

MINISTRY OF WATERS AND ENVIRONMENTAL PROTECTION

**CODE OF GOOD AGRICULTURAL PRACTICES
FOR FARMERS' USE**

**VOL. II - WATER PROTECTION AGAINST POLLUTION WITH
PESTICIDES AND OTHER POLLUTANTS GENERATED BY
AGRICULTURE**

**BUCHAREST
2002**

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I INTRODUCTION

1. In order to be competitive and efficient, the agriculture became a major destructive and polluting factor of environment due to the intensive and aggressive agricultural practices, supermechanization and intensively chemical treatments. Water and soil pollution with a multitude of pollutants generated by agriculture, from the nutrients and pesticides to the heavy metals and oil products, severely affect the human health and destroy entire ecosystems. This negative aspect of the present agriculture is also aggravated due to the risk induced even by the agricultural products to the people health having in view that a part of these polluting agents enter the food.
2. If until recently, the quality, besides the productivity, was the priority for assuring the profitability, now the food security occurs as a new priority all over the world, representing a major factor in the future evolution of agriculture. In this context, the codes of good agricultural practices, besides the codes of the good practices for food production and the code of food are becoming instruments valuable not only for the struggle for the environmental protection, but also for assuring and functioning the food security system.
3. This work refers to the good practices and recommendations regarding the products used for plant protection, veterinary usage, disinfection, disinsection and washing as well as oil products.
4. The code of good agricultural practices is not a complete and final document, it follows to be completed and supplemented as the interaction between the socio-economic conditions and the scientific knowledge changes and as a sustainable agriculture is going to be achieved.
5. The appropriation and implementation of this code of good agricultural practices will be operated on a voluntary basis by any farmer that has the goodwill, understanding and desire to obtain products of high quality, but also according to the requirements of the food security and to live in a clean, beautiful and prosperous country.

II PLANT PROTECTION

Plant Protection is the science that are studying the crop pest (phytopathogens, phytophagous arthropods, weeds, rodents etc.) with the final goal of establishing methods efficient to control the losses / economical damages produced by those pest. It is generally accepted that 1/3 from the potential yield of a crop is destroyed by pest, thus plant protection, as an applied biology science, contribute to the increase of the yield of crop and of the improvement of quality of the crop products.

6. The aspect of quality improvement is not so obvious. For that reason in this introduction part it will be presented several examples. One of the most obvious is the fruit pest (pre-harvest fruit tree pest and stored fruit pest) that is contributing significantly to quality decrease. Another example is the decrease of the quality of wheat due to the attack of cereal bug (*Eurygaster* spp., *Aelia* spp.). Cereal bug attack produce a reduction of gluten content of wheat, and, consequently a decrease of wheat quality requirement for panification.

7. A less known issue is the pre-harvest contamination of cereal with biological contaminants, and especially with mycotoxines. The classical example is the contamination of corn with aflatoxins produces by corn endo-parasitic fungi from *Aspergillus flavus-parasiticus* group. The aflatoxins are now considered as the most dangerous food biological contaminants, with a maximum level limit of 2 parts per billion (2 mcg per kg).

8. Due to the motifs presented above the pest control is a must for cropped plant, plant protection procedures being integrated in all good agricultural practice guides.

9. The pest control is done by several methods: chemical (involving the use of pesticides), biological (using antagonist and natural pesticides), genetically (through target breeding, aiming to increase the natural resistance of crop to pest), agrotechnics (through agrotechnic practice, include weeding) and physico-mechanical (thermal de-infestation of the seed, vegetal surgery, cleaning of seed from seed of parasitic plant etc).

10. The pesticides are mobile or strong adsorbed on soil organic material. They may be volatile, persistent or rapid degradable.

2.1. Definitions

In this code the terms used are defined as it will presented as follows:

- **Pesticide** is chemical means for plant protection, obtained by formulation of one (or several) active ingredient(s). With very few exception (i.e. plant growth regulator, that control the growth and development of crops, or products based on plant elicitor that acts through an activation of systemic acquired resistance, analogue with animal vaccines) pesticide active ingredients are **toxic** ingredients. This toxicity, thus selective, imposes a code of (distribution) and use of pesticides.

11. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.

- **Formulation** means the combination of various ingredients (solvents, surfactants, cosurfactants, adhesives, suspension agents, ameliorants for cuticular penetration, etc.) designed to render the product useful and effective for the purpose claimed; the form of the pesticide as purchased by users.
- **Conditioning** refers to content, eventually to hydrosoluble package provided with a protector package used for pesticide distribution to final users by wholesale and retail dealers

12. The compounds used for pesticide conditioning are also very important chemical pollutants (organic solvents are similar with detergents for water pollution), therefore represent another reason to elaborate a code of good practices for pesticide use.

