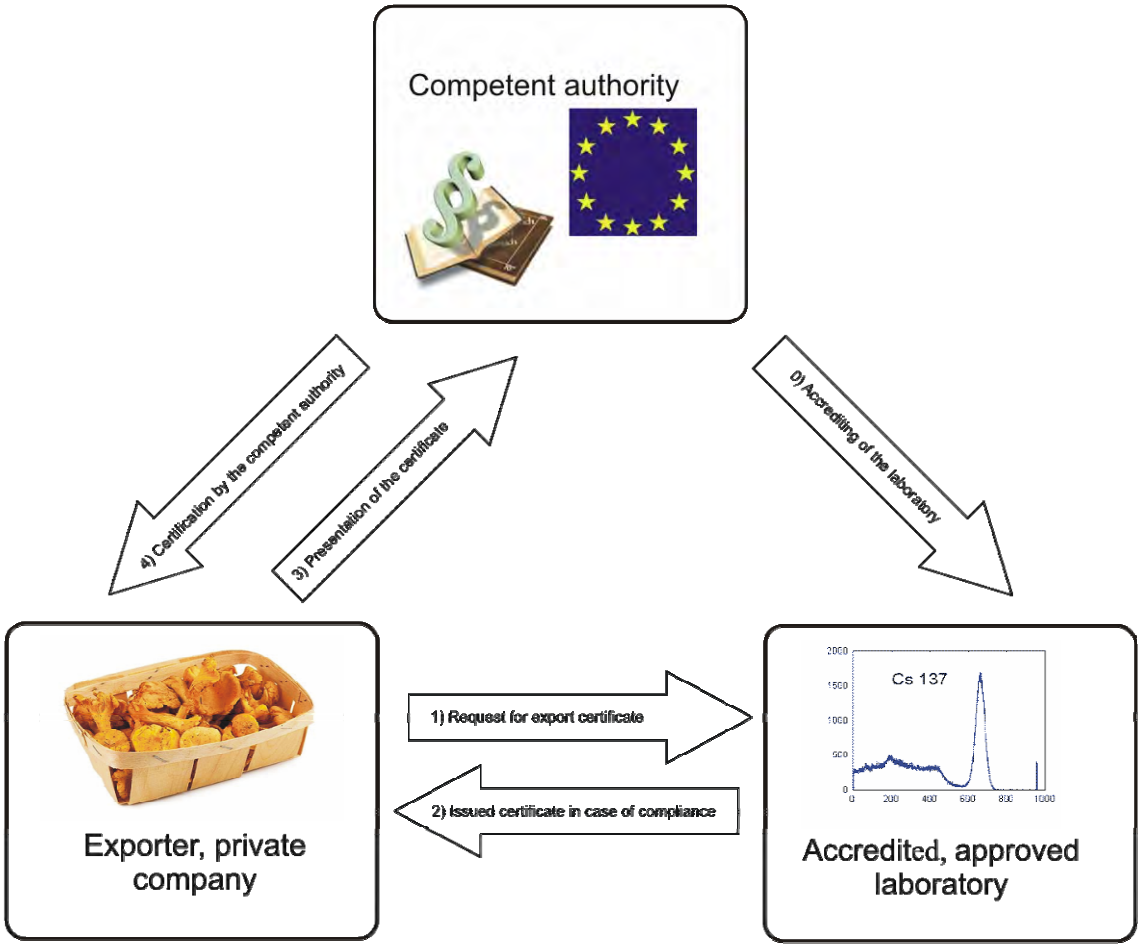


Figure 3-1: Steps in scheme of sampling, analysis and certification with respect to export of mushrooms from third countries to the EU.

A Microsoft Excel® version of the questionnaire with VBA background had been developed as well although the authors made better experiences with the printed medium than the electronic one.

3.4.5 Modelling of radio-caesium transfer from the environment into the food chain

Detailed knowledge about the transfer of radionuclides from soil into plant and into agro-ecosystems is necessary to reconstruct and also to predict the behaviour and the spreading of radionuclides in ecosystems and food chains.

Factors for radio-caesium transfer from various types of soil into plants of the same type are characterised by a large variability. This property is apparent especially for natural forest ecosystems and agricultural pastures. The results of investigations in /DFI 06/ showed that the observed differences are determined by the vertical distribution of radio-caesium in the soil profile and by the amount of exchangeable radionuclides in the different layers of the soils.

4 Results of investigation

4.1 Results from literature research

A short summary of some basic literature will be reported in the following. Numerous relevant publications are included in Section 4.5 where the relationship between radio-caesium deposition on soil and radio-caesium concentration in agricultural products is evaluated.

In 2006, the International Atomic Energy Agency published its report “Environmental Consequences of the Chernobyl Accident and their Remediation: Twenty Years of Experience Radiological Assessment Reports Series /IAE 06/. This reference gave a comprehensive overview on the accident itself and the radioactive contamination of the agricultural, urban, forest and aquatic environment. The literature refers to environmental countermeasures and remediation, human exposure, radiation induced effects on plants and animals as well as the environmental and radioactive waste management aspects of the dismantling of the Chernobyl shelter. The focus lies on the three most affected countries (Belarus, the Russian Federation and Ukraine).

The data compiled and processed within the framework of the French-German Initiative /DFI 06/ represent the so far most comprehensive collection of electronic data that has ever been put together on the topic of the “Study of the radio ecological consequences of the Chernobyl accident”. The database provides a tool for the reconstruction of the dispersion of radionuclides through the ecosystem and food chains and for the interpretation and prediction of their long-term behaviour. This allows the development of effective countermeasures to minimise risks to human health and to improve the overall environmental situation.

The “Atlas of caesium deposition on Europe after the Chernobyl accident” /EEC 98/ represents the results of a project in the collaborative programme (Joint Study Project No. 6) in which numerous institutions in Belarus, Russia , Ukraine and the European Union collected and validated extensive data on the deposition of radioactive material on Europe resulting from the ChNPP accident. The Atlas as an authoritative reference provide a picture of the distribution pattern and was identified to be an indispensable

source of information for any appraisal of the radio-caesium concentration in agricultural products in case that no direct concentration data had been provided.

The NCRP Report No. 154 /NCR 06/ presents a very extensive view on the behaviour of Caesium 137 in the environment. This report is to provide a

- summary of general knowledge on the properties, geographic distribution, and sources of Cs 137 in the environment;

- site-specific description of releases, environmental levels, transport pathways, and specific issues relative to Cs 137 at three major DOE facilities;

- relative detailed treatment of the radioecology of Cs 137 in terrestrial and aquatic ecosystems, including biogeochemical transport mechanisms and transport modelling concepts; and

- brief summary of the more generic management issues, remediation techniques, and cost to benefit considerations of alternative strategies for lands contaminated with sufficient levels of Cs 137 to warrant concerns about public health and environmental quality

Beside an intensive study of existing literature, information upon the radio-caesium concentration in agricultural products had been gathered by means of a field mission and a bi-lingual electronic questionnaire (English / Russian) as foreseen (see below).

4.2 Results from field mission at border control point Frankfurt (Oder), Germany

According to Commission Regulation 1661/1999 /CEC 99/, the regulatory authority of the Land Brandenburg (Ministry of Rural Development, Environment and Customer Protection) has announced the main custom offices at Frankfurt (Oder) and Cottbus - Forst, both situated alongside trans-European east – west orientated highways to the Commission. Due to their geographic orientation to the eastern border of Germany, most of the consignments of mushrooms from Russia, Belarus and Ukraine need to be declared for free circulation in the EU at this border check points. Until III/2004, intensive control of consignments had been performed (see Figure 4-1). Afterwards, on the 1st of May 2004 - Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia joined the European Union, an event that needed an update

of the CR 1661/1999. In the new situation, the goods need to be declared at the outer border of the EC and no longer at , e.g. the custom office in Frankfurt (Oder), Germany. The necessary corrections, e.g. the updated list of custom offices or of third countries (CR 1635/2006, Annex II) became Annexes of the relevant Accession Treaty.

Since that time the new member states themselves were responsible for any control of mushrooms declared for free circulation (Article 1-1 CR 1661/1999)

> *Article 1-1*
> *Checks on the radio-caesium content referred to in Article 3 of Regulation (EEC) No 737/90 of products referred to in Article 1 of the same Regulation, to ensure that the maximum permitted levels laid down by the said Regulation are observed shall be carried out by the Member States in which the products are released for free circulation and at the latest at that time.*

Nevertheless, no control reports (neither about random or systematic sampling and analysis nor about checked export certificates) were available at the above mentioned Ministry in the Land Brandenburg for the period between III/2004 – IV/2006.

Based on CR 1635/2006, Article 1-1 (having the same wording as Article 1-1 of CR 1661/1999) and Article 1-3b, the Ministry of Rural Development, Environment and Customer Protection of the “Land” Brandenburg published an ordinance on the 1st of February 2007 and decided to continue the control of the mentioned products in Annex 1 of CR 1635/2006.

> *Article 1-3b*
> *(…) These products may only be declared for free circulation in the Member State of destination in a restricted number of customs offices. The list of customs offices shall be published in the Official Journal of the European Union, following notification by the Member States.*

Although it was foreseen to control just 10% of the consignments, the Office for Veterinary and Food control in Frankfurt (Oder) insisted on a sampling and analysis of 100 % of the goods declared for free circulation in Frankfurt (Oder). Clearance of release for free circulation is subject to the presentation of a certificate issued by the competent authorities responsible for controls. In addition, a sample from each load of a truck will be analysed by a screening measurement at the custom office. In case that the MPL

for radio-caesium is in compliance with CR 737/90, the product will be released for free circulation. In case that the measured value lead to any doubt about the certified maximum concentration as mentioned in the certificate (e.g. concentrations in the range of about 500 Bq/kg), the sample will undergo a second measurement at the Landesmessstelle of the Land Brandenburg for safety reasons. The consignment will be stopped at the border as long as the compliance with the MPL in CR 737/90 isn't assured. In case that a non-compliance with the MPL is detected, the goods will return to the country of origin.

During a field mission in Frankfurt (Oder) and discussion with the head of the Office for Veterinary and Food control in Frankfurt (Oder), GRS was able to get deep insight into the routine work of staff at the customs office.

- Equipment and scientific knowledge as well as quality assurance of the used measurement principal match to the field of application (screening measurement of sampled fresh / dried / preserved mushrooms)

Nevertheless, some thought-provoking discrepancies to established practices of sampling or even the CR 1635/2006 were observed:

- The sampling of fresh mushrooms include just the last (or the last three) rows of baskets in the rear part of the truck. As this is a regularly procedure, its own the risk that less contaminated products might be placed in the rear part of the truck to avoid a detected non-compliance. Random sampling from the entire truck load is hardly possible due to the character of the product but should be foreseen from time to time. For mushrooms delivered in cans or barrels with brine, sampling will be done at any point of the load randomly.

- Several certificates where found with gross-concentration of Cs-137 plus Cs-134. Although the majority of the concentration is on Cs-137, this may lead to some confusion.

- In addition to the Cs-137 concentration, Sr-90 concentration was determined and certified.

- Some certificates where found with unusual low detection limits / small errors.

- The certified concentrations are (in most cases) not accompanied by any information about the status of preservation of the sample, i.e. had a sample of mushrooms in brine been measured with brine or without?

- Some certificates presented for free circulation are not in compliance with the export certificates as given in Annex III of CR 1635/2006. This included discrepancies in the language (like Russian only) as well as the format and structure of the certificate. It is doubtful whether each officer at the custom control is able to read Russian.

- Required stamps and signatures are missing from time to time.

- In some cases, dates of signature by certain authorities are too narrow aside (hard to understand how to obtain several signatures and the results of the analysis in such a short time) or differ by more than 10 – 12 days (hard to understand why a sensitive consignment like fresh mushrooms like chanterelle is stored for such a long time). As we are still not too familiar with the daily work of exporters, no conclusions can be drawn based on our opinion that requires confirmation at the site in the third country.

- No information about neither the competent authority in the country of origin nor the accredited laboratory is available at the customs office. No details concerning the authorities authorised in the third countries in question to issue export certificates will be checked at the border control.

To conclude, it needs to be mentioned that finally the decision of the Office for Veterinary and Food control in Frankfurt (Oder) to sample and analysis 100% of the presented products obviously was right, as compliance with CR 737/90 is not just a question of a presented certificate. Some small adjustments will be necessary to improve the sampling of products from a consignment without making the entire procedure too complicated.

A comprehensive overview on controlled consignments of mushrooms from Eastern-Europe third countries was provided by the Ministry of Rural Development, Environment and Customer Protection, Land Brandenburg, Germany (see Annex 2 for raw data) for the custom control office of Frankfurt (Oder) (Figure 4-1). Two conclusions might be drawn:

- The fraction of former EU member states countries (especially Poland) was dominant and dropped out after these countries joined the EU.

- Till 2004, the given form of the export certificate wasn't followed strictly but turns to be significantly better after 2006.

At the custom control office in Frankfurt (Oder), Germany, about 250 export certificates according CR 1635/2006 were evaluated. The results of the statistical analysis of the data from the certificates are given in the country reports for Russia, Belarus and Ukraine. The measuring results demonstrate, that in general the concentration of radio-caesium is below the MPL. Nevertheless, especially in Ukraine and Belarus, higher values could be observed.

The names of Governmental Authorities, laboratories and traders which were extracted from the certificates are listed in Annex 1.

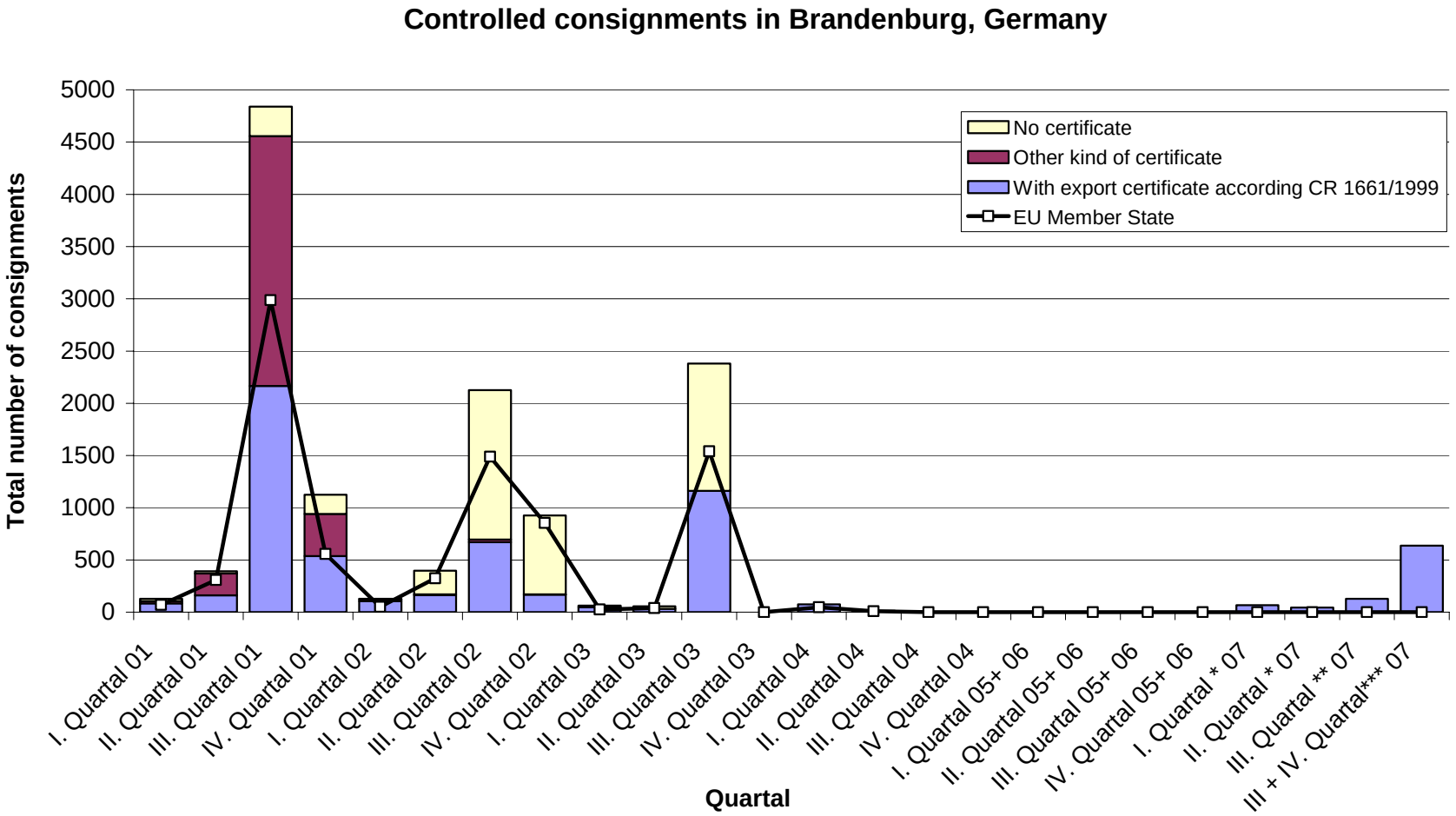


Figure 4-1: Controlled samples of edible mushrooms from Eastern-Europe at the border control point Frankfurt (Oder) (Majority) , Spree- Neiße and Cottbus-Forst in the Land Brandenburg (Germany) in 2001 -2007; * = Data from evaluated export certificates controlled at Frankfurt (Oder) ** Data until 10. 08. 07. * Data until 29.11.2007. No Monitoring between III/2004 – I/2007**

4.3 Results from the evaluation of the Rapid Alert System for Food and Feed (RASFF)

To get a first overview upon the volume of unauthorised trade of products, the annual reports (2004 / 2005 / 2006) of the DG-Health and Consumer Protection operated RASFF had been studied.

To get a better insight into the development of the number of notification, an analysis of trends in hazards notified through the RASFF was done in 2006, looking retrospectively at the year 2001. In none of these years, the number of notifications referring to the topic “radiation” (that means both, irradiation and contamination, but only the latter is of relevance for this project) exceeds a total of 10 notifications and therefore a statistical conclusion was rejected /RAS 07a/.

According to /RAS 07b/ 85 notifications on radioactivity in agricultural products were recorded since 1986, thereof 20 notifications in recent years from 2003 to 2007. The most notifications of 78 concerned mushrooms. Further 3 concerned blueberries and 4 times wild game. The annual notifications between 2003 and 2007 were as follows.

2003

In 2003, 6 notifications were received by DG SANCO, 4 from Germany and 2 from Spain. 3 notifications concerned wild boar meat with exceeded MPL. It was detected during market controls in Germany. The origin of this wild boar meat was Germany itself. Further 3 notifications were reported concerning mushrooms from which 1 consignment originated from Eastern Europe and 2 consignments from Bulgaria.

2004

In 2004 two notifications – both border rejections - were issued by Spain and France concerning mushrooms. Both consignments originated from Bulgaria.

2005

In 2005, a total number of 4 notifications (2 border rejections, 2 alerts) were issued by Italy, Spain, UK and Germany. 3 notifications concerned mushrooms, from which 1 alert was notified by Germany originating from Poland. 2 border rejections were notified by Spain originating from Romania and notified by Italy from Bosnia and Herzegovina. 1 notification on blueberries from Ukraine was notified by UK by alert market control. It

should be noticed that a counter analyses by Romania was favourable and the product was released on the market.

2006

6 notifications, all of them border rejections, were issued in 2006. 5 notifications were issued by Spain concerning dried mushrooms (Cantharellus) from Bulgaria. 1 notification was given by Latvia concerning blueberries originating from Ukraine.
It should be noted that the responsible Bulgarian Authority reported on the falsification of laboratory reports. The mushrooms were not tested in Bulgaria by authorized laboratories.

2007

Till 15th of October 2007, just two notifications were received by DG-SANCO, again concerning consignments with mushrooms. France and Germany reported each one consignment, one from Ukraine and one from Russia. The MPL were exceeded by a factor of about 2.

It is remarkable that one consignment had been controlled and found to be non-compliant by own checks carried out by a French distributor but had been released for free circulation within the EU already using an export certificate dated 07.08.2006. The product was a consignment of frozen mushrooms (Cantharellus) best before 01.05.2008.

This will raise the question whether a certification in the country of origin at a certain date automatically implies that the product is ready for immediate export. In case that the product had been released for free circulation in the EU market already in 2006, it obviously passed the border control (probably Frankfurt (Oder) as the product had been dispatched by a German company) without being controlled in detail. As already mentioned together with the results from the field mission at the border control in Frankfurt, during the time period III/2004 – IV/2006 no control of compliance with CR 737/90 according CR 1661/1999 were performed. The above mentioned notification with exceeded MPL by a factor of 2 underpins the importance of such a control mechanism. In addition, it is thought-provoking that both, the French as well as the German notification mentioned the same import company from Germany.

The following levels of radio-caesium contamination in the above described notifications on radioactivity in agricultural products were measured:

- **In 2003**
    - Mushrooms from Bulgaria: 5,710 Bq/kg and 1,910 Bq/kg, respectively
    - Mushrooms from Easter Europe: 685 Bq/kg
    - Wild boar meat from Germany: 1,247 Bq/kg, 1,118 Bq/kg and 1,080 Bq/kg, respectively
- **In 2004**
    - Mushrooms from Bulgaria: 1,610 Bq/kg and 628 Bq/kg, respectively
- **In 2005**
    - Mushrooms from Romania: 654 Bq/kg
    - Mushrooms from Bosnia and Herzegovina: 744 Bq/kg
    - Mushrooms from Poland: 662 Bq/kg
    - Blueberries from Ukraine: 1,942 Bq/kg
- **In 2006**
    - Mushrooms from Bulgaria: 8,210 Bq/kg, 3,900 Bq/kg, 2,590 Bq/kg, 2,310 Bq/kg and 2,040 Bq/kg, respectively (all notifications concerned dried mushrooms according to RASFF weekly reports on Week 2006/4, Week 2006/12, Week 2006/26)
    - Blueberries from Ukraine: 730 Bq/kg

- **In 2007**

    - Mushrooms from Ukraine: 1,320 Bq/kg

    - Mushrooms from Russian Federation: 1,400 Bq/kg

The evaluation of RASFF notifications indicate that some agricultural products still own a potential to exceed the MPL as given in CR 737/90.

- The product “mushroom” in any way of preservation or not was reported at the most to exceed the MPL.

- Berries and products thereof from the Genus *Vaccinium* had been reported to be not in compliance with the MPL.

- Some case of non-compliance with CR 737/90 had been reported for meat of wild boar whereby the origin of this product was Germany. The distribution pattern in Belarus, Russia and Ukraine show much higher caesium deposition on the ground, and without doubt this product should remain on the list of products that need to comply with CR 737/90.

There is a tendency for decreasing number of notifications with respect to the level of radioactive caesium contamination of foodstuffs. It should be noted that the 5 notifications on mushrooms in 2006 concerned dried mushrooms only and, if carrying out a recalculation of the measured Cs 137 activity to the fresh weight (according to CR 616/2000) by means of a drying factor of 7 only one sample would have had exceeded the MPL.

4.4 Results from questionnaires

The questionnaire had been designed and sent to contacts for each country by ordinary mail, fax or email, requesting the information listed in Section 3.4.4. Where possible, policy makers/regulators were contacted by telephone, prior to sending an e-mail, as it was felt that this would encourage a swifter and more focussed response. By the same reason, a personal contact as foreseen in case that no response had been received after a period of time, had been realised. Returned questionnaires were filled directly into a MS Excel spreadsheet by the addressee or in the document format. Ex-

tracts of the EC regulations and copies of the relevant annexes were send as an enclosure.

Consecutively, basic findings of our research will be presented, separated by the third countries according to Annex II of CR 1635/2006. If available, a summary of the returned questionnaires is given.

Albania

No questionnaire was returned from Albania.

No information about the distribution pattern of radio-caesium in Albania are available from the „Atlas of Cs deposition on Europe after the Chernobyl accident" issued by DG Research, JRC /EEC 98/. Nevertheless, if fitting the contamination pattern between Romania and Greek, the maximum level of Cs 137 on soil can roughly estimated as less than 10 kBq/m^2 for Albania.

This comparably low contamination level which is assumed for Albania lead to the conclusion that only for wild boar meat a small likelihood is given to exceed the MPL of 600 Bq/kg.

Republic of Belarus

The initial distribution patterns for radio-caesium are shown in Figure 4-2. Initial deposition need to be multiplied by a factor of 0.63 (0.0007) to get the recent Cs-137 (Cs-134) deposition on the ground corrected by radioactive decay.

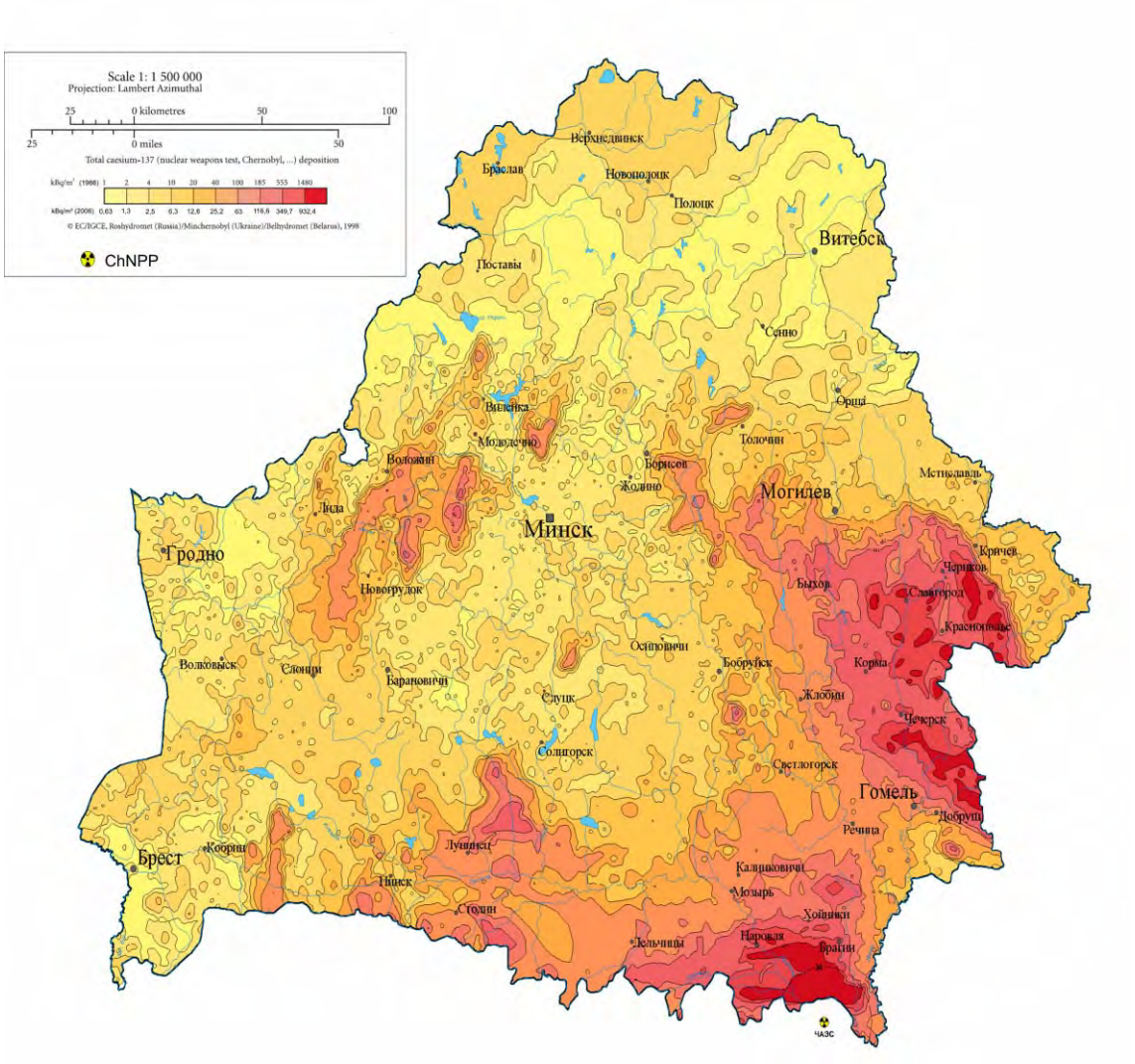


Figure 4-2: Total Cs-137 deposition on the territory of Belarus (nuclear weapon-test fallout and ChNPP accident) /after EC 98/

The evaluations of export certificates indicate that a small number of producers (13) deal will exports of mushrooms to the EU. The values as given in the export certificate were used to display the frequency distribution of certain concentrations of radio-caesium in mushrooms exported to the EU (Figure 4-3).

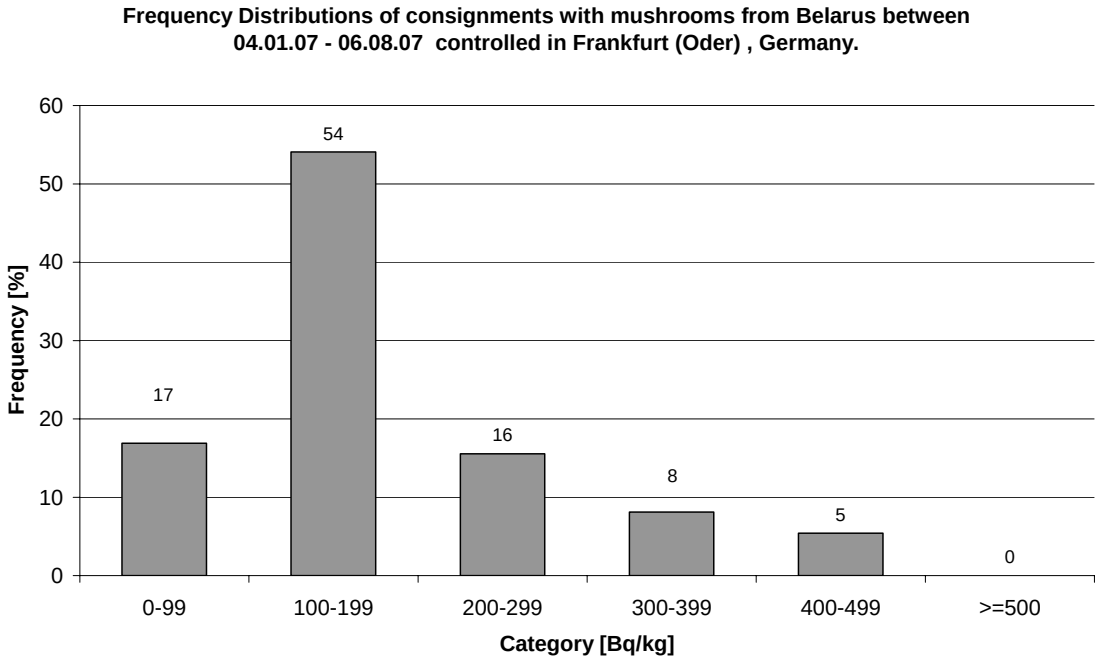


Figure 4-3: Frequency distribution of radio-caesium content in mushrooms from Belarus (148 samples, total of 1236.5 tons)

It should be mentioned that the high-season for mushroom - export is not included in the diagram above. Nevertheless, until 29.11.2007 no consignments with enhanced level of radioactivity above the MPL were detected at checkpoint Frankfurt (Oder), Germany.

Compared to the overall reaction of third countries upon the request to give some information by questionnaires, the response from Belarus was less reserved. We received 4 replies out of 47 contacted addresses.

One **producer** replied to the questionnaire. The main countries of destination for export are Austria, Belgium, France, Germany, Italy, Netherlands and Poland. Although no proves could be made, the re-shipment of such consignments via dispatchers is highly probable.

The total export volume just by this company amounts to 1.000 Mg (1.000 tons). The company explained that the CR 737/90 is applicable to this total amount and that they requested for a certificate of compliance with CR 737/90 for each of this consignments. In addition, an export certificate according CR 1635/2006 is applied for regarding any

consignment of non-cultivated mushrooms. In no case even in the past, the consignments of this company had been rejected at the border control point

Regarding the steps in scheme of sampling, analysis and certification, the company informed us that

a) The competent authority will obtain the physical sampling of the consignment

b) The competent authority will care for the submission of the sample to the laboratory

As the company requested for in total 43 in 2006 (total number in 2005: 56) certificates according CR 1661/21999, it is hard to believe that a competent authority will do so even for one company (please mind that 13 companies in Belarus exporting mushrooms had been identified from certificates already).

No information about the origin (region, district or even country) will be submitted to the laboratory.

No information was provided regarding an identification check of the consignment foreseen for export.

No information were provided regarding actions established to ensure that the certified consignment equals to the consignment from which samples were taken to approve conformity with the MPL in CR 737/90.

The minimum quantity limit that triggers the exporter to request for an export certificate is 10 kg, in compliance with EU regulation CR 1635/2006.

Three **laboratories** replied to the request:

1) Radiation monitoring laboratory of the State supervision over radiation contamination with the “Centre of standardisation, measurements and certification in Grodno

2) Radiation monitoring laboratory of the State supervision over radiation contamination with the “Centre of standardisation, measurements and certification in Gomel

3) Research Department of Radiative Metrology (RDRM) Belarusian State Institute of Metrology (BelGIM)

Competent national body in terms of accrediting a laboratory to issue / undersign export certificates according CR 1635/2006 is GOSSTANDART. The scope of the accreditation of the laboratories is ISO 17025 (Determination of radionuclide contents in environmental samples (aerosols, precipitations, surface water, groundwater, soil, grass, food, various environmental samples).

Clients that request the analysis of radio-caesium in agricultural products include individuals, private companies (producers), state owned companies (producers), traders, brokers, distributors, non-governmental authorities and the competent authorities themselves. Export and Import control seems to be the major field of work for these laboratories, including national control of foodstuffs with respect to consumer protection.

All the laboratories implemented a quality assurance system according ISO 9001:2000.

Regarding the steps in scheme of sampling, analysis and certification, the laboratories informed us that:

a) The sampling from consignments with mushrooms will be supervised by experts from the laboratory and attended by the exporter

b) The sampling follows a written procedure, either a separate document or part of the QA system and will be documented for routine.

c) No replicate sampling to gain a reference sample be performed

d) precautions are prescribed to avoid any change in composition of the sample

e) The submission of the sample lies in the responsibility of the laboratory or even the competent authority and will take below one day (1 – 3 h to 1 day)

In opposite what the producer mentioned that information about the origin of the goods will be given together with the sample.

Once the sample had been registered at the laboratory, sample preparation according a written description (either a separate document or part of the QA manual) whereby each food sample is handled in the same way.

The analysis of the radio-caesium activity concentration is done by NaI-scintillation crystal gamma spectrometer (plus HPGe-Gamma spectrometry in one case). The measurement range of the routine measurement method is about 2 – 10^5 (10^6) Bq/kg (Bq/l). No information was given on the detection limit itself. The total time for the sample analysis of a consignment is about 1 – 6 h.

The analysis need to be paid by a fee in the order of 90 $ (the answer about the fee rate was facultative and provided by one laboratory). Each of the laboratories will attend some periodic inter-comparison measurement.

The following agricultural products were observed to exceed the maximum permitted level for radio-caesium according CR 737/90 in 2005 or 2006:

Table 4-1: Agricultural products from Belarus with exceeded MPL for radio-caesium in 2005 / 2006

CN-CODE	DESCRIPTION	
CHAPTER 7	EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS	
0709 59 0711 59 00 0712 39 00	Dried, fresh or provisionally preserved mushrooms, other than cultivated mushrooms	**yes**
CHAPTER 8	EDIBLE FRUIT AND NUTS; PEEL OF CITRUS FRUIT OR MELONS	
0810 40 0811 90 50 0811 90 70 0812 90 40	Cranberries, bilberries and other fruits of the genus *Vaccinium*, fresh, frozen, cooked, provisionally preserved	**yes**
CHAPTER 20	Preparations of vegetables, fruit, nuts or other parts of plants	
2001 90 50 2003 90 00	Mushrooms, prepared or preserved by vinegar or acetic acid or otherwise, other than cultivated mushrooms	**yes**

The descriptions of product in the questionnaire did not enable the laboratories to distinguish according to a most detailed selection of the list of CN- codes. Therefore any possible CN-codes were mentioned.

The total number of requests for export certificates for consignments of mushrooms intended for export that the laboratories received in 2005 and/or 2006 is given in Table 4-2:

Table 4-2: Total number of requested and issued export certificates from Belarusian laboratories in 2005 and 2006

Laboratory	Year 2005	Year 2006
Radiation monitoring laboratory of the State supervision over radiation contamination with the "Centre of standardisation, measurements and certification in Grodno	481	532
Radiation monitoring laboratory of the State supervision over radiation contamination with the "Centre of standardisation, measurements and certification in Gomel	No information	No information
Research Department of Radiative Metrology (RDRM) Belarusian State Institute of Metrology (BelGIM)	394	484
Total sum	**875**	**1,016**

The above mentioned number equals to the number of issued certificates.

It is remarkable that this number per year is far higher than the total number of export certificates (Russia, Belarus and Ukraine) presented at the custom control office of Frankfurt (Oder), Germany, which is believed to play the major role regarding presentation of certificates and release of agricultural products with origin from third countries for free circulation in the EU. Either other ways of transportation had been overseen or not all of these certificates will be used for export / free release for circulation to the EU.

For some other products, exports certificates "according" CR 1661/1999 (CR 1635/2006) were requested: Cherries, edible snail meat (215,148 kg) and edible snails

shell (38,540 kg). Unfortunately, no information was provided about the concentration of radio-caesium for these products.

According to /NCR 07/ in Belarus lower limits for domestic trade with agricultural products exist compared to the corresponding EU limits (Table 4-3).

Table 4-3: Comparison of the maximum radio-caesium limits for domestic trade in Belarus to the corresponding EU limits

Food item	European Community (1986)	Belarus (2001)
Milk	370	100
Infant food	370	37
Dairy products	370	50 - 200
Meat	600	180 - 500
Fish	600	150
Vegetables, fruits etc.	600	40 - 100
Bread, cereals	600	40 - 60

Bosnia and Herzegovina

No questionnaires were returned from Bosnia and Herzegovina.

No information about the distribution pattern of radio-caesium in Bosnia and Herzegovina are available from the „Atlas of Cs deposition on Europe after the Chernobyl accident" issued by DG-Research, JRC /EEC 98/. Nevertheless, if fitting the contamination pattern between Romania and Greek the maximum level of Cs 137 on soil can roughly estimated as less than 20 kBq/m^2 for Bosnia & Herzegovina (Figure 4-4).

Figure 4-4: Total Cs-137 deposition in neighbouring countries to Bosnia and Herzegovina (nuclear weapon-test fallout and ChNPP accident) /EEC 98/

This assumed maximum contamination level of 20 kBq/m^2 for Bosnia and Herzegovina leads to the conclusion that only for wild boar and deer meat as well as for mushrooms the excess of MPL can not be excluded. According to the mentioned RASFF notifications reported by DG SANCO /RAS 07b/ in one mushroom sample from Bosnia and Herzegovina a Cs 137-activity of 744 Bq/kg was measured in 2005.

Croatia

No questionnaires were returned from Croatia.

The initial distribution pattern for radio-caesium on the territory of Croatia (1998) is shown in Figure 4-5. It can be shown from this Figure that in the north eastern part of Croatia close to the border to Austria some spots of radio-caesium activities exist with a contamination level of more than 40 kBq/m^2. Therefore the potential for radio-caesium activities above the MPL´s is given for a couple of the concerning foodstuffs.

Figure 4-5: Total Cs-137 deposition on the territory of Croatia (nuclear weapon-test fallout and ChNPP accident) /EEC 98/

Liechtenstein

Tasks related to radiation protection and food / consumer protection regarding radioactive contamination are shared with the Swiss regulatory body, the Bundesamt fuer Gesundheit (BAG). See the report of Switzerland for more details.

No information about the distribution pattern of radio-caesium are available from the „Atlas of Cs deposition on Europe after the Chernobyl accident" issued by DG-Research, JRC /EEC 98/. Nevertheless, the average and maximum levels of deposition can be taken from the adjacent areas of Switzerland (see Figure 4-13), i.e. the initial contamination level was between 1 kBq/m^2 and <10 kBq/m^2.

Former Yugoslav Republic of Macedonia

No questionnaires were returned from Former Yugoslav Republic of Macedonia.

Figure 4-6: Total Cs-137 deposition on the territory of the Former Yugoslav Republic of Macedonia (nuclear weapon-test fallout and ChNPP accident) /EEC 98/

No information about the distribution pattern of radio-caesium are available for the Former Yugoslav Republic of Macedonia from the „Atlas of Cs deposition on Europe after the Chernobyl accident" issued by DG-Research, JRC /EEC 98/. Nevertheless, if fitting the contamination pattern between Romania and Greek the maximum level of Cs 137 on soil can roughly estimated to be less than 40 kBq/m^2 for the Former Yugoslav Republic of Macedonia, whereas activity hotspots above 40 kBq/m^2 can not be excluded (Figure 4-6).

Moldova

No questionnaires were returned from Moldova.

The initial distribution pattern for radio-caesium on the territory of Moldova (1998) is shown in Figure 4-7 which demonstrates a relatively uniform distribution pattern of initial radio-ceasium contamination within the range of 10 kBq/m^2 – 40 kBq/m^2 in the northern part and between 2 kBq/m^2 – 10 kBq/m^2 in the southern part.

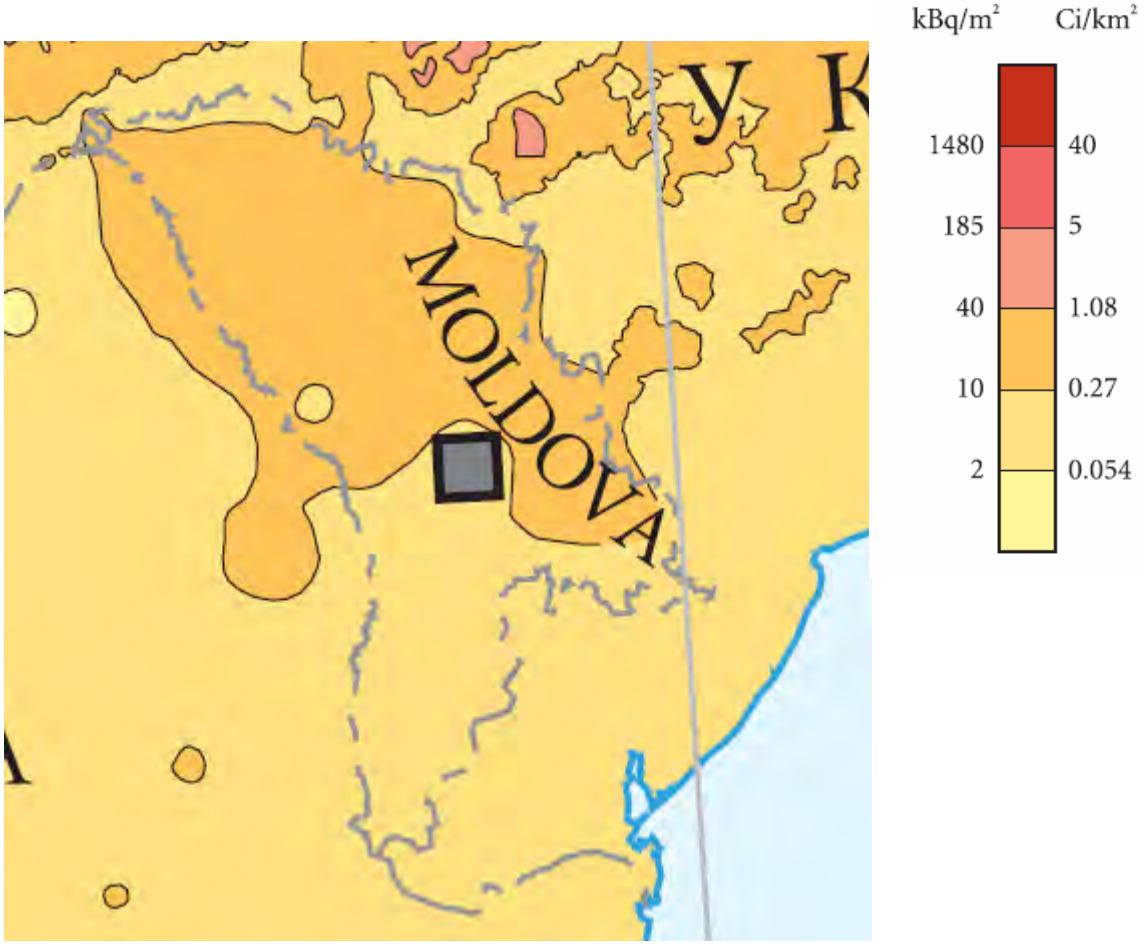


Figure 4-7: Total Cs-137 deposition on the territory of Moldava (nuclear weapon-test fallout and ChNPP accident) /EEC 98/

According to the outcome of a meeting between the Moldavian Minister of Agriculture and Food Industry and the Ministers of Agriculture and Food of the United Kindom and of Norhtern Ireland regarding the support in agricultural goods exports extending on the European Union market the effort will be centered especially on eggs export. Recently, the Moldavian export of agricultural products concerns especially fruits, honey and wine /MAI 07/.