- **Application technology.** The actual physical delivery and distribution process of a pesticide to the target organism or to the place where the target organism comes into contact with the pesticide. The pesticides are usually applied **treatments**, either treatment during the **vegetation** of the crop (spraying with different volume of liquid, using ground or aerial means) either **seed treatment** (seed being here a generic terms, referring to all parts of plant used to generate a crop, including, for example, the potato tubers).
- **Good Agricultural Practice** in the use of pesticides includes the officially recommended or nationally authorized uses of pesticides under actual conditions necessary for effective and reliable pest control. It encompasses a range of levels of pesticide applications up to the highest authorized use, applied in a manner that leaves a residue that is the smallest amount practicable.
- **Maximum residue limit (MRL)** means the maximum concentration of a residue that is legally permitted or recognized as acceptable in or on a food or agricultural commodity or animal feedstuff.

2.2. Products used in plant protection

In plant protection activity there are used chemical products (pesticides) and biological products (bio-products, called also in English bio-pesticides). Pesticides are classified, in accordance with the target pest, as insecticides, fungicides, acaricides, nematocides, moluscocides, raticides and products with combined action.

13. The bio-products are biological means obtained by an appropriate formulation of: (i) living systems beneficial to crop or (ii) natural products (mainly extracts from plant, generically named “botanicals”).

14. Due to their biological origin, the bio-products exert a complex action on crops, the most appropriate term being bio-products for crops and not bio-products for plant protection. A classical example is of products based on *Trichoderma*. Registered as bio-fungicides (including in Romania), the bio-products based on *Trichoderma* shown also to be plant growth stimulants (here is cited the paper of Baker, R, 1988, “*Trichoderma* spp. as plant-growth stimulants”, CRC

Crit. Rev. Biotechnol., 7, 97-106). The plant growth stimulating activity seems to be due to the intervention of fungus in plant nutrition.

15. The use of bio-products for plant cropping is important now due to their advantages:
- i) decrease of environmental pollution;
 - ii) avoiding of the possibility to develop resistance in the population of target pest;
 - iii) possibility to use not-skilled personnel in condition of high security, both for crop and user;
 - iv) sustainable utilization of environmental resources not used till now in agricultural systems.

2.3. Considerations regarding the registration of the products used in plant protection

The use of the products specific to plant protection is regulated in Romania by laws. On Romanian territory only products registered by the **Interministry Commission for Registration of Plant Protection Products** (Interministry Commission was established according to the provision of Ordinance no.4) are allowed to be manufactured / imported, trade and used. According to the Statutory Rules regarding the organization and functioning of the Interministry Commission for Registration of Plant Protection Products approved by OM MAA 8343/1995, OM MS 718/95 and OM MPAMI 444/95) to registered a new plant protection products it is necessary to scour the following steps:

- granting of "Pilot approval"
- granting of "Manufacturing approval" (for products that are indented to be produced in Romania)
- granting of "Environmental approval"
- granting of "Sanitary Approval"
- field test data enough to conclude "Biological report on product efficacy"
- granting of "Bulletin of physico-chemical analysis".

16. The procedure for plant protection products registration is in accordance to the European rules (Council Directive 91/414 EEC and Commission Directive 93/71 EEC).

17. Granting of the above mentioned approvals certify the efficacy of the product is estimate the risks for environment and human health, establishing in the same time the minimal condition for a proper management of risks.

18. After registration the legislation classify the product used in plant protection in two categories: products from **toxicity group III and IV** (moderately hazardous; slightly hazardous; products unlikely to present a hazard in normal use) are trading and used in a free manner, and products from toxicity group **I and II** (very toxic and high toxic) are used only by trained personnel authorized by competent Authorities (including here the Service for Arms Fire, Explosives and Toxic Substances from Police).

19. Pesticides are used according to some recommended technologies, under special advice and control.

20. It is a generalized practice on farms, but a wrong one, to voluntarily dispose of the pesticide residues and wastes in ditches, channels, and surface water bodies or on agricultural lands. They are coming from:

- surplus of pulverisable liquids;

- equipment washing;
- losses of pulverisable liquids during their supplying or technological operations;
- losses due to the non-uniform distribution,
- packages or recipients which still contain pesticides and are thrown off or inadequately deposited;
- residual liquids from the immersion baths or sheep dipping;
- waters from the washing of agricultural products;
- leakage from cracked and broken packages and recipients,
- pesticides disposed off due to the exceeding of expiration time.

21. The growing of vegetables and ornamental plants in glasshouses and solaria is an important source of complex local pollution with pesticides and fertilizers. The polluting substances reach the surface water bodies by other ways than in the case of agricultural crops, namely:

- a) overflows on the stained-glass windows(water of condensation or sprinkling irrigation) that transport the fertilizers and pesticides deposited on the inside stained-glass windows;
- b) irrigation equipment used for both the fertilization and pesticide application;
- c) waters coming from washing the inside and outside parts of the stained-glass windows
- d) residual waters from the special treatments applied for flower growing.

22. It is necessary to collect and store all these waters in waterproof concrete tanks and to recycle them without their evacuation.

2.4. Pesticide storage

Pesticide storage is done in appropriate building, specially designed as pesticide stores. The following devices and equipment must exist in a pesticide store:

- (i) **Fire prevention and extinction;**
- (ii) **Work Safety**
- (iii) **metrological approved measuring devices** (scales, balances, and volumetric measuring devices).