Montenegro

No questionnaires were returned from Montenegro.

No information about the distribution pattern of radio-caesium on the territory of Montenegro are available from the „Atlas of Cs deposition on Europe after the Chernobyl accident" issued by DG-Research, JRC /EEC 98/. Nevertheless, when fitting the contamination pattern between Romania and Greek the maximum level of Cs 137 on soil can roughly estimated to be less than 40 kBq/m^2 for Montenegro Figure 4-6.

Norway

The initial distribution pattern for radio-caesium on the territory of Norway (1998) is shown in Figure 4-8. As heavy rainfall occurred during the passage of the radioactive cloud across Middle Norway, most of the activity had been deposited in this area. Some emergency measures had been implemented within the first year after the ChnNPP-Accident (addiction of consumption of product from most affected regions).

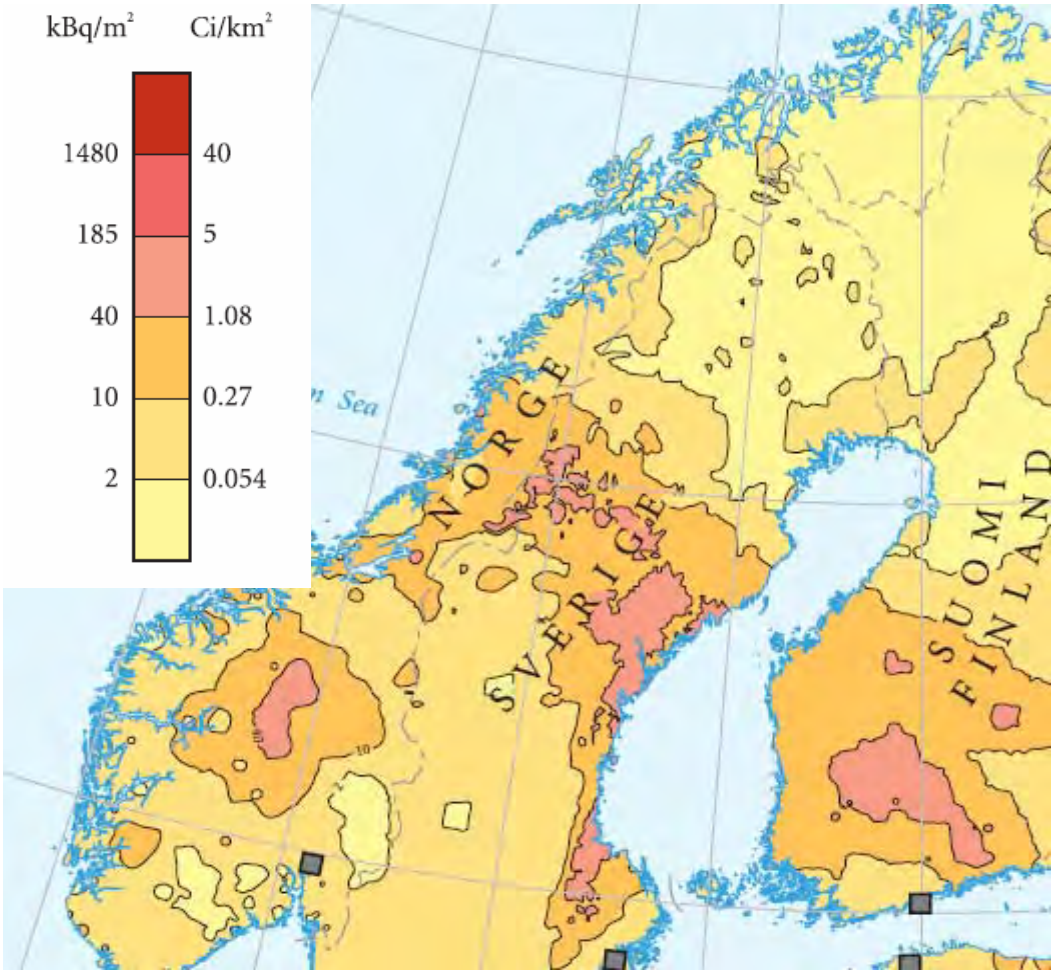


Figure 4-8: Total Cs-137 deposition on the territory of Norway (nuclear weapon-test fallout and ChNPP accident) /EEC 98/

Norway submitted one questionnaire to GRS filled in by the competent governmental Authority (Norwegian Food Safety Authority - FSA). The headquarter of the FSA is situated in Brumunddal and further 8 subsidiaries are spreaded over the territory.

According to the information given by this Authority, no system for accreditation of laboratories which are carrying out radioactivity measurements in environmental samples exists in Norway. Training of relevant personnel is provided by the Norwegian Radiation Protection Authority. Nevertheless, modern QA standards exist for laboratories carrying out radioactivity measurements. These laboratories are partners of the so called “LORAKON” system, a nationwide network of stations for local monitoring of radioactivity in drinking water and food. It was established by the Norwegian Radiation Protection Authority, the Norwegian Food Control Authority and the Norwegian Ministry

of Health already in 1963. Recently, 49 subordinated regional sevices and laboratories exist within the LORAKON system. A planned renewal will reduce this number to 20.

The nation-wide food and feed monitoring and countermeasure programmes are carried out or organised by the Norwegian Food Safety Authorities and their subordered regional services. Information regarding monitoring progammes of environmental radioactivity are provided by the FSA´s to the Radiation Protection Authority by summer supervision. Three annual reports covering the pasture season, one of them is entitled as “Radioactive contamination in rough grazing animals”.

Countermeasures to reduce the content of radioactive caesium had been carried out according to requirements of the FSA´s e.g. for alternative feeding of sheep with high level radioactivity by pre-slaughter measures. Random sampling and measurements are carried out after the period of alternative feeding. Control measurements of reindeer are allways carried out before slaughtering.

In Norway a couple of relevant national regulations covering radioactive contamination exist from which the following should be highlighted.

- Regulation on zone division in connection with alternative feeding caused by radioactivity (*Forskrift om soneinndeling i forbindelse med nedforing pga radioaktivitet*), FOR 2005-06-25 No. 693.
- Instruction on the meat inspection’s examination of radioactive substances in meat (*Instruks for kjøttkontrollens undersøkelse av radioaktive stoffer i kjøtt)*, adopted 4 September 1997, last amended 20 July 1999 No. 1999.
- Regulation on meat inspection and placing on the market of meat (*Forskrift om kjøttkontroll og omsetning mv av ferskt kjøtt*), FOR 1994-04-25 No. 320, as amended.
- Regulation on prohibition of placing on the market for mushrooms with high level of radioactive Caesium (*Forskrift om omsetningsforbud for sopp med høyt innhold av radioaktivt cesium*), FOR 2000-05-26 No. 550

The following regulations are directed towards the control of imports, exports and trade of agricultural products.

- Regulation on meat inspection and placing on the market of meat (*Forskrift om kjøttkontroll og omsetning mv av ferskt kjøtt*), FOR 1994-04-25 No. 320, as amended.

- Regulation on supervision and control of import and export of food and foodstuffs of animal origin within EEA, and of non-animal foodstuffs from third contries (*Forskrift om tilsyn og kontroll ved import og eksport av næringsmidler og av produkter av animalsk opprinnelse innen EØS, og av ikke-animalske næringsmidler fra tredjeland*), FOR 1998-12-23 No. 1471.

- Regulation on supervision and control of import and transit etc. of animal foodstuffs and products of animal origin etc. from third contries (*Forskrift om tilsyn og kontroll ved import og transit mv. av animalske næringsmidler og produkter av animalsk opprinnelse mv. fra tredjeland*), FOR 1999-10-18 No. 1163.

- Instruction on the supervision and control of import and transit etc. of animal foodstuffs and products of animal origin etc. from third contries (*Instruks for tilsyn og kontroll ved import og transit mv. av animalske næringsmidler og produkter av animalsk opprinnelse mv. fra tredjeland*), dated 1999-10.27 No. 1166.

The following national MPL´s of radio-caesium had been established in Norway for agricultural products (according to FSA questionnaire) These values are still valid for domestic trade:

General foodstuffs:	600 Bq / kg
Milk and baby food:	370 Bq / kg
Meat of reindeer and freshwater fish:	3,000 Bq/ kg
Milk for brown cheese production:	50 Bq / kg

The success of alternative feeding of goats from highly contaminated areas by means of the feed additive Berlins blue as a countermeasure to reduce the content of radioactive caesium in goats milk is demonstrated in Figure 4-9 and Figure 4-10, taken from the last summer report No 1 from 20 July 2007 /NRP 07/.

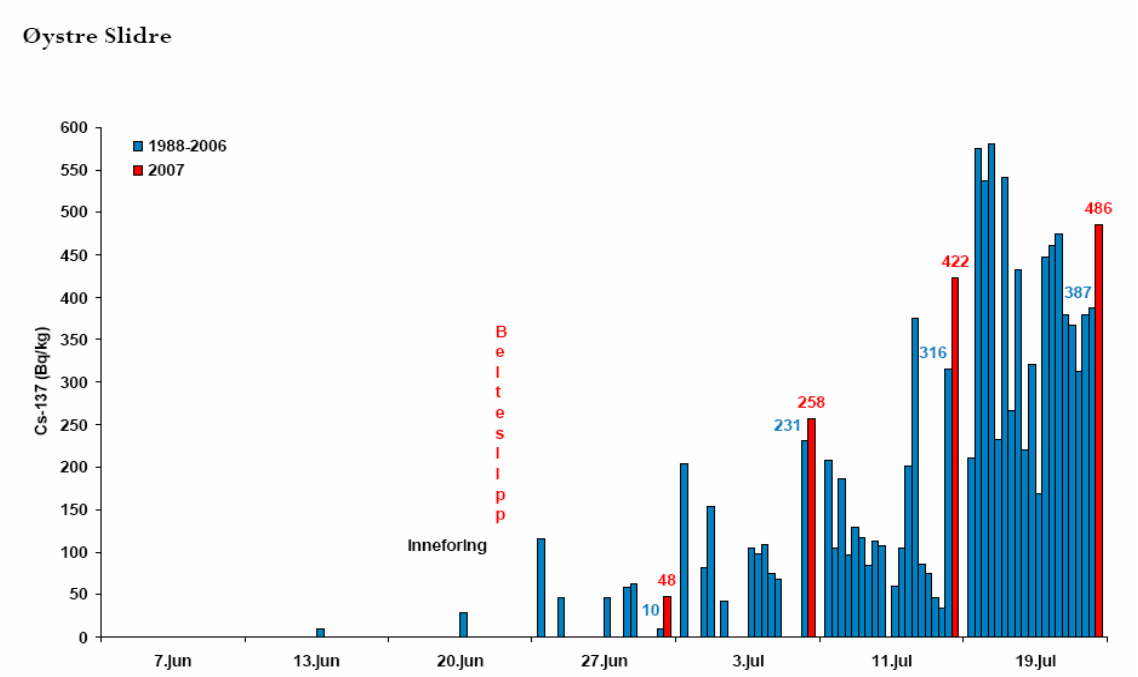


Figure 4-9: Cs 137-concentration in goats milk from Oyster region without caesium binding feed additives

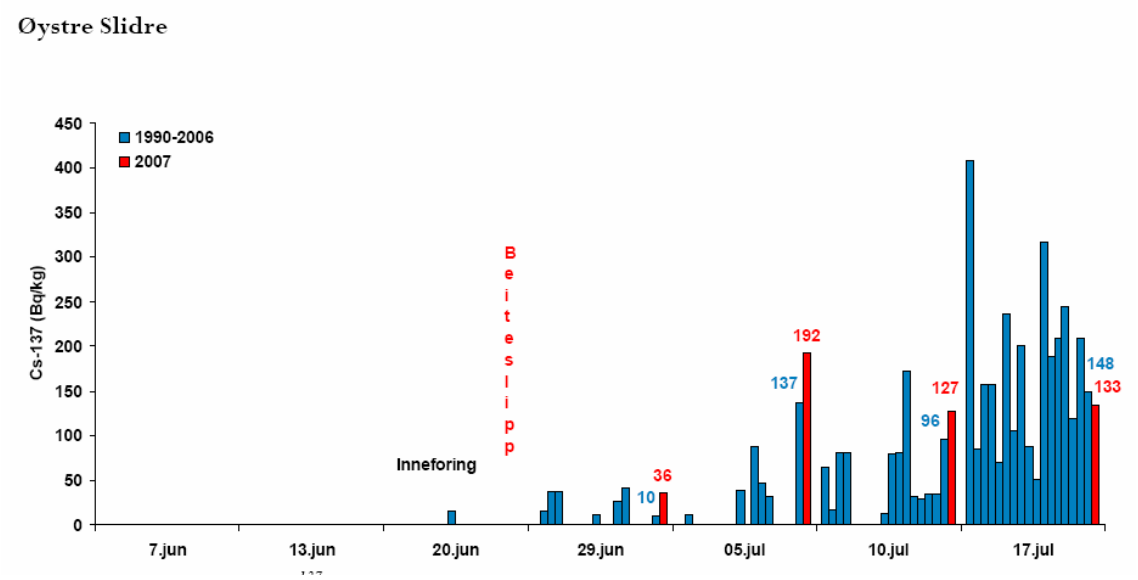


Figure 4-10: Cs 137-concentration in goats milk from Oyster region by means of the caesium binding feed additive Berlin blue

Random sampling of living sheep in September 2007 in the region of Hedmark and Oppland (inner, middle Norway), and of Troendelag and Moere and Romsdal gives result up to 3,046 Bq/kg. These are the two heaviest inflicted regions.

The following examples of Cs 137-measurements of meat from slaughtered animals were given by FSA:

Random sampling of meat from sheep from a local slaughterhouse in Trøndelag in autumn 2004 showed a lowest value of <50 Bq/kg and a maximum of 760 Bq/kg.

Random sampling of meat from cattle from a local slaughterhouse in the Oslofjord-region in December 2006 with lowest value of <10 Bq/kg and highest value of 55 Bq/kg.

In Hallingdal, situated in southern inner Norway, 100 samples of meat from sheep were taken in autumn 2007, out of which 99 samples contained < 600 Bq/kg, one (from Øystre Slidre) 666 Bq/kg. In 6 samples from meat of cattle the Cs 137-concentration was always < 600 Bq/kg.

The Cs 137-contamination of meat from sheep slaughtered at Rudshøgda (inner, middle Norway, the slaughterhouse covers a large area) was as follows. 75 000 sheep had been slaughtered, out of which 117 samples of meat were taken from them. 34 of which originating from animals ordered at alternative feeding before slaughter, with the result that 3 of which contained more than 600 Bq/kg but less than 1,000 Bq/kg. 83 samples were taken from animals originating from free zones, only one of which contained more than 600 Bq/kg (742 Bq/kg).

Results from freshwater fish are only available for the Finnmark region in northern Norway /ANO 05/. This area was only slightly influenced by radio-caesium deposition from the ChNPP accident (mean deposition less than 2 kBq/m^2, and maximum deposition less than 10 kBq/m^2). Nevertheless, the maximum Cs 137-concentration in predatory freshwater fish from the Finnmark region amounted in 2004 up to 65 Bq/kg. If keeping in mind that the radio--caesium deposition in middle Norway was between 40 kBq/m^2 and 185 kBq/m^2, i.e. 2 to 3 orders of magnitude higher compared to the Finnmark region, an excess of the MPL can also recently not be excluded.

Average radio-caesium concentration in selected agricultural products are given in Table 4-4.

Table 4-4: Average radio-caesium concentration in selected agricultural products as reported by Norway (results from Norwegian Radiation Protection Authority)

Section 1	**Live animals; animals products**	
CHAPTER 1	LIVE ANIMALS	**-** Bq / kg
CHAPTER 2	MEAT AND EDIBLE MEAT OFFAL	**100** Bq / kg[1] 70 Bq / kg[2] 40 Bq / kg[3]
EX CHAPTER 4	Dairy products; birds' eggs; natural honey; edible products of animal origin,	**70** Bq / kg[4]
Section 2	**Vegetable products**	
CHAPTER 7	EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS	**-** Bq / kg
	fresh or provisionally preserved mushrooms, other than cultivated mushrooms;	**80** Bq / kg
CHAPTER 8	EDIBLE FRUIT AND NUTS; PEEL OF CITRUS FRUIT OR MELONS	**-** Bq / kg
	Cranberries, bilberries and other fruits of the genus *Vaccinium*, fresh, frozen, cooked, provisionally preserved	**-** Bq / kg
Section 4	**Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes**	
CHAPTER 16	PREPARATIONS OF MEAT, OF FISH OR OF CRUSTACEANS, MOLLUSCS OR OTHER AQUATIC INVERTEBRATES	**-** Bq / kg
CHAPTER 20	PREPARATIONS OF VEGETABLES, FRUIT, NUTS OR OTHER PARTS OFPLANTS	- Bq / kg
	Mushrooms, prepared or preserved by vinegar or acetic acid or otherwise, other than cultivated mushrooms	- Bq / kg
Other products	Honey	**190** Bq / kg

[1] moose [2] roedeer [3] hart [4] goat´s cheese

No other products had been identified, exceeding the MPL as given in CR 737/90.

Russian Federation

No questionnaires were returned from Russia.

The evaluation of data on radio-caesium contamination of agricultural products could only be made on the basis of measurements of mushrooms at the German border control station in Frankfurt/O., view findings from the Alert System of DG Sanco and especially from calculation of Cs 137-concentration in agricultural products by means of maps of Cs 137 contamination pattern.

Contrary, no information was obtained by questionnaires. In total, 41 questionnaires were dispatched by mail or e-mail, 13 of them to laboratories and producers each and 15 sheets to governmental organisations and NGOs. No filled in questionnaires came back. A reason for this unexpected result could be the recently political disaccord in trade between Russia and EU, especially Poland, where the agricultural sector is preferentially concerned.

According to /NCR 07/ in the Russian Federation lower limits for domestic trade with agricultural products exist compared to the corresponding EU limits (see Table 4-5)

Table 4-5: Comparison of the maximum radio-caesium limits for domestic trade in Russia to the corresponding EU limits

Food item	European Community (1986)	Russian Federeation (1999)
Milk	370	100
Infant food	370	40 - 60
Dairy products	370	100 - 500
Meat	600	160
Fish	600	130
Vegetables, fruits etc.	600	40 - 120
Bread, cereals	600	40

The given values in Russia (1998) are applied in the four regions which were mostly contaminated by the Chernobyl accident as can be seen from the following Figure 4-11. It should be kept in mind that the area around the industrial complex “Mayak” was contaminated already in 1957 by a nuclear accident.

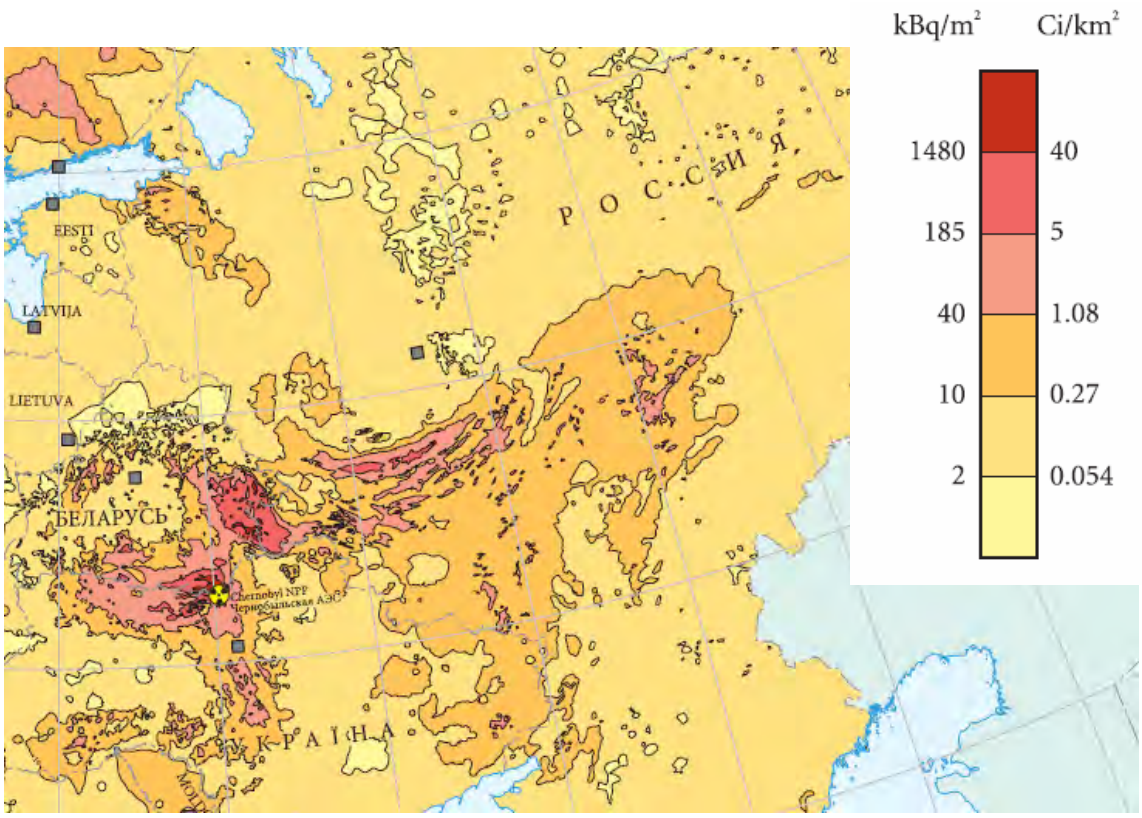


Figure 4-11: Total Cs-137 deposition on the territory of Russia (nuclear weapon-test fallout and ChNPP accident) /EEC 98/

The evaluations of export certificates indicate that a small number of producers from Russia (14) deal will exports of mushrooms to the EU. The values as given in the export certificate were used to display the frequency distribution of certain concentrations of radio-caesium in mushrooms exported to the EU (Figure 4-12).