23. The legal rules enforce that the **pesticide deposits** should be adequately **delimited** and marked ensuring a **properly physical protection**.

24. Substances in the **first and second toxicity groups** are stored in **separated rooms** and **special conditions**, provided with special guard and register to record them according to the legal stipulations.

25. The pesticide stores should not be located near the water bodies and where the ground water table is shallow. Their location should be at least 200 m far from residences, water sources, fodder, agricultural lands and animal farms.

26. The pesticide stores will be built using solid and fireproof materials with sufficient and adequate storage capacity.

27. The store should be able to contain the contents safely if they leak or are split. The floor should be impermeable and situated below ground level to form a sump, or there should be a doorsill and walls that not let liquids pass through and can content spillage.

28. To ensure the environmental protection in the case of fire, the store should be provided with a covered concrete ditch, where the liquid is collected.

29.

30. In the organization of pesticide store must be followed the rules of hygiene and public health and the specific rules for work safety and security. The pesticide store shall have a personal flow separate of pesticide flow, with corresponding facilities (showers and washers with hot water, toilet with a separate sewage, warmed locker room, and separate area for eating).

31. Pesticide handling will be done exclusively by personnel with protective clothes and with the protection equipment specified by the procedures of work safety (e.g. gas mask for very toxic gases).

32. The pesticides that are stored in an inappropriate way are dangerous, generally for the environment and directly for human health. The pesticide store will be organized only by users of medium and big dimensions (land users of 120 ha on plane and 90 ha on hills and mountains, company specialized in plant protection services). Only these pesticide users are allowed to store pesticides stocks for a long term. The small users do not have the right to store large quantities of pesticides, bigger than their need for one year.

33. Even in the temporary store of pesticides on small users the pesticides must be kept in appropriate conditions (avoiding heat, direct sunlight and high humidity), separate from others materials (and especially of food and feed). The liquid products are stored in room with min. 1 C deg and max 25 C deg.

34. It is not allowed heating with open source (stoves, electrical stoves) of the pesticides store. The store should be well lit with natural or electric lighting (200 lux) to permit container labels to be read easily. The electrical fitting of pesticide store must be done according to dust/flame proof rules for working environment with organic solvent and shall permit decontamination by washing with high-pressure water.

35. The pesticides will be kept in their original package, on shelves or on pallets. The package bigger than 20 kg will be handled exclusively by using mechanical handling devices (hydraulic handcart, motorized pile driver).

36. **Pesticide users** that are allowed to have a pesticide store must record all the entrances and exit of pesticides in a **specialized book - evidence file**. In this book shall be included all the operation with pesticides, from the acquisition (including supplier, number of invoice, price paid for pesticides) to the application. In the case of very toxic and highly toxic products (group I and II of toxicity) the record shall be done in accordance of the law.

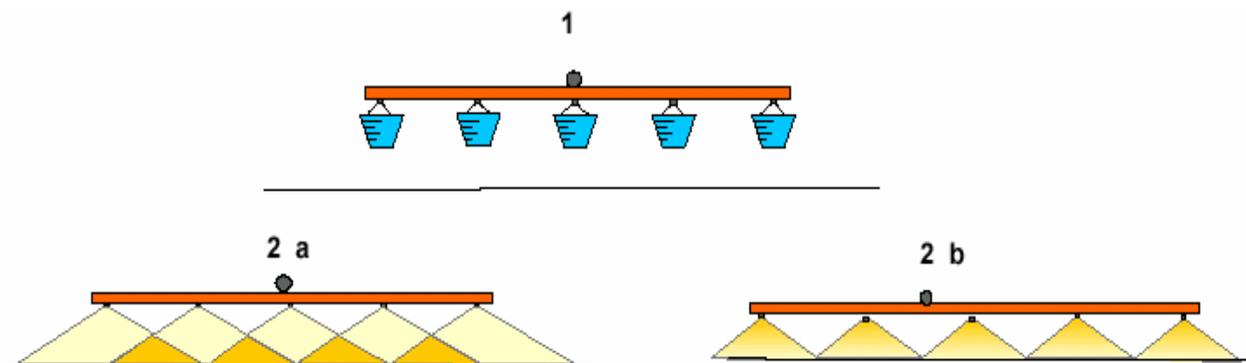
All pesticides users that have stocks of pesticides shall register this to the competent Romanian Authorities (Ministry of Water and Environment and Ministry of Agriculture, Food and Forestry).

37. All the movement of expired pesticides shall be notified to competent Authorities. Banned pesticides (and especially pesticides from POP - Persistent OrganoProducts - category - e.g. DDT based products) are a problem for Romania. The stocks of these pesticides, originating in the stocks of ex-governmental agricultural structures, are published by Romanian Ministry of Water and Environment in a “White Book”. These products will be slowly destroyed, together with others quantity of pesticides expired.

2.5. Application of the products used in plant protection and measures for protection of water and soil

38. The strategies to reduce the environmental impact due the application of pesticides may be approached in various ways, from prevention at the source to the treatment of symptoms revealing the ecologically harmful effects, among which there are:

- a) decrease the basic needs to protect the crops by chemical means using some practices and methods lowering the crop attacks (rational crop rotation, growing cultivars resistant to diseases and pests, using the seeds, seedlings free of diseases and pests, applying the adequate hygienic measures to limit the development of diseases and pests), as well as the strict use at the minimum rate of the chemicals for controlling the diseases and pests;
- b) rational choice only of the authorized pesticides that do not affect the environment as the selective ones;
- c) application of pesticides by a trained, tested and authorized personnel;
- d) strict monitoring of pesticide use and regime;
- e) interdiction of applying by spraying in air, especially when the agricultural lands are close to water bodies;
- f) limitation of fertilizer application because there are situations where some diseases and pests are favoured by increase of crop yield and productivity;
- g) decrease of the preventive use of pesticides having in view that the presence of parasitic organisms represents a normal conditions, their problem being considered only when there is an estimated risk or they exceed a certain noxious degree;
- h) partial application of pesticides by ecologically friendly means and methods other than chemical pesticides, traps, manual moving off of the pest nests, etc.).



It is need to check the sprayer and calibrate it before work season. 1 Choose nozzles of equal discharge 2. Choose optimal boom height above plants that solution would cover the plants more equally: 2a - when spray patterns overlap, 2 b - when spray patterns do not overlap

39. The following complementary recommendations should be taken into account to decrease the quantities of pesticides spreaded in the environment:

- providing the spraying equipment with antidispersion screen to limit the dispersion of pesticides outside area planned to be treated;
- pulverisers, especially their most important component - nozzle, should be maintained in the best condition at the optimum parameters, in this view, special attention will be paid to: periodical controls immediately changing the parts which are out of order, and strict correlation between the capacity and output of spraying equipment and pesticide loading allowed by environment,
- interdiction of orchard organization close to water bodies,
- planting of forest belt against the predominant winds;
- providing of 10 m wide pesticide-free zones close to water bodies.

40. *Chemical treatments for pest control are applied in a curative or preventive manner, either in vegetation, either by seed treatment, either by soil treatment. The pesticides are applied usually by wet treatment, by spraying, sprinkling or fumigation (toxic fog).*

41. Numerous largely used pesticides (bentazone, atrazine, simazine, dinozeb, etc.) are in the category of substances with a high pollution risk for both surface water and ground waters, When such a case of ground water pollution is detected, it is presumed that a concentration increase of these pesticides will follow because the water movement through soil profile takes a long time.

42. Sprinklings are done with portable devices of special machines. Pulverisation is applied by means of equipment provided with pneumatic devices. The aerosols are obtained with special equipment (mist generators). The difference between the moist treatments is given by the water drop size, which decreases from drops to aerosols.

43. Gasification is done in closed spaces, for disinfecting and disinfections of warehouse of agricultural commodities.

44. The toxic baits are use to control the soil insects (e.g. mole cricket), deleterious mammals (rats and mice), snails, crows etc.

45. The seed treatment is done either as wet treatment (sludge) either as dry treatment, according to the formulation of the product.

46. The most dangerous product for human health and for the environment is dustable powder. In Romania practically there are not longer such products, with the exception of sulphur, that is an environmental sound product, being natural, biodegradable and with a low toxicity for non-target organisms.

47. Generally all pesticides are biological active substances, with side effects on human and human health. **When there are possibilities to choose the option shall be for the product with the smallest impact on environment and with the lowest risks for human health.**

48. The most convenient dorm of pesticide application from environment point-of-view is the seed treatment. This is a form of preventive treatment this from of treatment shall be preferentially used on area with surface water.

49. The plant protection action of public interest (e.g. migratory locust control) are done under the supervision of competent Authorities (Counties Inspectorate for Plant Protection and Phytosanitary Quarantine)

The decision of pesticide use or of alternative means of plant protection is exclusively the decision of the **person that is performing the agricultural exploitation** (owner or tenant). The decision shall be done according to the concrete situation of the corresponding agricultural exploitation. The farmers without agronomic education shall take the decision of using a pesticide only according to an expert advice.

50. **The pesticide use shall be done only on warning. Treatment warning is done when a pest has the tendency to develop over the economic damage threshold (EDT).** Economic damage threshold is the level of pest population that produces a loss that is bigger than total costs (economical and ecological) of treatment with plant protection means (pesticides, bio pesticides). Generally competent Authorities do the treatment warnings. The most precise and advantageous warning is provided by the information technology (IT) systems of forecast and warning used locally.

51. Taking into consideration the centralised role of **IT systems** in the **Good Agricultural Practice** in the use of pesticides here we will develop this subject. These IT systems were done due to the development of microprocessors and of reliable sensors and due to the development of (radio) telecommunications. Consequently were done systems of warning and forecast complexes, flexible, with a functioning that allow a rationale use of plant protection means and methods, with a consequent decrease of the impact produced by pest. The IT systems are expert systems, which are functioning according to (mathematical) models of specific biological process.