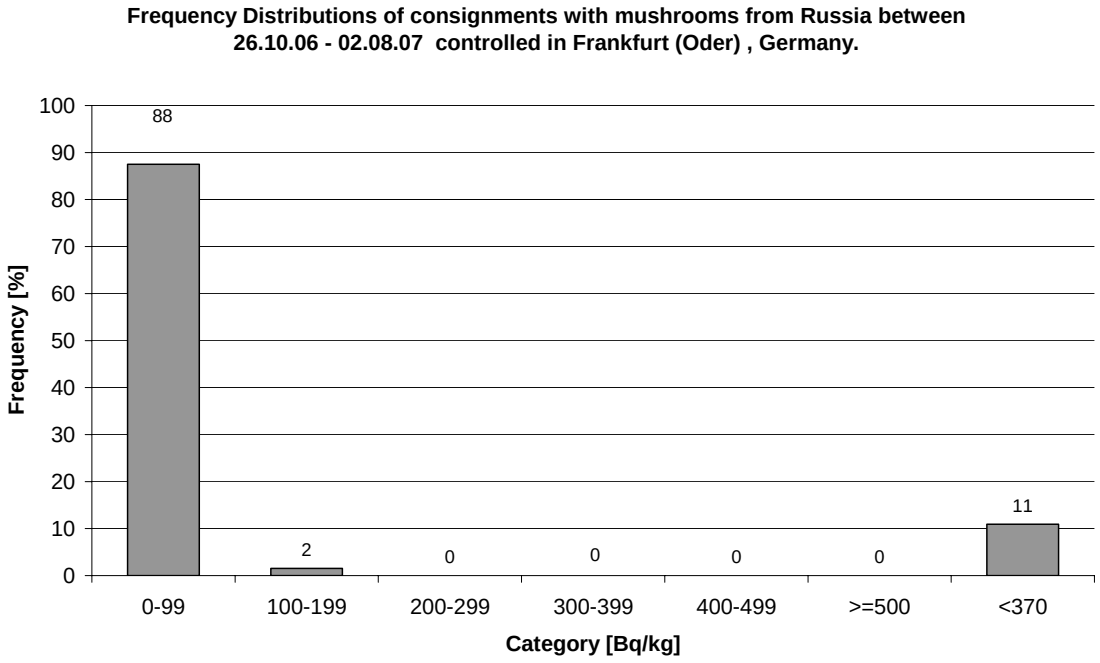


Figure 4-12: Frequency distribution of radio-caesium content in mushrooms from Russia (64 samples, total of 500.6 tons)

(last column: < 370 Bq/kg complies with the given detection limit)

Serbia

No questionnaires were returned from Serbia.

No information about the distribution pattern of radio-caesium on the territory of Serbia are available from the „Atlas of Cs deposition on Europe after the Chernobyl accident" issued by DG-Research, JRC /EEC 98/. Nevertheless, if fitting the contamination pattern on the adjacent areas of Greek the maximum level of Cs 137 on soil can roughly estimated to be less than 10 kBq/m^2 for Serbia (see Figure 4-6).

Switzerland

The initial distribution pattern in Switzerland is shown in Figure 4-13. As heavy rainfall occurred during the passage of the radioactive cloud in the Tessin area, most of the activity had been deposited in this Canton. Some emergency measures had been implemented within the first year after the ChNPP-Accident (addiction of consumption of product from certain Cantons). During the period between 3rd September 1988 and 9th

July 1988, a ban was imposed for fishing in the Lake Lugano. Recently, radio-caesium concentration of fish from this lake amounts to below 10 Bq/kg (see Figure 4-14)

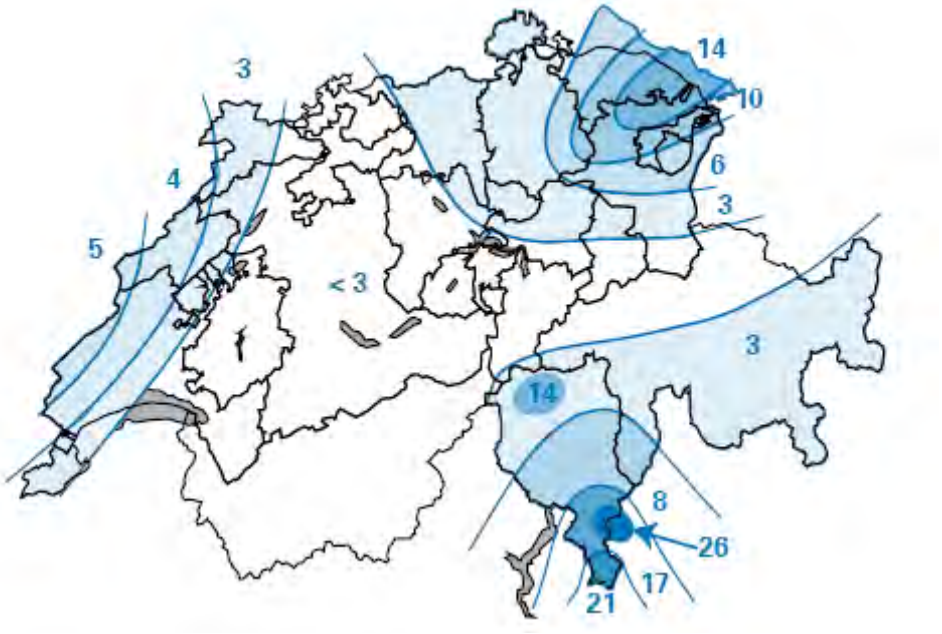


Figure 4-13: Initial distribution patter of radio-caesium in 1986 after the ChNPP accident (Cs-137 in kBq /m²) /BAG 06a/

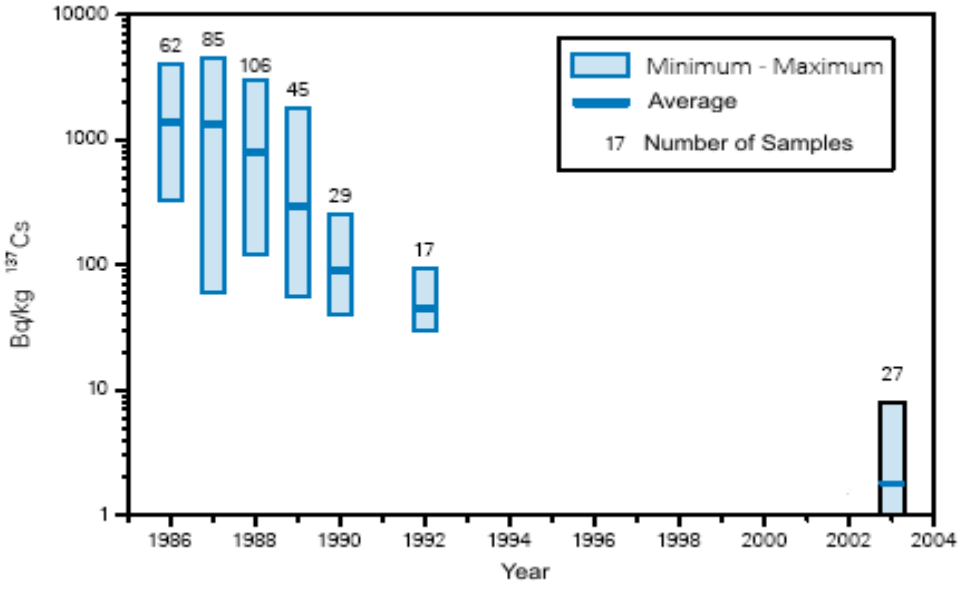


Figure 4-14: Radio-caesium concentration in fish from Lake Lugano /BAG 06a/

Switzerland submitted two filled questionnaires to the GRS, one for the competent governmental authority (Swiss Federal Office of Public Health, “Consumer Protection” Unit (Bundesamt für Gesundheit (BAG), Direktionsbereich Verbraucherschutz) and one for the laboratory dealing with radio-caesium in agricultural products (Swiss Federal Office of Public Health, Environmental Radioactivity Section). Competences regarding the monitoring of radioactivity in foodstuffs are defined in StSV (Strahlenschutzgesetz vom 22. März 1991 and Strahlenschutzverordnung vom 22. Juni 1994). The organisation (BAG) works together with the cantonal authorities (around 9 regional services spread within the country).

The BAG takes over the corresponding tasks in cooperation with regulatory bodies from Liechtenstein as well.

The Ordinance on Contaminants and Ingredients in Foodstuffs FVI (Verordnung des EDI vom 26. Juni 1995 über Fremd- und Inhaltsstoffe in Lebensmitteln (Fremd- und Inhaltsstoffverordnung) is mentioned to be from major importance as national MPL had been fixed in this regulatory document (Table 4-6).

Table 4-6: Tolerance and MPL values for radio-caesium isotopes in foodstuffs according Ordinance on Contaminants and Ingredients in Foodstuffs (FIV) in Bq/kg /BAG 06b/

Tolerance value [Bq/kg]**	**Maximum permitted level (sum of Cs-134 and Cs-137) [Bq/kg]**			
All foodstuffs	Foodstuffs in general	Liquid foodstuffs	Special food for feeding infants	Foodstuffs from minor importance
10 (600*)	1.250	1.000	400	12.500

* The tolerance value for radio-caesium in meat from wild animals and non-cultivated mushrooms had been fixed at 600 Bq/kg (sum of Cs-134 and Cs-137).
** maximum value of tolerance; if this value is exceeded the concerning foodstuff is considered as “contaminated” or “lowered in quality”

The following maximum concentration of radio-caesium had been measured in the region of Tessin in 2005 /BAG 06a/:

- 600 Bq / kg in soil
- 97 Bq/ kg dry weight in gras
- 9 Bq /l in milk
- < 30 Bq/kg imported meat from deer and roe deer

Remarkable products with enhanced radio-caesium concentrations of some thousand Bq/kg are meat from wild animals from Switzerland (especially wild boar) in winter 2001/2002.

Still, some samples of mushrooms from Switzerland exceeds the Swiss threshold value of 600 Bq/kg (3 times in 2006) but the number of analysed samples (41) is small randomised and include mushrooms not intended for export. Other agricultural products had been reported to range far below the MPL as given in CR 737/90 (Table 4-7).

Table 4-7: Average radio-caesium concentration in selected agricultural products as reported by Switzerland

Section 1	**Live animals; animals products**	
CHAPTER 1	LIVE ANIMALS (No data 2005/2006 for swiss samples)	**-** Bq / kg
CHAPTER 2	MEAT AND EDIBLE MEAT OFFAL	**< 2** Bq / kg
EX CHAPTER 4	Dairy products; birds' eggs; natural honey; edible products of animal origin,	**< 2** Bq / kg
Section 2	**Vegetable products**	
CHAPTER 7	EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS	**-** Bq / kg
	Dried, fresh or provisionally preserved mushrooms, other than cultivated mushrooms; Note : In 2005; no sample > 600 Bq/kg ; in 2006 3 samples > 600 Bq/kg were measured in one cantonal lab	**1-400** Bq / kg
CHAPTER 8	EDIBLE FRUIT AND NUTS; PEEL OF CITRUS FRUIT OR MELONS	**< 2** Bq / kg
	Cranberries, bilberries and other fruits of the genus *Vaccinium*, fresh, frozen, cooked, provisionally preserved (No data for swiss berries in 2005/6; only imported berries measured)	**-** Bq / kg

Section 4	**Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes**	
CHAPTER 16	PREPARATIONS OF MEAT, OF FISH OR OF CRUSTACEANS, MOLLUSCS OR OTHER AQUATIC INVERTEBRATES	**-** Bq / kg
	(No data in 2005/6)	
CHAPTER 20	PREPARATIONS OF VEGETABLES, FRUIT, NUTS OR OTHER PARTS OFPLANTS	- Bq / kg
	Mushrooms, prepared or preserved by vinegar or acetic acid or otherwise, other than cultivated mushrooms	**< 2** Bq / kg
Other products		**-** Bq / kg

Random test programmes to control the radio-caesium concentration in agricultural products intended for trade are run in Switzerland. These programmes are combined with the Swiss MPL (400 Bq/kg for foodstuffs indented to feed infants/ 1,250 Bq/kg for other foodstuffs) but not with the MPL as given in CR 737/90 (370 / 600 Bq/kg) nor with the value of the Codex Alimentarius (1,000 Bq/kg).

No special measures are undertaken to control the illicit trade of agricultural products exceeding the MPL, probably as this is not from importance in matter of contaminated foodstuffs as there is in fact no financial incentive for illicit trade.

Although Switzerland isn't a member state of the European Union, an export certificate according CR 737/90 and CR 1635/2006 is required since autumn 1999 for import of consignments of mushrooms from Eastern European countries to the territory of Switzerland. None of the consignments of mushrooms (one from Germany, 26 samples form other countries) exceeded the MPL according CR 737/90.

31 samples of imported blueberries (bilberries) from Sweden, Poland, Ukraine, Romania, countries from Baltic States, Russia as well as Belgium, Germany, France, Netherland and Canada were found to be in compliance with CR 737/90 (Figure 4-15) but exceeded in 19 cases the mentioned Swiss tolerance value of 10 Bq/kg but in non of the case the national MPL of 1,259 Bq/kg /BAG 06b/.

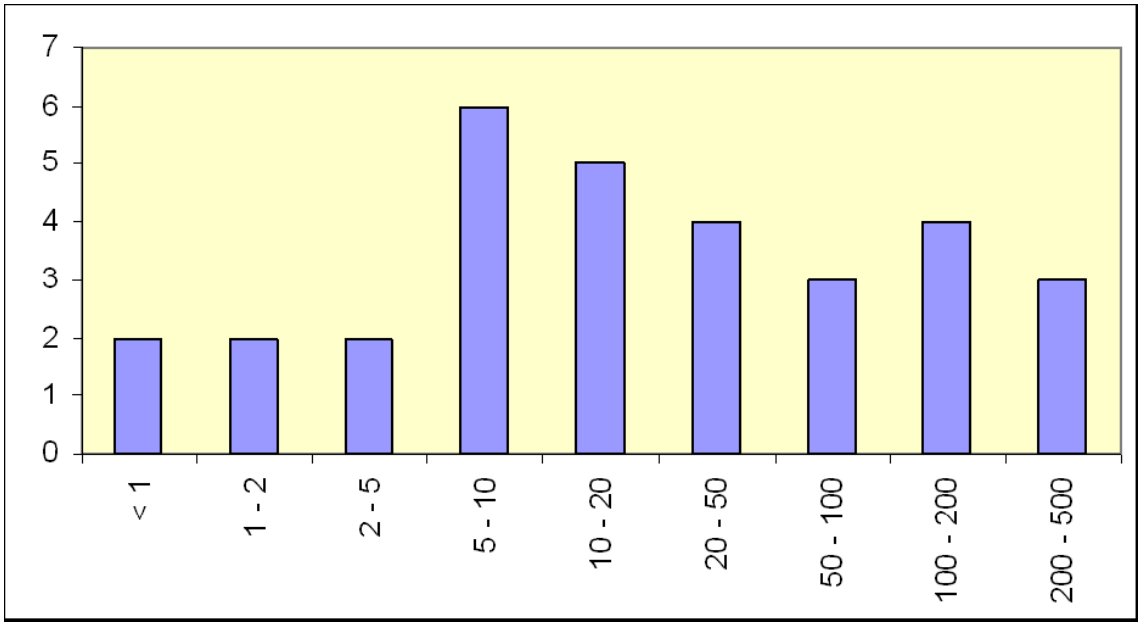


Figure 4-15: Frequency distribution of 31 Samples of imported blueberries and bilberries respectively products thereof /BAG 06b/

No accredited laboratory was mentioned by the Governmental authority to be in charge with the certification of compliance of agricultural foodstuffs intended for export to the EU, obviously because there is no noteworthy export of mushrooms to the EU, even though export certificates were issued (173 in the year 2005, 168 in the year 2006) but in relation with trade of goods in the Middle East and Northern African countries.

The competent laboratory that deal with measurement of radioactivity in foodstuffs (Swiss Federal Office of Public Health, Environmental Radioactivity Section) is accredited in terms of ISO / IEC 17025 – 2005 (Determination of radionuclide contents in environmental samples (aerosols, precipitations, surface water, groundwater, soil, grass, food, various environmental samples) / Determination of radionuclide contents in commercial products (compliance testing) / Determination of radionuclide contents in the environment and their individual contribution to the external dose rate. The first accreditation was on the 05.10.2001, last periodical accreditation on the 05.10.2006. The competent Swiss accreditation body is the Swiss Accreditation Service (SAS). The laboratory belongs to the “Radiation Protection” division of the “Consumer Protection” Unit at the Swiss Federal Office of Public Health (SFOPH National Authority for Radiation Protection.) 6 Staff members work in the laboratory which is certified according ISO 9001:2000 by external audit of the “Consumer Protection” unit each year by the Swiss Association for Quality and Management Systems (SQS).

Main field of activity is radioactivity analysis in environmental and foodstuff samples in order to assess the annual radiation doses received by the Swiss population. Occasionally, the laboratory is involved is export and import control. Main client is the competent authority itself. Occasionally individuals or companies request the service of the laboratory.

Regarding the sequence of work related to the certification of compliance with the MPL as like CR 737/90, the laboratory informed that usually the sample of the agricultural product will be taken by the exporter himself, transported to the laboratory by courier in 3 – 24 hours and first registered for housekeeping. The procedure for sample preparation depends on the type of sample.

The impression of the competent authority and the sub orientated laboratory is that the work is in general on a high standard and according best practice. Appropriate measures are undertaken to ensure a high level of quality assurance.

Turkey

After the accident at Chernobyl, large areas in northern Turkey were contaminated with radio-caesium by wet deposition in early May 1986. During this emergency, Çekmece Nuclear Research and Training Centre performed analyses of various substances, including foodstuffs to assess the population risk. In their reports, it has been noted that the soil surface Cs-137 activity of the eastern part of Black Sea Mountains was around 4000-4500 Bq/kg at the 0.5 cm soil in the year 1988.

A comprehensive study on the situation in Turkey after the ChNPP accident had been published in seven volumes and is available at:
http://www.taek.gov.tr/cernobil/giris.html. Unfortunately, this literature is available in Turkish language only.

No information about the radio-caesium contamination of the surface is available from the „Atlas of Cs deposition on Europe after the Chernobyl accident" issued by DG-Research, JRC for the eastern, Asian part of Turkey east of Bosporus.

One questionnaire was returned by the Ministry of Agriculture and Rural Affairs, General Directorate of Protection and Control, Food Control Services Department.

The competent authority in Turkey regarding the control of radiation in the field of radioactivity analysis and issuing certificate for radioactivity in foodstuffs is the Turkish Atomic Energy Authority (TAEA)

The Ministry of Agriculture and Rural Affairs (MARA) is the main decision making body in Turkey with respect to food safety, veterinary and phytosanitary issues.

Radio-caesium content in agricultural products laid down in CR 1635/2006 is analyzed and certificate is issued by Çekmece Nuclear Research and Training Centre (İstanbul) (TAEA).

Valuable information was provided regarding the organizational structure of the competent authority, their subordinated regional services, and way of training involved staff.

The Turkish authority gave precise information about the relevant national legislation concerning

- the control of radioactive contamination of foodstuffs:
    - Two regulations / laws in force. The appropriate mechanism for sampling, monitoring and restricting the sale of contaminated foodstuffs or feedingstuffs have been established in the By-law on nuclear and Radiological Emergency. (TAEA)

- the control of imports, exports and transits of agricultural products:
    - Law and regulation on the Production, Consumption and Inspection of Foodstuffs
    - Communique on the Control Activities Implemented at the Import Stage of Food and Food Contact Materials
    - Instruction on the Issuing Health Certificate at the Exportation Stage of Food and Food Contact Materials

- the control export of agricultural products as of Annex” of CR 737/90 and the annex in CR 1609/2000:
    - For the import/export of foodstuffs, there is a control mechanism established by an under-secretariat of Foreign Trade in coordination with TAEA, according to the principles laid down in the relevant EU legislation.

According to a Food Law no. 5179, all marketed foodstuffs should comply with a Turkish Food Codex. Compliance of foods to the Turkish Food Codex is checked in terms of food quality and safety criteria. Penalties are applied in accordance with the Law No 5179 for the products not complying with the legislation.

According to principles laid down in the relevant EU legislation, an under secretariat of Foreign Trade Ministry establishes the control mechanism that requires certification by TAEA on radioactive contamination in foodstuffs, with special respect to those established to fulfil CR 1635/2006.

Several national regulation regarding sampling and analysis of foodstuffs are in force. According to a by-law on nuclear and radiological emergency, TAEA is responsible for analysis/monitoring, the Ministry of Agriculture is responsible for sampling and Governor of the province is responsible for the restriction of foodstuffs. A Turkish Food Codex Regulation published in 16 November 1997 gives obviously precise information upon the Criteria for Sampling, Sample Preparation and Method of Analysis for the Official Control of the MPL of certain contaminates but no special communiqué regarding radioactive elements was mentioned.

No control measures are foreseen to certify the compliance with CR 737/90 for products other than listed in Annex I of CR Commission Regulation 1635/2006 or had been reported.

Periodical, annual monitoring programmes concerning the monitoring of the levels of radioactivity in the foodstuffs are implemented in collaboration with Turkish Atomic Energy Agency (TAEA) since 2006. Radioactivity contamination monitoring programme is prepared and implemented in line with the Commission Recommendation of 8 June 2000 on the application of Article 36 of the EURATOM Treaty concerning the monitoring of the levels of radioactivity in the environment for the purpose of assessing the exposure of the population as a whole (2000/473/EURATOM). In that regard 227 samples were taken from foodstuffs including meat, milk and its products, fruits and vegetables, meadow and grass in the year of 2006. The samples were selected by taking into account of the consumption habits and likelihood for the radioactivity exposure. In addition, an annual monitoring programme covering foodstuffs and some agricultural products is conducted in collaboration with Ministry of Agriculture.