52. The final goal of warning and forecast systems, respectively the efficient and sustainable use of agricultural resources is in accordance with the objectives of sustainable agriculture and precision agriculture. The use of expert system for warning and forecast determine not only ecological effect (decrease of environment and food pollution), but also has direct economical consequences. Treatment optimization determines important savings on pesticides, fuel, workers hour; these savings allow a rapid redeem of the investment in such an IT system. In EU countries investment in IT system of warning and forecast are considered investment for environment protection and benefit of fiscal facilities.

53. Here is to mention that Romania is one of the countries most advanced in producing and using such IT warning and forecast systems. In Romania there are several kinds of such IT systems that combine the latest achievement in the fields of electronics, information technology, and, last but not least, plant protection. These systems are composed of:

- central station, with the function of data storage, processing and visualization.
- one or two stations to measure and to transmit data from filed.

54. The use of such IT systems for warning and forecasting is recommended as one of the most efficient way to reduce the side effects of pesticides.

55. The workers that are using effectively the pesticides shall be instructed in an appropriate way. For the products of group I and II-a of toxicity the workers need to be skilled and authorized by competent Authorities.

56. The volume of solution or suspension of pesticides prepared should be in direct relation with the area needed to be treated.

57. If it is possible the recommendation is to use plant protection products with high selectivity for not-target organisms, and especially to those beneficial to crop (pollinators, parasitoids and predators insects, nitrogen fixing bacteria etc).

58. Treatment with pesticides shall be notified previously (in a written form) to local Authorities, mentioning the following at least:

- kind of treatment
- crop that will be protected
- plots that will be treated
- time of application
- types of pesticide(s) used

59. In the peculiar case of treatments with insecticides on meliferous crops (e.g. sunflower) the local Authorities shall notify the beekeepers from treated area, in order to avoid losses produced to beekeepers. This provision is valid also for the public Authorities that read conducting treatment of public interest.

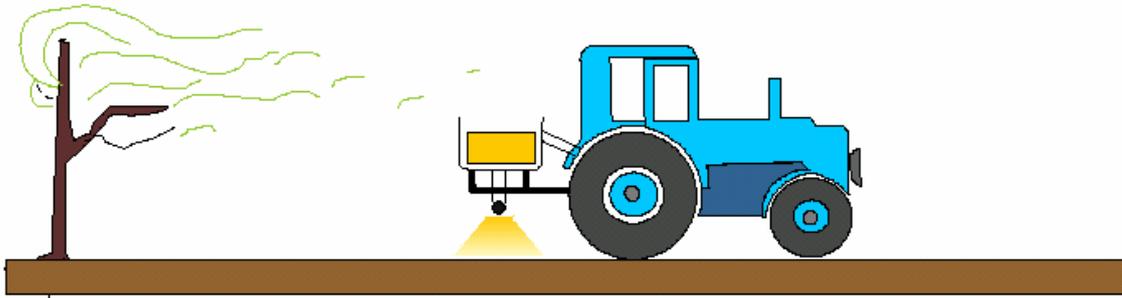
60. In area with surface water the **Good Agricultural Practice** in the use of pesticides impose the limitation of the use of aerial equipment of treatment (helicopters, moto-deltaplanes, planes etc) because these means have a too high drift

61. In area with surface water will be avoided, as much as possible, the treatment with insecticides that are toxic to fish (e.g. insecticides of synthetic pyrethroid class). If it not possible to renounce to these pesticides it will be undertake corresponding measures for risk management (precise delimitation of treated perimeter, with a min. distance of 10 m till the river border, mounting of devices for drift prevention of spraying equipment, capacity of spraying equipment strictly correlated to treated surface, treatment application under a wind speed below 4m/s, interdiction of disposal of pesticides polluted water originating in equipment wash etc).

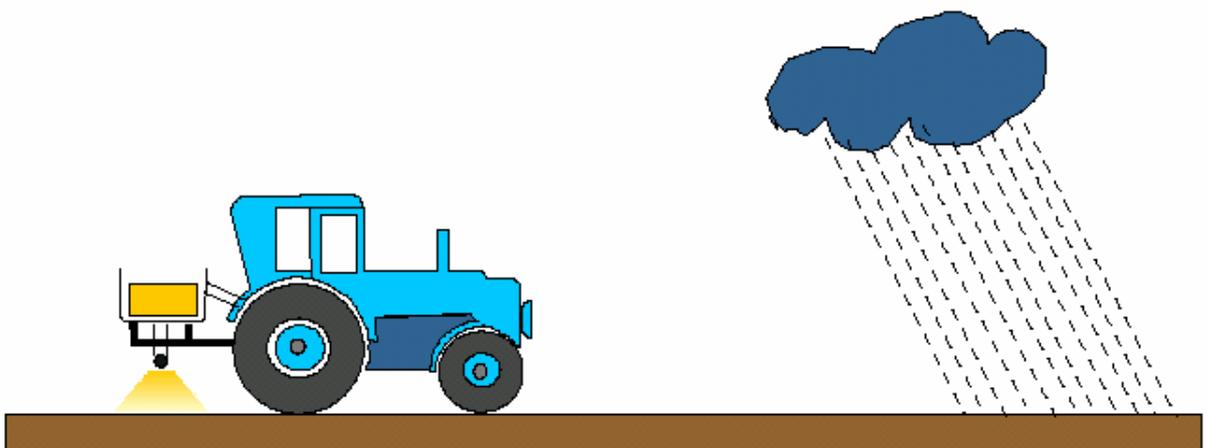
Pesticide treatment will be done only in meteorological condition established by the recommended technologies.