Turkey reported on the content of radio-caesium in the below mentioned agricultural products (Table 4-8):

Table 4-8: Average radio-caesium concentration in selected agricultural products as reported by Turkey

Section 1	**Live animals; animals products**	
CHAPTER 1	LIVE ANIMALS	<10 Bq / kg
CHAPTER 2	MEAT AND EDIBLE MEAT OFFAL	<10 Bq / kg
EX CHAPTER 4	Dairy products; birds' eggs; natural honey; edible products of animal origin,	<10 Bq / kg
Section 2	**Vegetable products**	
CHAPTER 7	EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS	<10 Bq / kg
	Dried, fresh or provisionally preserved mushrooms, other than cultivated mushrooms	Bq / kg
CHAPTER 8	EDIBLE FRUIT AND NUTS; PEEL OF CITRUS FRUIT OR MELONS	Bq / kg
	Cranberries, bilberries and other fruits of the genus *Vaccinium*, fresh, frozen, cooked, provisionally preserved	<10 Bq / kg
Section 4	**Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes**	
CHAPTER 16	PREPARATIONS OF MEAT, OF FISH OR OF CRUSTACEANS, MOLLUSCS OR OTHER AQUATIC INVERTEBRATES	<10 Bq / kg
CHAPTER 20	PREPARATIONS OF VEGETABLES, FRUIT, NUTS OR OTHER PARTS OFPLANTS	Bq / kg
	Mushrooms, prepared or preserved by vinegar or acetic acid or otherwise, other than cultivated mushrooms	<80 Bq / kg
Other products		Bq / kg

Regarding countermeasures or remediation measures to reduce the content of radioactivity contamination in foodstuffs, the following information is available:

Foodstuffs not in compliance with the maximum permitted levels are not allowed to be placed on the market. Regulation on Nuclear and Radiological Emergency Preparedness (15 Jan. 2000, Official Journal No:23934) sets down the remedial actions to be taken by the related national institutions in case of any radiological and nuclear emergency as well as remedial actions such as restriction of the sale of foodstuffs originating from the contaminated area.

Sanctions imposed are monetary fine, taking to the court in cases of threat to human health, cessation of the production and cancellation of the approval, withdrawal of the products from the market and destruction of the products.

Ukraine

The Chernobyl Nuclear Power Plant situated in the Ukraine on the border to Belarus was the source of radioactive contamination in whole Europe. The weather condition of the first days after the explosion had a determining influence on the distribution of the radioactive nuclides (Figure 4-16).

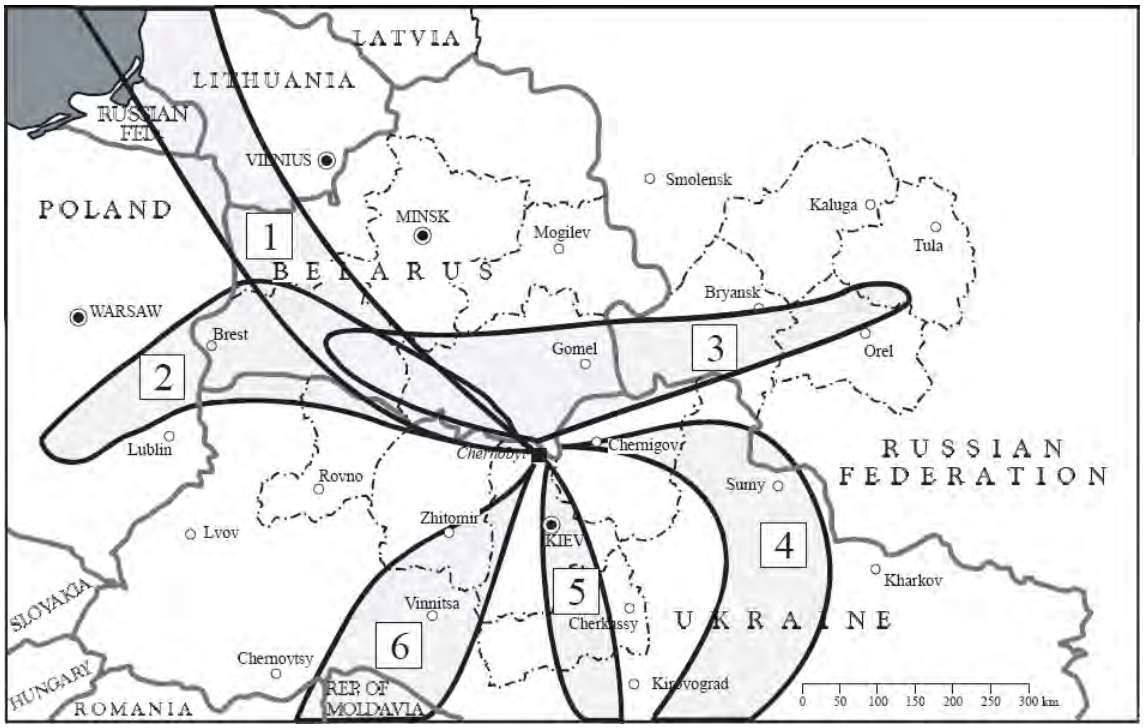


Figure 4-16: Calculated plume formation according to the meteorological conditions for instantaneous releases on the following dates and times (GMT): (1) 26 April 1986, 00:00; (2) 27 April, 00:00; (3) 27 April, 12:00; (4) 29 April, 00:00; (5) 2 May, 00:00; and (6) 4 May, 12:00 /BOR 93/

The given values in the Ukraine (overview, 1998) can be seen from the following Figure 4-17. The initial deposition need to be multiplied by a factor of 0.63 (0.0007) to get the recent Cs-137 (Cs-134) deposition on the ground corrected by radioactive decay.

Currently, more than 20 years after the accident, the Cs 137 activity concentration in agricultural food products produced in regions affected by the Chernobyl fallout are generally below national, regional (EU) and international action levels. However, in some limited areas (Zhytomyr and Rovno regions in Ukraine), the Caesium 137 activity concentration in food products, especially milk, still exceed the Ukrainian admissible levels of about 100 Bq/kg.

Figure 4-17: Total Cs-137 deposition on the territory of Ukraine (nuclear weapon-test fallout and ChNPP accident) /EEC 98/

In spite of big efforts, personal contacts on the 19th International Agricultural Exhibition-Fair "AGRO-2007" in June in Kiev, promised assents with regard to cooperation and multiple inquiries no questionnaires from the Ukraine were received. In total, 74 requests for information by questionnaires were launched, thereof 56 to producers, 11 to Governmental Authorities and 7 to laboratories.

The evaluations of export certificates indicate that a small number of producers from Ukraine (9) deal will exports of mushrooms to the EU. The values as given in the export

certificate were used to display the frequency distribution of certain activity concentrations of radio-caesium in mushrooms exported to the EU (Figure 4-18).

As in the case of Russia and Belarus it has to be mentioned that the autumn, the high-season for mushroom export, is not included in the diagram below. Nevertheless, until 29.11.2007 only one consignment with enhanced level of radioactivity above the MPL were detected at checkpoint Frankfurt (Oder), Germany. The average value of the Caesium 137 concentration of all samples was about 320 Bq/kg. Only one sample (frozen mushrooms) with a Caesium 137 activity concentration of 1486 Bq/kg was clearly higher than the admissible level.

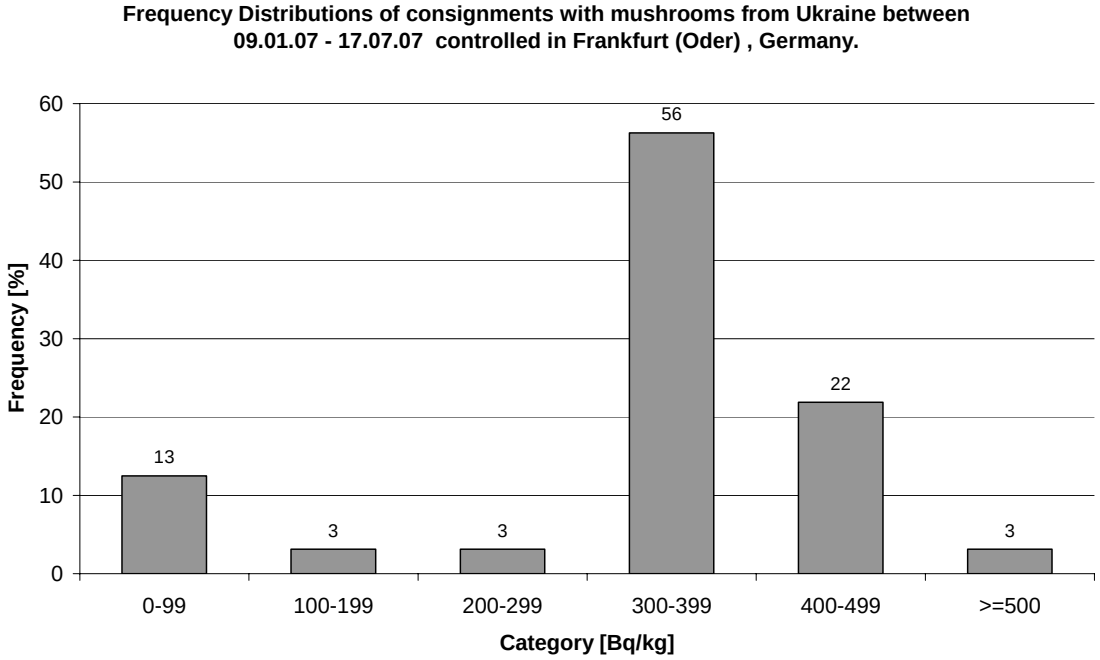


Figure 4-18: Frequency distribution of radio-caesium content in mushrooms from Ukraine (32 samples, total of 240.4 tons)

The admissible levels for the activity concentration of radioactive Cs 137 and Sr 90 in foodstuffs in the Ukraine had been fixed in a regulatory document in 2006 /MHP 06/ (Table 4-9). It is obviously that the admissible levels are lower than the corresponding values in the EU.

Table 4-9: Admissible levels for the activity concentration of Cs 137 and Sr 90 in foodstuffs in the Ukraine /MHP 06/

Product Category	Admissible level Cs [Bq/kg]	Admissible level Sr [Bq/kg]
Corn, flour products	20 - 50	5 - 30
Milk and dairy products	40 – 500	5 - 100
Meat and meat products	50 - 400	20 - 200
Fish and fishery products	150 - 600	35 - 200
Poultry eggs and egg products	100 - 400	30 - 100
Vegetables and vegetables products	40 - 240	20 - 80
Fruits and berries	50 - 140	10 - 40
Mushrooms (fresh, frozen or preserved)	500	50
Mushrooms (dried)	2500	250
Drinking water	2	2
Beverages	10 - 200	5 - 100
Child food	40	5

4.5 Modelling of radio-caesium transfer from the environment into the food chain

Detailed knowledge about the transfer of radionuclides from soil into plant and into agro ecosystems is necessary to reconstruct and also predict the behaviour and the spreading of radionuclides in ecosystems and food chains.

Parameters describing the radio-caesium transfer from various types of soil into plants of the same type are characterised by a large variability. This property is apparent especially for natural forest ecosystems and pasture lands. The results of investigation /DFI 06/ showed that the observed differences are determined by the vertical distribution of radio-caesium in the soil profile and by the amount of exchangeable radionuclides in the different layers of the soils.

4.5.1 Potentially contaminated foodstuffs

A short survey over the actual caesium concentration in foodstuffs leads to the assumption that the products listed in Table 4-10 could contain concentrations of radio-caesium close to or above the limits, if they were produced in highly contaminated regions.

Table 4-10 Agricultural products which are potentially contaminated

Terrestrial products	Mushrooms	Mushrooms from natural and semi natural habitats
	Plants	Berries, nuts and honey from natural and semi natural habitats
	Animals	Wild boar, reindeer, roe deer, deer, elk, sheep, goat
	Dairy products	milk from reindeer, sheep, goat
Aquatic products	Plants	no
	Animals	Freshwater fish, mussels and crustaceans

4.5.2 Radio-caesium transfer to terrestrial products

Radio-caesium concentration in soil

Maps about the Cs 137 deposition in Europe until May 10, 1986 are given in /EEC 98/. Since then, radioactive decay took place so that the deposition in 2007 can maximally amount to 62 % of the numbers given in /EEC 98/.

There are some more processes to reduce the radio-caesium concentration in and on soil:

- Water erosion by rainfall and during snow melt, depending on kinetics of rainfall, water saturation of the soil, slope and canopy
- Wind erosion, depending on kinetics, soil composition, grid size and canopy;
- Resuspension during fire events
- Remediation processes
- Vertical movement in the soil

The degree of erosion is further influenced by soil cultivation, tillage, canopy height, gaps between plants, and direction of plant rows in relation to slope, hedges and live-

stock. /KON 00/ gives a well founded description of these processes, /UWB 98/ gives details about the relationship between the radio-caesium inventory in catchments and the adjacent aquatic system.

Material eroded by wind will largely redeposit in the vicinity, material resuspended during fire events can travel over larger distances before it is deposited elsewhere. Most of the material eroded by water will be transported via creeks and rivers into the ocean. The list of processes influencing the amount of erosion shows that it is not possible to give a single number valid for all Europe. Rather will there be great differences even within small distances.

Erosion mainly takes place at the upper soil layer. While during the first years after 1986 most of the radioactivity was within the upper centimetre, now the bulk has moved deeper into layers which are less severely affected by erosion. Furthermore, Cs 137 has now been fixed by soil, especially clay particles. Therefore the reduction of caesium concentration is now slowing down, and there is no longer a direct correlation between the amount of erosion and the reduction of Cs 137 in soil.

The vertical migration of caesium in the soil column can be caused by various transport mechanisms including convection, dispersion, diffusion and biological or mechanical mixing. Convection, dispersion and diffusion are processes which are enhanced by humidity. The downward migration is therefore enhanced in areas with high precipitation, or, in case of pastures, with high irrigation.

Another reason for the difference in ecological halftimes is the different fixation capacity in various soils. In soils with high clay content caesium will be fixed and immobilized. The degree of immobilization depends from the kind of clay. Immobilized caesium is neither easily taken up by plants nor is it easily washed out or dislocated into deeper soil layers. Sand does not fix caesium, therefore in sandy soils it is more rapidly taken up by plants and it is also washed off more rapidly. Organic matter is capable to change the chemical status of caesium to complexes which are even more rapidly taken up by plants. In soils with very high organic matter content caesium travels most rapidly. Micro-organisms like mycorrhizal fungi transport caesium from the soil solution into plant roots, especially those of conifers, without accelerating the down-movement in soil.

Bioturbation and mixing by agricultures practices cause a rapid homogenization of caesium in the mixing layer which can be between some centimetres in shallow agricultural soils and a meter in chernosem soils. Remediation measures mainly consist in deep ploughing to dilute the caesium concentration. Convection, dispersion and diffusion also take place in agricultural soils and remediated soils but these effects are comparably small.

In the soil under conifer forests, great part of the caesium deposited in 1986 is still in the organic layers above the soil itself, it will disappear mainly by decay. Soils under deciduous forests normally contain a richer soil fauna which causes a dilution of caesium within a soil layer of some centimetres.

In summary the movement of caesium in soil depends on soil characteristics, moisture, soil cultivation and plant canopy. Although it is possible to give tendencies for the distribution of these characters in the world it is not possible to ascribe a certain caesium movement to a certain European country.

The observed ecological halftime of available Cs 137 in the upper 10 cm of soil is in the order of magnitude of 30 to 300 years /PRÖ 04/. By neglecting this fact, 21 years after the deposition, the concentration of Cs 137 in agricultural products will be overestimated by a factor of less than 2.

Limiting concentrations of Cs 137 in soil, 1986

The concentration of 600 Bq/kg in agricultural products will be achieved, if the following conditions are valid:

- Mushrooms and plants:
  $[Soil] * T^P > 600$ Bq/kg
  or
  $[Soil]_{ag} * T_{ag}^P > 600$ Bq/kg
  with:

[Soil]	Concentration of Cs 137 in Bq/kg
T^P	Transfer factor which describes the relation between the concentration of Cs 137 in mushroom or plant P and in soil in Bq/kg (FW) : Bq/kg (DW)

$[Soil]_{ag}$ Deposition of Cs 137 in Bq/m²

T_{ag}^{P} aggregated transfer factor which describes the relation between the concentration of Cs 137 in mushroom or plant P and the deposition onto soil in Bq/kg (FW) : Bq/m²

- Animal products:
  $[Soil] * T^{p} * M^{T} * T^{T} > 600$ Bq/kg
  or
  $[Soil]_{ag} * T_{ag}^{T} > 600$ Bq/kg
  with:
  M^{T} Fodder uptake in kg/d
  T_{ag}^{T} aggregated transfer factor which describes the relation between the concentration of Cs 137 in animal product T and in soil in Bq/kg (FW) : Bq/m²

In the case of milk, milk products and infant nutrition the number of 370 Bq/kg replaces the number of 600 Bq/kg.

The estimation of transfer factors, concentration factors and the daily fodder intake are necessary to assess the Cs 137 concentration in agricultural products on the basis of the soil contamination in 1986. Easier is the assessment on the base of the aggregated transfer factor T_{ag}, because fewer variables are needed. Furthermore, the Cs 137 soil contamination in 1986 is given in Bq/m² /EEC 98/.

In case that a conversion from transfer factors in the cited literature to aggregated transfer factors is necessary, the soil layer from which plant roots take up Cs 137 is set 10 cm in the case of pasture and forest, 20 cm in the case of arable land. Soil mass is set 120 kg/m² (forest, pasture) and 280 kg/m² (arable land) /BFS 05/.

The reduction of caesium content in soil by radioactive decay since May 1986 is considered but further reduction by erosion is not considered. The influence of changing chemical status of caesium during the first decade on the aggregated transfer factor is not considered. The movement down to deeper soil layers has hitherto not caused a significant reduction in plant radioactivity, because most of the caesium activity is still in the root layer. On the other hand, the down-movement causes higher caesium concentrations in mushrooms whose mycelium is beyond the soil surface.

Ecological halftimes for caesium in plants have been reported by Pröhl /PRÖ 04/. These halftimes do not reflect the first reduction which took place when the extern contamination of foliage was high.

Grain	2,5 to 6 years
Fruit, vegetables	5 to 6 years
Potatoes	5 to 8 years
Milk	5 to 9 years
Meat	2 to 9 years

These halftimes are far smaller than the halftimes reported for the caesium concentration in soil (30 to 300 years). This shows that there are more factors influencing the uptake of caesium into plants than just the concentration in soil, namely the fixation processes in soil. Fixation processes finally come to equilibrium, when the relation between caesium in soil and plants is constant.

The observations confirm the theory: Generally the ecological halftimes tend to lengthen with time; about ten years after the accident the reduction of the Cs 137 concentration in agricultural products is mainly due to the radioactive decay /PRÖ 04/.

Due to neglecting the reduction of transfer factors the concentration of Cs 137 in agricultural products in Europe will be less than is given here but it is not possible to give the real numbers. Anyway, the resulting list of questionable products and countries will be safe.

4.5.3 Radio-caesium concentration in agricultural products

In general, agricultural products are less severely contaminated than products grown in natural or semi natural areas. This is due to many facts /IAE 06/:

- Agricultural soils are ploughed so that the radioactivity in the soil is diluted

- Agricultural soils are fertilized with potassium and ammonium, therefore the uptake of caesium decreases

- Agricultural soils tend to be slightly acid or neutral whereas natural and semi natural soils are often acid and poor in nutrients. This causes a higher transfer of caesium from soil to plant in semi-natural and natural areas.

- Many natural and semi natural soils are rich in sand and/or organic matter whereas agricultural soils often contain more clay. Clay is able to retain caesium impeding the uptake by plants on agricultural areas.

Because of all these reasons, the caesium content of most agricultural plant products has now fallen beyond the limit of 600 Bq/kg (FW), even in the regions which were highly contaminated in 1986 /IAE 06/.

Animal products often contain more caesium than plant products. In intensely managed agricultural ecosystems where animals receive fodder from arable fields the caesium content is low, too, but products from animals which can freely graze are often higher contaminated /IAE 06/.

Mushrooms

The aggregated transfer for Cs 137 depends on the nutrition of mushrooms. Parasite and saprophytic mushrooms are generally lowly contaminated whereas mushrooms living symbiotically can be critically contaminated. Cultured mushrooms e. g. champions are saprophytic with low caesium content.

Especially high aggregated transfer factors (> 0,05 Bq/kg mushroom (FW) / Bq/m² soil) are frequently reported for the following mushrooms: Many species of Xerocomus spec.(e. g. bay bolete), Hydnum repandum (wood hedgehog), Entoloma sericeum (silky pinkgill) and related species. Some of these species are frequently imported into the European Union.

During the last decade the concentration of Cs 137 has been reduced only by decay; therefore it is expected that also in the near future the contamination will decrease only slightly.

The limit of 600 Bq/kg (FW) can be exceeded if the deposition onto forest soil in 1986 was higher than 10 kBq/m². This value was exceeded in many countries or at least parts of them.

The aggregated transfer factor for mushrooms like Boletus edulis (king bolete), Cantharella cibarius (chanterelle), Suillus luteus (slippery jack), Laccaria amethysta (amethyst deceiver), Leccinum scabrum (brown birch bolete) and many Xerocomus, Lactarius (e.g. saffron milkcap) and Russula (e.g. milk white brittlegill) species are a bit lower. The most important species traded are Cantharellus cibarius, Boletus edulis and Suillus luteus. The critical deposition in 1986 is 20 kBq/m².

Countries where the concentration limit in mushrooms could be exceeded are given in Table 4-11.

Table 4-11: Countries where the concentration limit in mushrooms could be exceeded

Limit for the Cs 137 deposition in 1986 in kBq/m²	**10**	**20**
Country	**Xerocomus badius and other fresh mushrooms**	**Boletus edulis, Cantharellus cibarius, and other fresh mushrooms**
Albania*		
Belarus	X	X
Bosnia and Herzegovina*	X	
Croatia	X	
Liechtenstein		
Former Yugoslav Republic of Macedonia*	X	X
Moldova	X	X
Montenegro*	X	X
Norway	X	X
Russian Federation	X	X
Serbia*		
Switzerland	X	X
Turkey (European part)		
Ukraine	X	X

* The deposition patterns in Albania, Bosnia and Herzegovina, Serbia, Montenegro and the Former Yugoslav Republic of Macedonia are not available in /EEC 98/. Nevertheless, if fitting the contamination pattern between Romania and Greek the maximum level of Cs 137 on soil can roughly estimated to be less than 10 kBq/m^2 for Albania and Serbia, less than 20 kBq/m^2 for Bosnia & Herzegovina as well as less than 40 kBq/m^2 for Montenegro and Former Yugoslav Republic of Macedonia (with spots > 40 kBq/m^2)

In the past the limit of 600 Bq/kg was also valid for dried mushrooms. This value could already be exceeded if the deposition onto soil exceeds 1 kBq/m². This would be possible in every country all over Europe. Therefore the Council of the European Union decided in 2000 (Council Regulation No 616/2000) in order to remain consistent between fresh and dried mushrooms that the MPL referred to in Article 3 of Council Regulation No 737/90 "…thereof are to be calculated for all concentrated or dried products on the basis of the reconstituted products as ready for consumption".

Plants and plant products

- **Berries**

The aggregated transfer factors for berries are generally smaller than those for mushrooms. Berries from natural and semi natural habitats - forests, moors and heaths, wetlands - contain more caesium than cultured berries. This holds even for the same species. The reason lies in the generally more acid soil substrate in semi natural and natural habitats and in their nutrient-poor conditions, especially the lack of potassium. Berries which are frequently traded are Vaccinium myrtillus (bilberry), Vaccinium vitis-idaea (cranberry), Rubus chamaemorus (Cloudberry), Rubus idaeus (raspberry) and Rubus fructicosus (blackberry). All these berries can grow on neutral or slightly acid soil, but the Vaccinium species and Rubus chamaemorus also accept acid soils, where most other plants would not grow.

The aggregated transfer factors can reach up to 1 Bq/kg (DW) / Bq/m² in acid areas, whereas in slightly acid and neutral areas they are only up to 0.01 Bq/kg (DW) / Bq/m². If dry matter in berries amounts to about 15 % /SOU 81/ the critical limit of 600 Bq/kg fresh berries could be exceeded if acid forest, heath or wetland soil contained more than 60 Bq/m² in 1986 or neutral soil contained more than 6000 kBq/m² in 1986 (Table 4-12).

Table 4-12: Countries where the concentration limit in berries and nuts from natural or semi natural areas could be exceeded

Limit for the Cs 137 deposition in 1986 in kBq/m²	**60**	**6,000**
Country	**Berries from areas with acidic soils nuts**	**Berries from areas with slightly acidic or neutral soils**
Albania*		
Belarus	X	X
Bosnia and Herzegovina*		
Croatia	X	
Liechtenstein		
Former Yugoslav Republic of Macedonia*	X	
Moldova		
Montenegro*		
Norway	X	
Russian Federation	X	
Serbia*		
Switzerland	X	
Turkey (European part)		
Ukraine	X	X

* The deposition patterns in Albania, Bosnia and Herzegovina, Serbia, Montenegro and the Former Yugoslav Republic of Macedonia are not available in /EEC 98/. Nevertheless, if fitting the contamination pattern between Romania and Greek the maximum level of Cs 137 on soil can roughly estimated to be less than 10 kBq/m^2 for Albania and Serbia, less than 20 kBq/m^2 for Bosnia & Herzegovina as well as less than 40 kBq/m^2 for Montenegro and Former Yugoslav Republic of Macedonia (with spots > 40 kBq/m^2)

- **Nuts**

The caesium concentration in nuts is generally higher than in other plants growing in the same habitat. This is due to the fact that the dry matter content on nuts is generally high, about 95 % /SOU 81/. This is also the case for grain, but generally grain fields are ploughed and fertilized with more potassium than the habitat where nuts are growing, which is normally a semi-natural one. Most nuts prefer neutral or slightly alkaline soils which are well drained. From this it follows that the aggregated transfer factor (related to dry weight) for nuts must be lower than the aggregated transfer factors for berries from comparable semi-natural areas. Comparative studies of the caesium content in

various fresh plants from the same region confirm this assumption. The caesium concentration is in the same order of magnitude as in fresh Vaccinium species /BLU 06/.

Animal products, life animals, meat

- **Wild boar**

Wild boar (Sus scrofa) lives in total Europe. Its contamination is dependent on the nutrition in the last months before shooting, i. e. on the season /FIE 05/. Low contaminated food in spring and summer time are fruit, grasses and foliage, low contaminated autumn food acorns and beech-nuts, especially high contaminated autumn food are Elaphomyces granulatus (false truffle), a subterranean mushroom unsuitable for human nutrition which takes up caesium even more efficiently than bay bolete. The caesium content of Elaphomyces is steadily increasing with time because Cs 137 is migrating into deeper soil layers. Therefore the Cs 137 content of wild boar increases in autumn with a half-time of 60 to 80 years /FIE 05/, but it decreases in spring and summer. The difference between the 5th percentile and the 95th percentile in wild boars shot in the same year at the same place is thus increasing from year to year, in 2004 it was a factor of 20, as calculated from data in /FIE 05/. The data given in /FIE 05/ allow the calculation of aggregated transfer factors. They amount in 2004

Mean value	0,016 Bq/kg meat // Bq/m² soil
95. Percentile	0,051 Bq/kg meat // Bq/m² soil
Maximum value	0,21 Bq/kg meat // Bq/m² soil with increasing tendency

An aggregated transfer factor of 0,2 Bq/kg meat // Bq/m² soil means that the limit of 600 Bq/kg meat could be exceeded when the soil deposition in 1986 was 4,8 kBq/m². As the map /EEC 98/ gives the contamination of 4 kBq/m², this contamination level will be taken as the distinguishing feature. This limit is valid for wild boars of vast forests shot in autumn, while other animals will be less contaminated (Table 4-13).

Table 4-13: Countries where the concentration limit in animals from natural or semi natural areas could be exceeded

Limit for the Cs 137 deposition in 1986 in kBq/m²	4	2	10		50
Country	**Wild boar**	**Reindeer**	**Roe deer, deer,**	**moose**	**Goat, sheep**
Albania*	X	Not relevant			
Belarus	X	Not relevant	X	X	X
Bosnia and Herzegovina*	X	Not relevant	X		
Croatia	X	Not relevant	X		
Liechtenstein	X	Not relevant			
Former Yugoslav Republic of Macedonia*	X	Not relevant	X		X
Moldova	X	Not relevant	X		
Montenegro*	X	Not relevant	X		
Norway	X	X	X	X	X
Russia	X	X	X	X	X
Serbia*	X	Not relevant			
Switzerland	X	Not relevant	X		X
Turkey (European part)	X	Not relevant			
Ukraine	X	Not relevant	X	X	X

* The deposition patterns in Albania, Bosnia and Herzegovina, Serbia, Montenegro and the Former Yugoslav Republic of Macedonia are not available in /EEC 98/. Nevertheless, if fitting the contamination pattern between Romania and Greek the maximum level of Cs 137 on soil can roughly estimated to be less than 10 kBq/m^2 for Albania and Serbia, less than 20 kBq/m^2 for Bosnia & Herzegovina as well as less than 40 kBq/m^2 for Montenegro and Former Yugoslav Republic of Macedonia (with spots > 40 kBq/m^2)

- **Reindeer**

Reindeer (Rangifer tarandus) mainly lives in the northern part of Europe. During summer time it stays in the tundra but during winter time it lives in the taiga and in the boreal coniferous woodlands. It is the only domesticated deer.

Reindeer nutrition consists of grass, herbs, shrubs and berries in summer, and in winter of lichens, mainly Cladonia rangiferina (reindeer lichen), which is normally more contaminated. Therefore, caesium concentration in reindeer meat is also dependant on the season. In winter the concentration of Cs 137 is twice the summer concentration or higher /MAC 07/.

The mean aggregated transfer factor for Cs 137 in reindeer meat is 0,13 Bq/kg meat (FW) : Bq/m² soil and the maximum about 0,6 Bq/kg meat (FW) : Bq/m² soil /IAF 03/. Unlike meat of wild boar, the tendency is not increasing.

Because of the seasonal variability the aggregated transfer factor is set to 0,5 Bq/kg meat (FW) : Bq/m² soil. The resulting limit for the deposition in 1986 correspond to 1,2 kBq/m², a number which is exceeded in most parts of Europe, but wild reindeer does not live everywhere.

- **Roe deer, deer, moose**

The aggregated transfer factor for Cs 137 in roe deer meat is 0.02 Bq/kg meat (FW) : Bq/m² soil /FAS 03/. This aggregated transfer factor was found during May /SSI 99/. Aggregated transfer factors for roe deer meat shot in autumn are about 0.1 Bq/kg meat (FW) : Bq/m² soil. The increase in autumn is the consequence of the higher fodder intake, while the fodder is not higher contaminated than summer fodder.

In regions where both, roe deer and deer live, deer meat is lower contaminated than roe deer meat /FIE 05/, because the uptake of lower contaminated fodder is dominant during the hunting season for deer compared to the rest of the year.

Elk and moose meat is only rarely traded. The aggregated transfer factor can be taken from roe deer.

An aggregated transfer factor of 0.1 Bq/kg meat (FW): Bq/m² soil implicates that the deposition in 1986 could be up to 10 kBq/m² without exceeding the limiting concentration of 600 Bq/kg meat in 2006.

- **Sheep, goat**

Recommendations about sheep meat are taken from numerical results obtained in Wales. The maximal caesium deposition in 1986 was lower than 40 kBq/m² /EEC 98/. Nevertheless, the British limit for Cs 137 in sheep meat of 1,000 Bq/kg was exceeded in 9,700 farms with 4,2 million sheep /BLA 06/. Therefore restrictions for use of sheep meet with excess radio-caesium concentrations were implemented. Up to now the caesium contamination has been monitored regularly, and nearly for all the farms the restrictions were annulled, while in 2005 still 359 farms remained restricted /FSA 06/. The

limit for the de-restriction was set to a maximum activity concentration of 645 Bq/kg within the flock. Soils in this region where the restricted farms are situated are generally poor in potassium content and the caesium uptake into meadow grass is therefore high. From this it can be taken that the relation between deposition in 1986 and concentration in sheep meat is relatively high for the above described conditions.

A comparably high transfer of caesium from grass to sheep was also reported by the Norwegian Food Safety Authority with a maximum value of more than 3,000 Bq/kg in 2007, found in the highest contaminated area of Norway.

On the other hand, it can be estimated that sheep meat from such regions where the caesium deposition was below 50 kBq/m² combined with a stronger caesium fixation at soil particles do not exceed the MPL. The countries where this level can be exceeded are given in Table 4-13. The caesium level in goat meat is not supposed to be higher than in sheep meat, therefore the safe level of deposition is valid for goat meat, too.

- **Beef, pork, poultry**

The radio-caesium content in meat ready for exports of these animals from the mentioned third countries into EU is no longer exceeding the maximum permissible level of 600 Bq/kg /IAE 06/. Radioactivity in live animals is in the same order of magnitude as the radioactivity in the comparable dead animal. That is also valid for these animals and their meat for the regions from which live or slaughtered/hunted wild boar, reindeer, roe deer, deer, moose, goat and sheep originate.

Free range cattle are supposed to contain more Cs 137 than do cattle from cultivated meadows. This can be deducted from experience with milk: Milk from great farms contains much less Cs 137 than does milk from little farms who let their cows graze on poorly amended meadows or free /IAE 06/. Due to socio economic factors, meat from free range cattle will hardly be exported. Companies who produce meat for exports will feed their animals on cultivated pasture and add concentrate, but peasants who feed their cattle on natural or semi-natural meadows will presumably not export the meat.

In the case of life cows these conditions can not be assumed without a proof. According to /BFS 05/ cattle take up 65 kg natural fodder (fresh weight), the transfer factor from daily food intake to meat is 0.03 Bq/kg : Bq/day. The transfer factor for root uptake

into grass is 0.05 Bq/kg /BFS 05/. Therefore, the caesium concentration of 600 Bq/kg meat will be obtained in regions where the deposition in 1986 amounted to 1200 kBq/m². This is a high figure which is only achieved in certain regions of Belarus, Ukraine and Russia.

Horse meat is a food item that is rarely consumed in Europe. The highest per-capita-intake in the old European countries is below 5 kg/a /SEM 06/. According to /SEM 06/ equilibrium transfer factor from feed to horse meat is 0.035 Bq/kg : Bq/d. The intake of fresh fodder is set to 40 kg/d (30 kg for maintenance /NME 99/ and 10 kg to meet the higher demand in cold times and other stress). The limit of 600 Bq/kg is therefore obtained if the deposition in 1986 was higher than 1600 kBq/m².

- **Milk**

It is not expected that there is any import of milk from other animals than cows, goats and sheep. The caesium content in cow milk is no longer exceeding the maximum permissible level of 370 Bq/kg /IAE 06/.

In general the factor for the transfer of caesium from fodder intake into milk is much lower than the transfer into meat. This is the case for cow milk (0.03 d/kg vs. 0.005 d/l /BFS 05/ and horse milk (0.035 d/kg vs. 0.012 d/l) /SEM 06/, and also Welsh sheep milk is not reported to exceed the limit. The deposition level in this region was over 500 kBq/m².in 1986 /EU 98/. The limit for surveillance should therefore be a deposition level of 500 kBq/m², a level which is only exceeded in Belarus, Ukraine and Russia.

- **Honey**

There is a difference between floral honey and honeydew based honey. Generally honeydew based honeys contain more caesium than do floral honeys. This can easily be understood from the production: Floral honey is made by bees from floral nectar, but honeydew based honey from the sweet secretions of aphids or other plant sap-sucking insects who feed on conifers, especially Picea species. That is, this honey is produced in semi-natural habitats and often on an acid soil while floral honey is mainly produced in fertilized fields and meadows on slightly acid or neutral soils. The exception is floral honey from bilberries grown in regions with highest caesium deposition which perhaps

could contain more than 600 Bq/kg. The difference in the caesium content of floral honey and honeydew honey is clearly shown in /LGL 05/.

4.5.4 Radio-caesium transfer to aquatic products

Cs 137 concentration in water bodies

The concentration of Cs 137 in aquatic food is related to the Cs 137 concentration in water, and this is related to the deposition. There are differences between standing water bodies and flowing water bodies and more differences related to near-surface geology, hydrology and geochemistry, canopy, climate and orographical features.

Radionuclides from the 1986 Chernobyl fallout in deep standing water bodies are nearly entirely in the sediment phase while new sediment covering the contaminated layer. In shallow lakes, remobilizing takes place during storms and heavy rainfall. Radionuclides from sediments can also re-enter the food chain via the food of fish, mussels and crustaceans.

Radionuclides from 1986 deposition have mainly disappeared from flowing water bodies by run-off into the ocean, except those in the sediment. Sediments in flowing water bodies can be raised during heavy rains and snow melt, causing the sediment to flow towards the ocean.

It is impossible to give a generally valid relation between the Cs 137 deposition in 1986 and the Cs 137 concentration in water bodies of 2007 because of the above cited influencing factors. Highest Cs 137 concentrations are supposed to occur in water of shallow standing water bodies in undulated or mountainous regions without important farming on sandy or organic soils with low potassium content in a climate which provides torrential rains or sudden snowmelt /IAE 06/.

Although there is no general, common parameter value for the relation between deposited activity in 1986 and the actual concentration in lakes, it is possible to deduce some information from deposition data published in /EEC 98/ and concentration values in Finnish lake waters in 2002 /SAX 07/. According to this, the relation between $5 \cdot 10^{-5}$ and $2 \cdot 10^{-3}$ Bq/m³ water vs. Bq/m² deposition is found. In 2007 the concentration factor

will have fallen to half the cited values. The higher parameter value will certainly be valid for lakes in more unfavourable situations: standing lakes in regions in which sandy and organic soils low in potassium prevail.

Radio-caesium in fish

The Cs 137 content of fish flesh is related to the potassium content of the water and of the situation of the fish species in the food chain. Predatory fish accumulate more caesium than plant eating fish do.

Data from /MLUV 02, SAX 07, WEI 84/ allow to find equations for the concentration factor T_{Cs}^{Fi}. As is normal in biological material the equations differ from each other, but all of them show the same tendencies. The following equations approximately give the round-up:

Non-piscivorous fish $$T_{Cs}^{Fi} = \frac{2500}{C_K^{water\,0,7}}$$

Piscivorous fish $$T_{Cs}^{Fi} = \frac{6000}{C_K^{water\,0,7}}$$

with:

T_{Cs}^{Fi} Cs concentration factor in fish in Bq/kg fish (FW) : Bq/l water

C_K^{water} Potassium concentration in unfiltered water in mg/l

The relation given in /BFS 05/

Cs in fish $$T_{Cs}^{Fi} = \frac{15000}{C_K^{water\,1}}$$

lead to the somewhat higher Cs concentrations in fish flesh than is given above for predatory fish in water with low potassium concentration; in the range between 10 and 30 mg K / l water the results are about equal.

There is a synergistic effect: the bioaccumulation of caesium in fish is highest when the potassium concentration in water is lowest. This is the case for water bodies in catchments with wet organic soils which are normally poor in potassium contain relatively much caesium, as explained above.

The following estimation is only an example for the calculation of Cs 137 in fish in 2007:

Cs 137 deposition in 1986	100 kBq/m² soil
Remaining Cs 137 in 2007	60 kBq/m² soil
Factor for the estimation of caesium in lake or river	0.001 Bq/m³ water: Bq/m² soil
Caesium concentration in lake	0.06 Bq/l water
Potassium concentration in lake or river	1 mg/l water
Caesium concentration in predatory fish	360 Bq/kg fish (FW)

If the potassium concentration in water is only 0,5 mg/l the caesium concentration in predatory fish could amount to about 700 Bq/kg fish (FW).

This example shows that in regions with a caesium deposition in 1986 smaller than 100 kBq/m², the fish flesh is “safe”, even at very unfavourable conditions.

In regions with agricultural industry the fish will be safe also in regions with higher deposition of caesium in 1986. Here the caesium concentration in water is lower because the soil retains caesium more firmly, due to soil texture and fertilization. At the same time, the water contains more potassium from the run-off of the fields, and so fish contains far less caesium.

For fish from fish farms the Cs 137 limit of 600 Bq/kg will never be exceeded because the Cs intake is only by feed.

Therefore it can be said, that the limit of Cs 137 deposition in agricultural regions is significantly higher and will easily exceed 200 kBq/m². In Table 4-14 the countries are given, where the Cs 137-concentration in fish might exceed 600 Bq/kg.

Table 4-14: Countries where the concentration limit in piscivorous fish, mussels and crustaceans in natural or agricultural catchments could be exceeded

Limit for the Cs 137 deposition in 1986 in Bq/m²	**100 natural area**	**1,000 agricultural area**	**2,000 natural areas**
Country	**Piscivorous fish**	**Piscivorous fish**	**Mussels, crustaceans**
Albania*			
Belarus	X	X	X
Bosnia and Herzegovina*			
Croatia			
Liechtenstein			
Former Yugoslav Republic of Macedonia*			
Moldova			
Montenegro*			
Norway	X		
Russian Federation	X	X	
Serbia*			
Switzerland			
Turkey (European part)			
Ukraine	X	X	X

* The deposition patterns in Albania, Bosnia and Herzegovina, Serbia, Montenegro and the Former Yugoslav Republic of Macedonia are not available in /EEC 98/. Nevertheless, if fitting the contamination pattern between Romania and Greek the maximum level of Cs 137 on soil can roughly estimated to be less than 10 kBq/m^2 for Albania and Serbia, less than 20 kBq/m^2 for Bosnia & Herzegovina as well as less than 40 kBq/m^2 for Montenegro and Former Yugoslav Republic of Macedonia (with spots > 40 kBq/m^2)

Mussels and crustaceans

The caesium concentration factor in freshwater mussels and crustaceans seems to be in the range of 100 to 1000 Bq/kg vs. Bq/l /VAN 75/. The relationship to potassium is not reported. The higher concentration factor mentioned is in the range of the concen-

tration factor for piscivorous fish in water bodies with high potassium content. The limits given in Table 4-14 are only tentative.

4.6 Information about the potential for illicit trafficking of contaminated products

No direct information or notification was found regarding the potential for illicit trade of contaminated products. Taking into account the enormous amount of e.g. mushrooms imported into the EU each year, the illicit trade would obviously not be that beneficial to cope with the risks. This assumption will be supported by the fact that in general a small number of alert or information notifications about a “too high level of radioactivity” had been submitted from market controls.

For true, is will be possible to import 10 kg of mushrooms per person carried by a member of the public when entering the EU but probably this will play a major role only in the direct vicinity of the external border.

It should be kept in mind that the number of alert and information notification decreased significantly after the EU enlargement to the East. In turns that mean that most of the consignments of mushrooms from former third countries still will be traded in the EU but will not require any certification or procedure of release for free circulation anymore.

A source for illicit trafficking is the dispatching of consignment within third countries with intensive re-labelling of raw material and products thereof. Some of the export certificates from Lithuania e.g. where attached to consignments from Ukraine. Even export certificates for product from Lithuania had been presented at the customs control. It is thought-provoking that the number of requested export certificates from Belarus exceeds the total number of presented consignments significantly. Although non-compliance with CR 737/90 wasn’t reported by Belarusian laboratories, it is questionable what purpose these additional certificates will serve.

As already pointed out in Chapter 3.4, the Office for Veterinary and Food Control at the border control point Frankfurt (Oder), Germany plays an important role in this game. Although each consignment presented at the custom control will be analysed regarding the contamination with radio-caesium, the kind of sampling from the consignment owns a risk for illicit import of mushrooms exceeding the MPL. It should be assumed that the routine sampling from the rear part of the load will be well known in each country of

origin. Products in compliance with CR 737/90 may be loaded particularly to this part of the truck whereby products with higher level of radioactivity will be hidden. This is highly speculative but some random testing from the entire load should be foreseen which will be quickly be communicated among the traders of such products.