62. When the treatments with pesticides are carried out, the distance between the treated field and the neighbouring water bodies should be carefully considered. It is clear that the treatment with pesticides of the field near the surface waters as well as the steep river banks leads to the pollution of these waters with high quantities of pesticides.

63. The treatment will be not done on high temperature, at noon, and the products with an inverse temperature quotient will respect the maximum indicated temperature. It will be not done treatments on rainy time (before and after) and the pesticides will be not applied when the humidity will be very high. The maximum speed of the wind that allows treatment with pesticides will be of 4 m/s. In the case of high speed of the wind the treatment with pesticides will be done in the morning or in the evening.



Crop fields may be sprayed while wind speed is less than 4 m/sec.



Do not spray crop fields before rain

64. Pesticide treatment will be done in accordance with the specific rules of environment protection and work safety. The most important requirements are the following:

- Only trained persons who have acknowledged with the characteristics of plant protection products and requirements of work safety and fire prevention and extinction may work with pesticides.
- Only healthy persons who have health examination certificates can work with pesticides.
- During pesticide treatments it is necessary to use personal safety precautions and to follow rules of hygiene.
- The personnel that use new sprayers must verify the technical agreement of the equipment and sprayers in use must be checked by technical inspection. Use only correct, calibrated and checked prior to operations machines and equipment for spraying of pesticides on crop fields and for dressing of seeds.
- It is forbidden to apply pesticides on blooming plants. The blooming plants could be sprayed only in exception, following special recommendations (e. g control of fire-blight, *Erwinia amylovora*, in fruit tree).

It is forbidden to use other phytosanitary products than those homologate by the Interministerial Commission to Homologate Products of Phytosanitary Use

65. In Romania, the practice to use illegally marketed pesticides is quite frequent. These illegal pesticides are:

- i. Those introduced in the country by the small scale transfrontier traffic from the neighbour countries;
- ii. Those existing in the storage of expired pesticides (including the stocks of DDT!);
- iii. Those taken from the dumps of wastes disposed off by chemical factories.

66. Use of illegally marketed pesticides (especially those in ii and iii categories) has extremely severe consequences both on the users and their communities. An example can be the recent case where the milk marketing was forbidden in several counties in Central Transylvania due to the contamination with illegal pesticides

67. Use of illegally marketed pesticides is limited by firmly application of legal sanctions and especially by popularization of multiple risks for users of such illegally marketed pesticides

2.6 Regime of technological equipment

68. The equipment used for plant protection have specific uses, they cannot be used for other purposes too (for instance, the pumps carried on one's back, used to spray the trees cannot be used for painting).

The equipment used in Romania for plant protection is according to the European Union requirements.

69. The use of this equipment is carried out according to the recommendations of the equipment's constructor, requirements of pesticide producer and rules regarding the application technologies.

70. In order to assure an adequate operation, the spraying equipment should be regularly tested and certified. Each distribution device (spraying nozzle, rotative sprinklers, etc.) should supply similar quantities of solution - suspension in a constant and reproducible way. The system of fitting the respective spraying devices should permit a strict adjustment of the distance to the treated plants. The out of order devices should be immediately changed with new ones.

71. The spraying systems should assure the strictly localized distribution along the plant row not on the whole field. The occurrence of the non-treated land areas and/or double treated ones should be avoided. This is achieved by marking the land area going to be treated and the equipment applying the pesticides should work taking into account these marks.

72. The rate of pesticide applied per hectare should be strictly correlated with the watering rate established by the Interministerial Commission to Certify the Products for Plant Protection. The watering rates are established according to the type and age of crop and they are between 330 and 1100 l/ha. Usually, in order to easily respect the pesticide rate, the use recommendations provide both the rate and the concentration recommended for the corresponding watering rate.

73. The quality of treatment depends on the type of equipment for applying the pesticides and on the preparation of the working equipment, but also on the qualification of operator and its care to do treatment of good quality.

74. In the case of modern spraying machines, the precision of the solution rating and distribution permits to reduce the quantity of the chemical substances that fall on the soil. The operation process parameters are in accordance with the initial adjustment. The solution discharge can be controlled, and, in the case of some machine, it can be automatically correlated with the moving speed of the spraying aggregate. The solution discharge control is also necessary in the case of the machines applying the herbicides.

75. The precision of spraying the solutions with fungicides and insecticides largely depends on the pulverization quality and the capability to send the droplets directly to the plants. The pulverization quality is very largely influenced by the technico-functional parameters of the nozzles and their condition. In the last years, numerous nozzle types were manufactured, characterized by a very good precision for different working conditions and different times of treatment application. These nozzles allow the dispersion in the form of fine and uniform droplets.

76. The user is obliged to select the adequate nozzle according to the specificity of the work going to be executed. Also, the user should avoid to use the nozzles that are out of order, dirty, plugged, because even if initially they have been very good, cause working process disturbances, leading to asymmetric jets with large and non-uniformly distributed drops. Under these conditions, a risk increase also occurs by which, in some land areas, high solution concentration fall on plants and soil leading to the pollution degree increase.

77. The spraying machines with ramps for treating the field crops should be checked up, having in view that all the nozzles should provide the same quantity of solution per unit of time.

The code of good agricultural practices has specific provisions referring to the washing and/or decontamination of the used equipment. The pulverization equipment should be provided with proper washing facilities. These facilities should allow the washing of both the equipment and the pesticide packages. It is recommended that the spraying equipment should have also a reservoir of an adequate capacity with clean water.

78. The waters resulted from the washing the packages will be transferred into the spraying solution respecting the watering rate. The equipment will be washed with a pressure jets in specially organized areas provided with a necessary means (bases) to inactivate the pesticides in washing waters. The bases to inactivate the washing waters will be adequately delimited and marked (Danger, Poisonous Areas!). The inactivation bases will be located at an adequate distance from residences, wells, animal shelters, and agricultural crops.

2.7. Alternative methods for plant protection

79. As was already presented, the alternative methods of plant protection, beside the chemical ones (using of pesticides) are the biological methods (bio pesticides based on antagonist organisms and natural products), genetically (through resistance breeding to of plant to pest) agrotechnics (weeding, crop rotation etc) and physico-mechanical (thermal dis-infestation, vegetal surgery, etc).

The European Legislation for agriculture (the EU acquis) focus also on the limitation of the use of pesticides and encouraging of use of alternative methods for plant protection, in order to achieve the ecological sound development, the sustainable development (see COM (1999) 22 “Directions towards sustainable agriculture”).

A sustainable agriculture is a part of a general process of sustainable development. Sustainable development is the main goal of all the developmental strategies issued on whole the world, including in Romania. As is defined by Bruntland Commission, the “sustainable development is the development that correspond to the present needs without compromising the possibility of future generations to satisfy their needs” (definition after the law no. 137/1995 regarding Environmental protection).

80. Alternative methods for plant protection increase the sustainability of agriculture. The clearest example is that of "supresive soils", more exactly of solid treated with biopesticides that not longer permit the development of plant pathogens

81. The alternative methods of plant protection: biological methods (based on antagonist organisms and natural products), genetically (through resistance breeding to of plant to pest) agrotechnics (soil tillage including weeding) and physico-mechanical (thermal dis-infestation, vegetal surgery, etc).

82. A new way to make plant resistant to pest is through engineering (Genetically Modified Organisms) - e.g. potato resistant to Colorado beetle due to the insertion on his genome of the gene for endo-protein from *Bacillus thuringiensis* var. *tenebriones*. The modified plant are allowed to be cropped in Romania only after the approval by the Biological Safety Commission.

83. Here is to mention that some of pesticides, traditionally used in plant protection have a low impact on environment, their use being allowed in the system of organic agriculture. These products are the sulphur and the potassium salt of fatty acids (pesticidal soaps).

84. Sulfur has the following use:

- control of mildew diseases of plant: grape, fruit tree, vegetables, ornamental plants, and cereals;
- controls of trips, aphides and acarians on grape, fruit tree, vegetables and ornamental plants.

85. Pesticidal soaps have similar use with sulphur (control of mildew diseases of plant: grape, fruit tree, vegetables, ornamental plants, cereals; control of trips, aphides and acarians on grape, fruit tree, vegetable and ornamental plant) beside that are used for:

- control of bacterioses on soy and bean crop;
- preventive treatment for limitation of spreading of fruit tree firelight;
- weed control in garden, parks, etc. (total herbicide).

86. The most used biopesticides in Romania are bioinsecticides based on *Bacillus thuringiensis*. In table 1 is presented a list of products based on *B. thuringiensis*.

Table 1. Bio insecticides based on *Bacillus thuringiensis* registered in Romania*

Commercial name	<i>B. thuringiensis</i> var.	Pest
Bactospeine HP WP	<i>kurstaki</i>	<i>Lobesia botrana</i>
Dipel 8L	<i>kurstaki</i>	<i>Lymantria dispar</i>
Dipel ES	<i>kurstaki</i>	<i>Tortrix viridana; Hyphantria cunea</i>
Dipel WP	<i>kurstaki</i>	<i>Lobesia botrana; Pieris brassicae; Mamestra brassicae; Cydia funebrana; Hyphantria cunea; Malacosoma neustria; Drymonia spp.</i>
Dipel 2x WP	<i>kurstaki</i>	<i>Mamestra brassicae; Pieris rapae; Hyphantria cunea; Lobesia botrana</i>
Ecotech extra	<i>kurstaki</i>	<i>Leptinotarsa decemlineata (L₁ -L₂); Lobesia botrana</i>
Ecotech pro	<i>kurstaki</i>	<i>Lymantria dispar</i>
Foray (Biobit)	<i>kurstaki</i>	<i>Mamestra brassica; Pieris rapae; Anarsia lineatella; Cydia molesta; Tortrix viridana; Geometridae</i>
Novodor™	<i>tenebrionis</i>	<i>Leptinotarsa decemlineata</i>
Thuringin 6000	<i>kurstaki</i>	<i>Phyllonorycter blancardella; Stygmella malella; Eriosoma lanigerum; Cydia funebrana; Eranis defoliaria; Anarsia lineatella; Operophtera brumata; Hyphantria cunea</i>