In case that the trader does not intend to release the consignment for free circulation in Germany according Article 1-1 CR 1661/1999, he may decide to select another custom office in any of the European member states. The list of custom offices had been updated in the Official Journal of the European Union (C172, 25.07.2007). In case he does so, the goods will be transported within the EU without prior control till being presented to a custom office. Recently, the control of the export certificate and random market or custom controls are foreseen to ensure the compliance with CR 737/90. From our recent investigation, it can be concluded that at least in Frankfurt (Oder) such a release of products imported in bond for free release is a real serious matter and analysis will be made of each consignment (even though some optimisation regarding the sampling is recommended). Nevertheless, no information could be made available regarding other custom offices, their practises and experiences.

A more detailed mission regarding this topic “illicit trafficking” would be required to answer this question in depth but believed to be not a dominating task for the future.

5 Recommendations to the Commission on agricultural products to be exported to the European Union that may still have a potential to exceed the MPL of radio-caesium

5.1 General remarks

The provision of recommendations to the European Commission upon an update of the Council Regulation (EEC) No. 737/90 with a possible exclusion or uptake of agricultural products to be exported to the European Union that may still have a potential to exceed the MPL of radio-caesium is founded on three bases:

- Review of information about the radio-caesium concentration in the agricultural product considered, collected from any notification (RASFF, border control, market control mission), reported by a third country via a returned questionnaire or identified from a literature research.

- Review of the distribution pattern and recent contamination of the soil in the third country

- Proof on the adequacy of the regulatory controls in the third country, mainly affecting the role of authorities and laboratories.

In principal, a failure in compliance in the third field of investigations (Proof on the adequacy of the regulatory controls) in any of the countries contacted would lead to an automatic conservation of the current list of product to which CR 737/90 is applicable. Unfortunately, several of the third countries did not provide the requested information. A compliance with CR 737/90 couldn't be assumed and especially for the most affected countries Russia, Belarus and Ukraine is unlikely for some products. That would lead to the recommendation to carry out a mission at least in these countries to gain a most detailed overview on the current situation and efficiency of regulatory control. Sure, such missions seem to be desirable but only feasible for Ukraine which may be considered as a candidate country, while for Russia and Belarus such a mission can be excluded for political reasons.

5.2 Recommendations to the Commission in form of an updated list of products for the purpose of revising ComR 1609/2000

Based on our assessment of the transfer of radio-caesium from the ground into the food chain, the following products out of the list of products to which CR 737 / 90 will be applicable may still have the potential to exceed the MPL (Table 5-1):

Table 5-1: Relevant agricultural products (according CR (EC) No. 1609/2000 and CR (EC) No. 1719/2005)

CN Code Chapter	Product description	Remark/ Potential to exceed the MPL	CR 737/90 should be applicable (product should remain in 1609/2000)
SECTION I	**LIVE ANIMALS; ANIMAL PRODUCTS**		
CHAPTER 1	**LIVE ANIMALS**		
0101 19 10	Live horses, other than pure-bred breeding animals, for slaughter	Unlikely, only in areas with an initial deposition >1.600 kBq/m²	NO
0102 90	Live bovine animals, other than pure-bred breeding animals, domestic species	Unlikely, only in areas with an initial deposition >1.200 kBq/m²	NO
0103 91	Live swine, other than pure-bred breeding animals, weighing less than 50 kg	Wild boar in case that the initial deposition > 4 kBq/m²	Yes
0103 92	Live swine, other than pure-bred breeding animals, weighing 50 kg or more	Wild boar in case that the initial deposition > 4 kBq/m²	Yes
0104 10	Live sheep, other than pure-bred breeding animals	Yes, in case that the initial deposition was >50kBq/m²	YES
0104 20 90	Live goats, other than pure-bred breeding animals	Yes, in case that the initial deposition was >50kBq/m²	YES
0105	Live poultry, that is to say, fowls of the species *Gallus domesticus*, ducks, geese, turkeys and guinea fowls	No	NO
0106 00	Other live animals	Roe deer, dear reindeer, elk (Moose) in case	YES

CN Code Chapter	Product description	Remark/ Potential to exceed the MPL	CR 737/90 should be applicable (product should remain in 1609/2000)
		that the initial deposition > 10 kBq/m²	
CHAPTER 2	**MEAT AND EDIBLE MEAT OFFAL**		
	All	Meat , edible flours and meals of meat and meat offal from animals as mentioned from Chapter 1	YES
0210 99 31	Of reindeer		YES
CHAPTER 3	**FISH AND CRUSTACEANS, MOLLUSCS AND OTHER AQUATIC INVERTEBRATES**	**Predatory freshwater fish, not from fish farming industry, not from rivers or streams**	
0301 99 19	Other live freshwater fish	Unlikely, only in areas with an initial deposition >100 kBq/m²	NO
0302 69 19	Other Freshwater Fish, fresh or chilled, excluding fish fillets and other fish meat	Unlikely, only in areas with an initial deposition >100 kBq/m²	NO
0303 79 19	Other Freshwater Fish, frozen, excluding fish fillets and other fish meat	Unlikely, only in areas with an initial deposition >100 kBq/m²	NO
0304 19 19 0304 19 91 0304 29 19 0304 99 21	Other Freshwater Fish fillets and other fish meat (whether or not minced), fresh, chilled or frozen:	Unlikely, only in areas with an initial deposition >100 kBq/m²	NO
0305 30 90 0305 49 80 0305 59 80 0305 69 80	Other freshwater Fish, dried, salted or in brine; smoked fish, whether or not cooked before or during the smoking process; flours, meals and pellets of fish, fit for human consumption:	Unlikely, only in areas with an initial deposition >100 kBq/m²	NO

CN Code Chapter	Product description	Remark/ Potential to exceed the MPL	CR 737/90 should be applicable (product should remain in 1609/2000)
0307 60 00	Snails, other than sea snails	Unlikely, only in areas with an initial deposition >2000 kBq/m²	NO
CHAPTER 4	**DAIRY PRODUCE; BIRDS' EGGS; NATURAL HONEY; EDIBLE PRODUCTS OF ANIMAL ORIGIN, NOT ELSEWHERE SPECIFIED OR INCLUDED**		
ex Chapter 4	Dairy products; birds' eggs; edible products of animal origin, not elsewhere specified or included, except products of CN codes 0408 11 20, 0408 19 20, 0408 91 20 and 0408 99 20 (Egg products, dried, unfit for human exposure)	Unlikely	NO
0409 00 00	Natural honey	Unlikely	NO
SECTION II	**VEGETABLE PRODUCTS**		
CHAPTER 7	**EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS**		
ex 0709 59	Mushrooms, fresh or chilled, other than cultivated mushrooms	YES	YES
0710 80 69	Mushrooms (uncooked or cooked by steaming or boiling in water), frozen, other than cultivated mushrooms	YES	YES
0711 59 00	Mushrooms provisionally preserved (for example, by sulphur dioxide gas, in brine, in sulphur water or in other preservative solutions),	YES	YES

CN Code Chapter	Product description	Remark/ Potential to exceed the MPL	CR 737/90 should be applicable (product should remain in 1609/2000)
	but unsuitable in that state for immediate consumption, other than cultivated mushrooms		
0712 39 00	Dried mushrooms, whole, cut, sliced, broken or in powder, but not further prepared other than cultivated mushrooms	YES	YES
CHAPTER 8	EDIBLE FRUIT AND NUTS; PEEL OF CITRUS FRUIT OR MELONS		
ex 0802 2 ex 0802 3 0802 40 00 0802 50 00	Nuts, fresh or dried, whether or not shelled or peeled, except tropical nuts	Yes, in case that the initial caesium deposition in 1986 exceeded 60 kBq/m²	YES
0810 40	Cranberries, bilberries and other fruits of the genus *Vaccinium*, fresh	Yes, in case that the initial caesium deposition in 1986 exceeded 60 kBq/m²	YES
0811 90 50	Fruits of the species *Vaccinium myrtillus,* uncooked or cooked by steaming or boiling in water, frozen, whether or not containing added sugar or other sweetening matter	Yes, in case that the initial caesium deposition in 1986 exceeded 60 kBq/m²	YES
0811 90 70	Fruits of the species *Vaccinium myrtilloides* and *Vaccinium angustifolium* uncooked or cooked by steaming or boiling, in water, frozen, whether or not containing added sugar or other sweetening matter	Yes, in case that the initial caesium deposition in 1986 exceeded 60 kBq/m²	YES
0812 90 40	Fruits of the species *Vaccinium myrtillus*, provisionally preserved (for example, by sulphur dioxide gas, in brine, in sulphur water or in other preservative solutions), but unsuitable in that state for immediate consumption	Yes, in case that the initial caesium deposition in 1986 exceeded 60 kBq/m²	YES

CN Code Chapter	Product description	Remark/ Potential to exceed the MPL	CR 737/90 should be applicable (product should remain in 1609/2000)
Section IV	**Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes**		
CHAPTER 16	PREPARATIONS OF MEAT, OF FISH OR OF CRUSTACEANS, MOLLUSCS OR OTHER AQUATIC INVERTEBRATES		
1601 00	Sausages and similar products, of meat, offal or blood; food preparations based on these products	Made from animals as mentioned from Chapter 1	YES
1602	Other prepared or preserved meat, meat offal or blood	Made from animals as mentioned from Chapter 1	YES
ex 1603 00	Extracts and juices of meat	Made from animals as mentioned from Chapter 1	YES
CHAPTER 20	PREPARATIONS OF VEGETABLES, FRUIT, NUTS OR OTHER PARTS OFPLANTS		
2001 90 50	Mushrooms, prepared or preserved by vinegar or acetic acid, other than cultivated mushrooms	YES	YES
2003 20 00 2003 90 00	Mushrooms, prepared or preserved otherwise than by vinegar or acetic acid, other than cultivated mushrooms	YES	YES

For some of the mentioned products (fish, molluscs, nuts, honey), the data base is incomplete and weak. Based on the assumption and using transfer factors as given in Section 4.5, exceeded levels of radio-caesium might be calculated but will be highly speculative. Affirming alert or information notifications hadn't been reported to the RASFF and such non-compliance with MPLs as given in CR 737/90 were not found in the literature. Therefore, these products should kept excluded from the list of agricul-

tural products to which CR 737/90 is applicable. One exception should be made for nuts as the required initial deposition of radio-caesium to reach the MPL is in the order of 60 kBq/kg, similar to the initial deposition used to calculate the transfer to berries of the genus Vaccinium that had been reported to exceed the MPL in several notifications.

5.3 Assessment of the likely duration of the potential to exceed the MPL for radio-caesium concerning the above identified agricultural products

In general, the limit of 600 Bq/kg (fresh weight) can be exceeded if the deposition onto forest soil in 1986 was higher than 20 kBq/m² for the most important species of Chantarella and Boletus. For some other mushroom species with minor importance, this limit was set at 10 kBq/m². For dried mushrooms the same limits can be taken if assuming a realistic water content of at least 90% (see also CR No 616/2000). Consequently, those areas where still radio-caesium in the upper soil layers will exceed 20 or 10 kBq/m² will have the probability to cause radio-caesium concentrations in mushrooms that will exceed the MPL.

If the concentration of radio-caesium is only decreasing by decay the concentration will half within 30 years. In fact the concentration in the upper soil layers soil is decreasing further because of erosion and infiltration into deeper soil layers. While erosion always leads to a decrease of the caesium concentration in foodstuffs, infiltration into the soil can have different effects. Some mushrooms, especially false truffles, take up caesium from deep soil layers, therefore the concentration of radio-caesium in false truffles will continue to increase until the effect of decay is stronger than the effect of infiltration. Erosion will hardly take place in forests, the habitat of false truffle. It is not possible to give a date for the peak activity because the forest soils all over Europe are not identical.

The rootage (organic matter) of most plants is in the upper 10 to 30 cm of the soil. The peak concentration of radio-caesium in plants which take up water and caesium from the upper 10 cm will be many years prior than the peak concentration of plants which take up water and caesium from a deeper layer. The infiltration velocity is dependent on many features which can vary widely. Because of this uncertainty the effect of infiltration will be neglected except for mushrooms in deep soil layers. The effect of erosion can be neglected to, because the plants which now are suspicious to contain much

caesium grow in natural and semi natural habitats where the canopy is standing all over the year. Such habitats are not as much affected by erosion as cultivated fields which are bare for many months of the year.

Erosion which takes place in agricultural fields leads to a steady input of radio-caesium into water bodies. Therefore the caesium concentration in standing water bodies like ponds and lakes which are fed by small creeks will hardly decrease except by decay.

Based upon the above mentioned mechanisms a cautious, prediction of the development of the radio-caesium concentration in foodstuffs can be made. The prediction period ends in about 2040. Beyond this time the probability that the prediction is over conservative is far too high.

5.3.1 Mushrooms

The caesium concentration in wild mushrooms like Xerocomus badius from Belarus, Russia and Ukraine, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia, Moldova, Montenegro, Norway and Switzerland will probably remain too high for trading for at least three decades. In 2040, trade of most mushrooms of the class dominated by King boletus and chanterelle will have to be restricted only if the country of origin is one of the three exceptionally affected countries Russia, Belarus and Ukraine as well as Norway. Nevertheless, the potential to exceed the MPL is also given for the Former Yugoslav Republic of Macedonia, Moldova, Montenegro and Switzerland, where small areas with an initial radio-caesium deposition above 20 kBq/m² had been found or extrapolated according to /EEC 98/. Even these countries will predominantly produce safe mushrooms, but the products will have to be checked.

5.3.2 Plants

According to Table 4-12 it is recently assumed that the MPL in berries (from acidic soils) and nuts could be exceeded in Belarus, Ukraine and Russia and Norway. Nevertheless, the potential to exceed the MPL is also given for Croatia, the Former Yugoslav Republic of Macedonia and Switzerland, where small areas with an initial radio-caesium deposition above 60 kBq/m² had been found or extrapolated according to /EEC 98/. Due to the small areal extension of higher contaminated sites in connection

with the radioactive decay the restrictions on berries and nuts can probably be cancelled in about 20 years. Only products from Belarus, Ukraine and Russia will have to be checked first.

5.3.3 Live animals and meat

In the case of **wild boar** the Table 4-13 will remain valid for some decades. In fact, radio-caesium concentration in meat of wild boar shot in spring and summer will lie within the accepted boundaries in most regions but the problems arise in autumn due to the preferential uptake of higher contaminated feed, especially truffles. Truffles are growing in the highest contaminated soil layer. Because the vertical penetration of radio-ceasium into deeper soil layers in forest soil is very slowly, the Cs 137-activity will remain in the layer where the truffles are growing for longer time, i.e. the radioactive decay is the only relevant process which cause the decrease of the contamination of wild boar.

Reindeer meat from Norway and, probably also from Russia will be suspicious for at least thirty more years. The other highly affected countries in Europe are supposed not to export reindeer meat. The reindeer husbandry in Russia where recently the total number of domesticated reindeer amount to about 1.2 million is predominantly conducted by indigenous peoples living in the northern and north eastern parts of the Russian Federation /MOA 07/. The contamination level of these areas is always less than 10 kBq/m² or even less than 2 kBq/m² as can bee seen from Figure 4-8 compared to the distribution pattern of reindeer herds in Russia /MOA 07/.

Roe deer and **deer** meat from Belarus, Russia and Ukraine, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia, Moldova, Montenegro, Norway and Switzerland will remain suspicious for at least 30 years. For **moos** the same initial contamination limit is assumed as for roe deer and deer, but the occurrence of moos is limited to Belarus, Norway, Russia and Ukraine, i.e it will also remain suspicious for at least 30 years in these countries.

Meat from **goat** and **sheep** from Belarus, Ukraine and Russia and Norway should still be checked in thirty years time. The other countries of origin will be safe than.

5.3.4 Fish

The calculation of the radio-caesium concentration in fish flesh done in Section 4.5 is highly speculative. The outcome is that only piscivorous fish from lakes and ponds without intensive farming in regions in Russia, Belarus and Ukraine as well as Norway, can exceed the level of 600 Bq/kg if the potassium content of the water is 1 mg/l or less and the water exchange rate (dilution) is weak. Although actual measuring values on Cs 137- concentration in fish from these countries which prove the excess of MPL in piscivorous fish like pike, pike-perch or catfish are not available, water bodies having the above described features are prevalent in areas with the “Chernosem” soil type. That exactly concerns the mentioned countries. In such water bodies with a potassium content of 1 mg/l the water –fish accumulation factor for caesium is in the range of 6,000 to 8,000 for piscivorous fish /WEI 84/. According to /BUC 02/ the Cs 137-concentration in catfish from the Chernobyl NPP cooling pond was about 5,000 Bq/kg in 2001. The corresponding Cs-137-concentration in the water of the pond was 1 Bq/l (in comparison: the limit of Cs 137 in drinking water according to the Ukrainian drinking water ordinance is 2 Bq/l) and a potassium content of 2 mg/l was measured.

Furthermore, according to the data provided by the Norwegian Authority, the excess of the Cs 137 activity concentration in such piscivorous freshwater fish could be assumed if the reported results from freshwater fish of the slightly contaminated Finnmark region in northern Norway /ANO 05/ are extrapolated to higher contaminated areas in middle Norway with an initial contamination between 40 kBq/m^2 and 185 kBq/m^2, i.e. 2 to 3 orders of magnitude higher than in the Finnmark region.

Nevertheless, actual measuring data on Cs 137 in fish from these areas are needed to proof this assumption.

5.4 Recommendations on exclusion of countries

No exclusion of countries form the list of third countries was targeted by this project but some ideas for further actions will be given:

- The assumption of transfer of radio-caesium into agricultural products is based on the initial deposition pattern on the ground.

- High aggregated transfer factors can be found for wild boar.

- There is, without doubt, no relevance for some products (like elk meat or reindeer from Serbia) but it will be hard to cummunicate between the members of the European Union that mushrooms from one third country might get excluded from regulations and from another need to comply with CR 737/90.

Therefore the list of products where CR 737/90 is applicable cannot separate between the third countries.

The assessment of the likely duration indicates that a control of certain product will be recommended for years especially for higher contaminated territories. In fact, Russia, Belarus and Ukraine will play the major role in future with some small proportions by Norway. Due to that, it needs to be assumend that certain agricultural prodcuts will be traded in the third countries within the next decades. No administrative control of this trade by the European Commission is foreseen or enabled neither favoured by the EU or the third countries. As long as the member states of the European Country will not be able to ensure that products from either Russia, Belarus or the Ukraine (especially mushrooms) will bear the possibility to be dispatched via other third countries to the EU, it is recommended to insist at least on the export certificates for mushrooms according to Annex 1 of CR 1635/2006 as a prove of the origin of the product. Sure, such certificates would also be useful for the other mentiond agricultural products which are proposed for remaining in list of products where CR 737/90 is applicable, but it is voluntary only.

The list of third countries as updated in CR 1635/2006 includes territories with initial contamination rather low (like European part of Turkey), countries with very inhomogeneous distribution pattern due to the meteorological condition during the passage of the

radioactive cloud as well (like Switzerland) and countries without any provided information about the radio-caesium concentration on the ground (like Asian part of Turkey, F:Y.R.M., Bosnia-Herzegovina, Yugoslavia, Serbia, Albania). Taking to account the decay since 1986, it might be possible to exclude countries from this list that comply with the following requirements.

- The recent surface concentration will not exceed 4 kBq/m² anymore.
- The distribution pattern had been determined for the whole territory of the country and information had been provided to the EC.
- No products according to Annex I of CR 1635/2006 will be traded to the EC.
- In case that products to which CR 737/90 is applicable will be traded to the EC, dispatched or be used as an ingredient in other products, a complete chain of certifications regarding the country of origin will be provided.

Turkey might be such a candidate but the distribution pattern of the Asian part isn't yet shown in the "Atlas of caesium deposition on Europe after the Chernobyl accident" /EEC 98/ although such information is believed to be available.

6 Conclusions and proposals for further activities

The project was devoted to the identification of agricultural products which might exceed the maximum permitted level (MPL) of radioactive caesium laid down in Article 3 of Council Regulation (EEC) No. 737/90. Council Regulation (EEC) 737/90 shall expire on 31 March 2010. Before that date, the Commission has to review the current list of products in the light of the radiological situation in the relevant third countries and has to decide on the basis of the results of this review whether it should propose a further extension of the validity of Regulation (EEC) No 737/90 to the Council. Based on the results of this project, the contractor made recommendations to the Commission in the form of an updated product list for the purpose of revising the Commission Regulation (EC) No. 1609/2000.

An in-depth review for responsible national authorities and involved laboratories as well as a collection of recently active producers / trader had been performed, resulting in a huge contact list made available to the Commission.

A questionnaire was spread among involved parties from third countries, asking specific questions related to the filed of responsibilities of competent authorities, laboratories and producers.

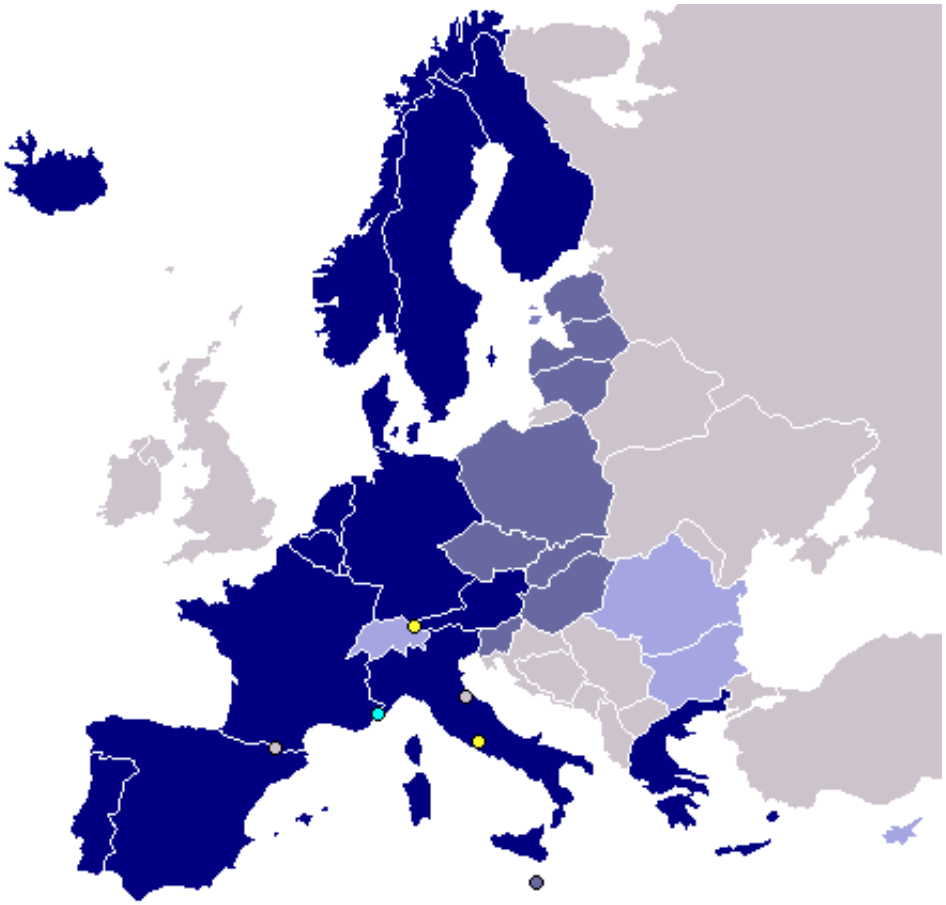
Many valuable side-information were collected during this study regarding the daily routine work at a custom office in Frankfurt (Oder), Germany. Some questions regarding the procedures of control were raised and the potential for illicit trade was evaluated.

An assessment of the radio-caesium transfer from the environment into the food chain and the likely duration of agricultural products to exceed the MPL allow a forecast of the future level of contamination of foodstuffs.

- **EU Enlargement**

The enlargement of the EU to the East is associated to a slow approach of the EU outer border line towards the source of contamination responsible for radio-caesium in

agricultural products, namely the ChNPP, respectively the highly contaminated areas in Belarus, the Ukraine and Russia (see also Figure 6-1)



Implementing countries

Implementing through partnership with a signatory state

Members implementing from 21 December 2007 (overland borders and seaports) and 29 March 2008 (airports)

Members (not yet implemented)

Expressed interest in joining

Figure 6-1: Schengen border situation at recent times

Due to differing social-cultural structures, new kinds of agricultural product may enter the market of the European Union, yet not in the focus of CR 737/90 but probably worth to be controlled (like some fish foodstuffs). Attention should be paid to this phenomena

in future whereby the extent of the trade with yet unconsidered agricultural product is hard to predict.

Potential for export could also be assessed basing upon EUROSTAT to support our recommendations on “rejection” or “re-introducing” of certain agricultural products from the list of CR 1609/2000. On the other hand it must be pointed out that the EUROSTAT data on import of the concerning agricultural products give only a picture from the past while an import into EU in future can not be excluded.

Attention must also be paid to the actual situation where the eastern and south-eastern outer borders of EU came closer to the source of contamination and therefore to areas with higher initial contamination. That could be a reason to reintroduce special food-stuffs again which were exclude in the past (e.g. freshwater fish) in the list of CR 1609/2000. In addition, the potential of export of agricultural products according to CR 1609/2000 to EU is increasing for economical reasons due to the reduced distance for transport on roads or by rail.

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Commission Regulation (EC) No 727/97 of 24 April 1997 establishing a list of products excluded from the application of Council Regulation (EEC) No 737/90 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power station

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8 Appendix

8.1 Annex 1: Extract from the Access Data Base “Contact Data”

Country	InstitutionKind	InstitutionName
Albania	Governmental Authority	Directorate of Food Quality and Inspection, Documentation Centre, Ministry of Agriculture and Food, Skenderbe sq, Tirana
Albania	Governmental Authority	Ministry of Agriculture, Food and Consumer Protection (MAFCP) Directorate General of Food Security & Consumers, Directory of Food security, Sector Food security
Belarus	Governmental Authority	Belarus State University (BSU)
Belarus	Governmental Authority	MES - Ministry for Emergency Situations
Belarus	Governmental Authority	Ministery of Agriculture of the Rep. Of BY
Belarus	Governmental Authority	Ministry of Natural Resources and Environmental Protection of the Republic of Belarus
Belarus	Governmental Authority	State Committee for Standardization, Metrology and Certification (Gosstandard) of the Republic of Belarus.
Belarus	Governmental Authority	The Departament on the Liquidation of the Consequences of the Catastrophe at the Chernobyl NPP
Belarus	Laboratory	Belarusian State Institute of Metrology (BelGIM)
Belarus	Laboratory	Center of Standards and Metrology
Belarus	Laboratory	Division Gosnadzor for means of dimension of the Gomel Center Metrology and Certification
Belarus	Laboratory	Ministry on Emergency Situations of the Republic of Belarus
Belarus	Laboratory	RCRCM Republican Centre of Radiation Control and Environment Monitoring
Belarus	Laboratory	Remediation Polluted territories Laboratory
Belarus	Laboratory	Republic´s Unitary Company "Grodno CSMS". Laboratory of radiological control
Belarus	Laboratory	Standard Laboratory Measurement of Activity
Belarus	Laboratory	The National Academy of Sciences of Belarus
Belarus	Producer/ Exporter	ABC Firm
Belarus	Producer/ Exporter	AVI V. Gitkauskas
Belarus	Producer/ Exporter	Belarussian Chamber of Commerce
Belarus	Producer/ Exporter	CLC "VEGO"
Belarus	Producer/ Exporter	Farm " Fruit Land"
Belarus	Producer/ Exporter	Firm "Moka" LTD

Country	InstitutionKind	InstitutionName
Belarus	Producer/ Exporter	FP "Setton"
Belarus	Producer/ Exporter	JLLC "Berry-Trade"
Belarus	Producer/ Exporter	Kreo - Produkt, Ltd.
Belarus	Producer/ Exporter	OOO "Agranik"
Belarus	Producer/ Exporter	Pana-Fruit GmbH
Belarus	Producer/ Exporter	Paparat-Kvetka GmbH
Belarus	Producer/ Exporter	PPTUE Ukraset
Belarus	Producer/ Exporter	SOOO "LIDVARE"
Bosnia and Herzegowina	Governmental Authority	Ministry of Agriculture, Forestry and Water Management
Bosnia and Herzegowina	Governmental Authority	Ministry of International Economic Relations
Bosnia and Herzegowina	Governmental Authority	Nutrition / Health / Consumer Protection
Bosnia and Herzegowina	NGO	Association of Producers and Users of Healthy Food in Upper Vrbas Region, Jajce
Croatia	Governmental Authority	Croatian Standards Institute (HZN), National Codex Contact Point, Ms. Tea Havranek, pp 167, 10002 Zagreb
Croatia	Laboratory	Ministry of Agriculture, Forestry and Water Management
Liechtenstein	Governmental Authority	Amt für Lebensmittelkontrolle und Veterinärwesen (ALKVW)
Liechtenstein	Governmental Authority	Amt für Umweltschutz
Macedonia	Governmental Authority	Republic Institute for Health Protection
Macedonia	Governmental Authority	Republic Institute for Health Protection, Codex Alimentarius
Moldavia	Governmental Authority	Ministry of Agriculture and Food Industry (MAFI)
Moldavia	Governmental Authority	Ministry of Agriculture and Food Industry (MAFI), Directorate of Foreign Relations and European Integration
Moldavia	Governmental Authority	Ministry of Health, National Centre for Applied and Scientific Preventive Medicine
Moldavia	Governmental Authority	State Agrarian University of Moldova
Montenegro	Governmental Authority	Ministry of Agriculture, Forestry and Water Management
Montenegro	Governmental Authority	Ministry of Health, Labour and Social Welfare
Norway	Governmental Authority	Minisatry of Environment
Norway	Governmental Authority	Ministry of Agriculture and Food
Norway	Governmental Authority	Norwegian Scientific Committee for Food Safety
Norway	Governmental	Statistics Norway

Country	InstitutionKind	InstitutionName
	Authority	
Norway	Governmental Authority	The Costums and Excise Authority
Norway	Governmental Authority	The Norwegian Food Safety Authority
Norway	Governmental Authority	The Norwegian Ministry of Fisheries and Costal Affairs
Norway	Governmental Authority	The Norwegian Radiation Protection Authority
Russia	Governmental Authority	Akademia veterinarnoj medizina
Russia	Governmental Authority	Federal State Statistics Service
Russia	Governmental Authority	Institute of Nutritition of the Russian Academy of Medical
Russia	Governmental Authority	International Center for Environmental Safety of Minatom RF
Russia	Governmental Authority	Ministerstvo sdravoohkranenia RF
Russia	Governmental Authority	Ministerstvo selskovo rosyaistvo RF, Dep. Okhroditshevorosyaistvo
Russia	Governmental Authority	Ministerstvo selskovo rosyaistvo RF, Dep. Pishevoi, pererabatujbayushey promyshlenosti i katshestva
Russia	Governmental Authority	Ministerstvo selskovo rosyaistvo RF, Dep. rybolovtsva
Russia	Governmental Authority	Ministerstvo selskovo rosyaistvo RF, Dep. Veterinary i shivotnovodstva
Russia	Governmental Authority	RIARAE - Russian Institute of Agricultural Radiology and Agroecology, Obninsk
Russia	Governmental Authority	State organisation A.N. Sysin Research Institute of Human Ecology and Environmental Health
Russia	Governmental Authority	The Moscow State Academy of Veterenary Medicine and Biotechnology
Russia	Governmental Authority	Vetkom-Bars OOO
Russia	Laboratory	FGU "Nishegorodsky Referentnuj Zentr"
Russia	Laboratory	FGU Orlovskij Referentnuj Zentr
Russia	Laboratory	FGUS "Zentr Gigienuj i Epidemologij v Kalushskoi Oblasti"
Russia	Laboratory	FGUZ CGIE IN RME, Section Radioactivit
Russia	Laboratory	Filial FGUS "Zentr gigienuj i epidemologij v Lushskom rajone"
Russia	Laboratory	Gorodskaya Veterinarnaya Laboratoria S. Peterburgskaya GU
Russia	Laboratory	Gorodskaya Veterinarnaya Laboratoria S. Peterburgskaya GU, Ispuitatelnuj Zentr
Russia	Laboratory	Gorodskaya Veterinarnaya Laboratoria S. Peterburgskaya GU, Radiologitshesky Otdel
Russia	Laboratory	Krasnoyarsk Center of Standardization and Measurement
Russia	Laboratory	Laboratoria Otdela Radiogigienuj
Russia	Laboratory	State St. Petersburg Veterinary Laboratory of Test Centre
Russia	Laboratory	Upravlenie Federalnoj Slushbuj po Vetreinarnomu i Fitosanitarnoj Nadsoru

Country	InstitutionKind	InstitutionName
Russia	NGO	International Academy of Ecology and Life Protection Sciences (MANEB)
Russia	Producer/ Exporter	"Kantarella" GmbH
Russia	Producer/ Exporter	"Siberian Wonder" LLC
Russia	Producer/ Exporter	"TEOS" Ltd.
Russia	Producer/ Exporter	JSC KRASPILZ
Russia	Producer/ Exporter	OOO "AURA"
Russia	Producer/ Exporter	OOO "Juonius"
Russia	Producer/ Exporter	OOO "Praimfruit"
Russia	Producer/ Exporter	OOO "Promsevis-NN"
Russia	Producer/ Exporter	OOO "SM"
Russia	Producer/ Exporter	OOO "STIN"
Russia	Producer/ Exporter	SAO "Dariles"
Russia	Producer/ Exporter	SAO "Jana-LISI"
Russia	Producer/ Exporter	SAO "Roslita"
Serbia	Governmental Authority	Crop and Vegetable Scientific Institute
Serbia	Governmental Authority	Institute for Standardization of Serbia (ISS)
Serbia	Governmental Authority	Ministry of Health
Serbia	Governmental Authority	Ministry of International Economic Relations
Serbia	Governmental Authority	Ministry of Science and Environmental Protection
Serbia	Governmental Authority	The Institute of Agricultural Economics (IAE) Crop and Vegetable Scientific Institute Ministry of Science and Environmental Protection The Ministry of International Economic Relations
Serbia	Laboratory	Institute for Nuclear Sciences Vinca; Laboratory of Radiation and Environmental Protection
Switzerland	Governmental Authority	Bundesamt für Gesundheit (BAG)
Switzerland	Governmental Authority	Bundeseinheit für die Lebensmittelkette (BLK)
Turkey	Governmental Authority	Ministry of Agriculture and Rural Affairs, General Directorate of Protection and Control, Akay Cad. No 3 Bakanliklar, Ankara
Turkey	Governmental Authority	The Ministry of Agriculture and Rural Affairs, Food Control Services Department General Directorate of Protection and Control
Ukraine	Governmental Authority	Ministry of Agrarian Policy

Country	InstitutionKind	InstitutionName
Ukraine	Governmental Authority	Ministry of Enviromental Protection of Ukraine
Ukraine	Governmental Authority	Ministry of Health
Ukraine	Governmental Authority	Ministry on Emergencies and Affairs of Population Protection from the Consequences of Chornobyl Catastrophe (MECA)
Ukraine	Governmental Authority	SEC for Radiol., Hydrogeol., Environm., and Ecol. Studies, National Academy of Sciences
Ukraine	Governmental Authority	UIAR - Ukrainian Institute of Agricultural Radiology
Ukraine	Laboratory	Division Gosnadzor for Means of Dimension of the Chernigov Center
Ukraine	Laboratory	Santitary-Epidemiological Station of Manevichi
Ukraine	Laboratory	Santitary-Epidemiological Station of the Chernigivska Oblast
Ukraine	Laboratory	Santitary-Epidemiological Station of the Rovno Oblast
Ukraine	Laboratory	Santitary-Epidemiological Station of Zhitomir
Ukraine	Laboratory	Ukoopspylka
Ukraine	Producer/ Exporter	"UKRRYBGOSP"
Ukraine	Producer/ Exporter	43000, Lutzk, Str. Sobornosti, 42 A 80-79
Ukraine	Producer/ Exporter	Agroindustrial exchange "Donbas"
Ukraine	Producer/ Exporter	Corporation "Agroprombirzha"
Ukraine	Producer/ Exporter	CR "EKOMA"
Ukraine	Producer/ Exporter	EuroFeed (Jewrokorm)
Ukraine	Producer/ Exporter	General agency, Chelmenitsky Oblast
Ukraine	Producer/ Exporter	General agency, Chornomorsc commodity exchange of agroindustrial complex
Ukraine	Producer/ Exporter	General agency, Crimea universal exchange
Ukraine	Producer/ Exporter	General agency, Donetsc commodity exchange
Ukraine	Producer/ Exporter	General agency, Ivano-Phrankovsc agrarian exchange
Ukraine	Producer/ Exporter	General agency, Kharkov commodity exchange
Ukraine	Producer/ Exporter	General agency, Kiev agroindustrial exchange "Kievagroprombirzha"
Ukraine	Producer/ Exporter	General agency, Mariupol universal commodity exchange
Ukraine	Producer/ Exporter	General agency, Odessa commodity exchange
Ukraine	Producer/ Exporter	General agency, Podyl specialyzed agrarian exchange
Ukraine	Producer/ Exporter	General agency, Poltava regional agroindustrial exchange
Ukraine	Producer/ Exporter	General agency, Pridniprovya commodity exchange

Country	InstitutionKind	InstitutionName
Ukraine	Producer/ Exporter	General agency, Prikarpatya regional commodity exchange
Ukraine	Producer/ Exporter	General agency, Rivne commodity exchange
Ukraine	Producer/ Exporter	General agency, Sumska Oblast
Ukraine	Producer/ Exporter	General agency, Sumy commodity exchange"Sumyagroprombirzha"
Ukraine	Producer/ Exporter	General agency, The commodity exchange agroindustrial complex of central regions of Ukraine
Ukraine	Producer/ Exporter	General agency, Ukrainian agrarian exchange
Ukraine	Producer/ Exporter	General agency, Ukrainian universal commodity exchange
Ukraine	Producer/ Exporter	General agency, Volynsc specialyzed agrarian exchange
Ukraine	Producer/ Exporter	General agency, West - Ukrainian regional agroindustrial exchange
Ukraine	Producer/ Exporter	General agency, Zaporozhye commodity exchange "Pleya"
Ukraine	Producer/ Exporter	Italspawn
Ukraine	Producer/ Exporter	Lisy Volyni Ltd.
Ukraine	Producer/ Exporter	OAO "Kertschensky Rybokombinat"
Ukraine	Producer/ Exporter	OOO "GELEKA-M"
Ukraine	Producer/ Exporter	Pidprismets Isak S.V.
Ukraine	Producer/ Exporter	PP "NDK - Ukraine"
Ukraine	Producer/ Exporter	PP Popleta I.M.
Ukraine	Producer/ Exporter	Private Enterprise "U.M.B. Export"
Ukraine	Producer/ Exporter	SAO Kotowskovo; Dnjepropetrowsk
Ukraine	Producer/ Exporter	Unknown
Ukraine	Producer/ Exporter	VERES
Ukraine	Producer/ Exporter	Vinnitsa universal commodity exchange
Ukraine	Producer/ Exporter	Zentrum Odessa "Oblgosplodorodye"

8.2 Annex 2: Controlled samples of edible mushrooms from Eastern-Europe at the border control point Frankfurt (Oder) (Majority) , Spree-Neiße and Cottbus-Forst in the Land Brandenburg (Germany) in 2001 - 2007

Controlled samples of edible mushrooms from Eastern-Europe at the border control point Frankfurt (Oder) (Majority) , Spree- Neiße and Cottbus-Forst in the Land Brandenburg (Germany) in 2001

2001	I. Quarter	II. Quarter	III. Quarter	IV. Quarter	Sum
Controlled samples	129	393	4838	1124	6484
Non-complience to CR 737/90	0	0	0	0	0
With export certificate according CR 1661/1999	83	162	2166	536	2947
Other kind of certificate	22	209	2391	404	3026
No certificate	24	22	281	184	511
Country of Origin					
Poland	59	282	2484	507	3332
Belarus	31	71	506	118	726
Lithuania	11	25	485	49	570
Ukraine	1	3	41	20	65
Russia	16	6	286	66	374
Latvia	1	1	17	2	21
Bulgaria	0	0	0	0	0
Estonia	0	0	0	0	0
Kazakhstan	0	0	0	1	1

Controlled samples of edible mushrooms from Eastern-Europe at the border control point Frankfurt (Oder) (Majority) , Spree- Neiße and Cottbus-Forst in the Land Brandenburg (Germany) in 2001

2002	I. Quarter	II. Quarter	III. Quarter	IV. Quarter	Sum
Controlled samples	128	397	2125	927	3577
Non-complience to CR 737/90	0	0	0	0	0
With export certificate according CR 1661/1999	106	163	670	168	1107
Other kind of certificate	21	8	25	3	57
No certificate	1	226	1430	756	2413
Country of Origin					

2002	I. Quarter	II. Quarter	III. Quarter	IV. Quarter	Sum
Poland	31	308	1335	837	2511
Belarus	41	49	197	31	318
Lithuania	16	16	152	16	200
Ukraine	11	8	20	4	43
Russia	24	15	76	34	149
Latvia	4	0	1	0	5
Bulgaria	0	0	0	4	4
Estonia	0	1	2	1	4
P.R. China	1	0	0	0	1

Controlled samples of edible mushrooms from Eastern-Europe at the border control point Frankfurt (Oder) (Majority) , Spree- Neiße and Cottbus-Forst in the Land Brandenburg (Germany) in 2001

2003	I. Quarter	II. Quarter	III. Quarter	IV. Quarter	Sum
Controlled samples	54	55	2379		2488
Non-complience to CR 737/90	0	0	0		0
With export certificate according CR 1661/1999	46	32	1162		1240
Other kind of certificate	0	0	0		0
No certificate	17	23	1217		1257
Country of Origin					
Poland	15	37	1277		1329
Belarus	17	4	483		504
Lithuania	9	3	253		265
Ukraine	4	3	36		43
Russia	8	7	316		331
Latvia	1	0	9		10
Bulgaria	0	0	0		0
Estonia	0	1	4		5
Kazakhstan	0	0	1		1

Controlled samples of edible mushrooms from Eastern-Europe at the border control point Frankfurt (Oder) (Majority) , Spree- Neiße and Cottbus-Forst in the Land Brandenburg (Germany) in 2001

2004	I. Quarter	II. Quarter	III. Quarter	IV. Quarter	Sum
Controlled samples	75	15	No Monitoring	No Monitoring	90
Non-complience to CR 737/90	0	0			0
With export certificate according CR 1661/1999	75	11			86
Other kind of certificate	0	0			0
No certificate	0	4			4
Country of Origin					
Poland	25	8			33
Belarus	28	4			32
Lithuania	15	1			16
Ukraine	3	0			3
Russia	21	1			22
Latvia	6	0			6
Bulgaria	2	1			3
Estonia	0	0			0
Kazakhstan	0	0			0

Controlled samples of edible mushrooms from Eastern-Europe at the border control point Frankfurt (Oder) (Majority) , Spree- Neiße and Cottbus-Forst in the Land Brandenburg (Germany) in 2001

2005/2006	I. Quarter	II. Quarter	III. Quarter	IV. Quarter	Sum
Controlled samples	No Monitoring	No Monitoring	No Monitoring	No Monitoring	
Non-complience to CR 737/90					
With export certificate according CR 1661/1999					
Other kind of certificate					
No certificate					
Country of Origin					
Poland					

2005/2006	I. Quarter	II. Quarter	III. Quarter	IV. Quarter	Sum
Belarus					
Lithuania					
Ukraine					
Russia					
Latvia					
Bulgaria					
Estonia					
Kazakhstan					

Controlled samples of edible mushrooms from Eastern-Europe at the border control point Frankfurt (Oder) (Majority) , Spree- Neiße and Cottbus-Forst in the Land Brandenburg (Germany) in 2007; * = Data from evaluated export certificates controlled at Frankfurt (Oder) ** Data until 10. 08. 07. *** Data until 29.11.2007

2007	I. Quarter* 07	II. Quarter* 07	III. Quarter** 07	III + IV. Quarter*** 07	Sum
Controlled samples	68	45	128	637	750
Non-compliance to CR 737/90	0	0	0		0
With export certificate according CR 1635/2006	68	45	128	637	750
Other kind of certificate					
No certificate					
Country of Origin					
Poland	0	0	0		0
Belarus	44	32	72		148
Lithuania	0	0	0		0
Ukraine	21	10	10		32
Russia	12	3	46		61
Latvia	0	0	0		0
Bulgaria	0	0	0		0
Estonia	0	0	0		0
Kazakhstan	0	0	0		0