* Data from Romanian Codex of Registered Plant Protection Products [1]

87. The periodically phytosanitary control is very important. It is carried out concerning both the soil and the crops and agricultural products, and its purpose is to reveal and estimate the agrobiocenotic components (their distribution included) on a farm, cropping zone or deposit of agricultural products. Thus, the abundance of agrobiocenotic components and the attack intensity of pathogenic agents are established. The advantages of this method are as follows:

- it allows to establish the optimum control time;
- it may efficiently intervene to prevent and control;
- knowing the present pathogenic species and their biology, it is possible to choose the optimum means to control them, including those which are selective and do not affect the environment;
- it allows launching the early warnings.

88. The phytosanitary control and warning have a particular importance because they transform the preventing administration of the pesticides from a routine operation into one of exception, because in this way the quantity of pesticides are limited at the strict necessity and even chemical treatment methods may be change with biological or physical control methods.

89. Among the methods and practices that replace or reduce the use of pesticides are:

- soil and crop management measures to prevent, reduce and eradicate the plant diseases and pests;
- biological methods to control the pests (use of parasitic and predatory entomophagous organisms, acariphagous predators, launching of sterile insect in the mating period);

- use of some physical control means (soil treatment with overheated watery vapours, seed treatment with warm water and air, traps and baits with pheromones, glue or toxic substances, caterpillar collecting, manual destruction of caterpillar nests or chrysalises, vegetal surgery and hygiene, seed winnowing, removing the *Cuscuta* control, tree shaking, etc.)
- by mechanical and biological weed control methods.

90. It is very important to know the soil type for each agricultural land in order to establish the cultivars going that can be used, but also the possible pests that may attack these crops, due to the preferences of the pests for some soil types (for instance, the wireworms develop in the slightly acid soils with high moisture regime).

91. The rational crop rotation reduces the attack of some pathogenic agents, which are specific for each cultivar host. The monocultural system inevitably leads to high multiplication of pathogenic agents and diseases specific for the respective crops. Therefore, it is necessary to introduce such crop rotations so that the same cultivar may not come again on the same land plot earlier than four years. can come again on the same place at least after four years.

92. Soil tillage contributes to the elimination of many pests by bringing them to the soil surface (larvae, eggs and pupae included) where they are destroyed by birds, low or high temperatures, water, etc. In addition, the soil tillage favours the access of the predatory insects and destroys the weeds - intermediary host and contagious centres for the diseases and pests.

93. The excessive soil moisture favours the multiplication of pests and pathogenic agents whose proliferation is stopped if the land is drained. Also, acid soil liming decreases the incidence of some plant diseases and pests.

94. It is very important to establish the sowing time and depth so that the plant emergence period may not coincide with the proliferation time of some plant diseases and pests (for instance, the pea pest - moths and ladybugs - do not cause crop damages if the crops are early sown; also the potatoes planted below 10-13 cm deep are protected against the mildew infection).

95. The chemical fertilizers and liming materials, rationally applied, can contribute to both the development of plants more vigorous and more resistant to diseases, but also to the decrease of pests depending on the fertilizer type (for instance, the ammonium nitrate causes a high mortality of wireworms, and the superphosphate destroys the nematodes and snails without shell).

96. The crop harvesting in optimum time and with well adjusted machines avoids the shaking and yield loss that lead to occur new seedlings where a series of diseases and pests are developed.

2.8. Disposal of used pesticide containers and safety measures

In accordance with the international rules, public Authorities, pesticide industry, pesticide dealer/trader and the agricultural community should implement policies and practices to prevent the accumulation of used containers. This mean that cannot exist a BAP code of pesticide use without such a system to recover the used containers and obsolete pesticides, to store and to transport in

similar condition with pesticide products and to dispose the used containers in specialised plant (pesticide burners). This system is not yet functional in Romania and must be done. All the other proposed measures (as used containers store on special place, with appropriate fence and signaling) are palliatives that do not solve the problem of used container disposal in accordance to international rules established by international organisation that Romania belong (FAO, EU as associate country). The pesticide hydro-soluble packaging represents an elegant solution to the problem of used container disposal; the use of this kind of hydro-soluble packaging shall be encouraged by GAP of pesticide use.

The personnel that applied pesticides will be instructed for an appropriate rinsing of used containers and for recovery and disposal of used containers.

97. Safety measures in recovery and disposal of used containers are those included in the technical documentation that background registration for the corresponding chemical products. Recycling of used containers is not allowed, inclusively for other pesticide repackaging!

III PRODUCTS FOR VETERINARY USAGE; PRODUCTS USED FOR WASHING, DISINFECTION, AND DISINSECTION IN AGRICULTURE AND ANIMAL HUSBANDRY FARMS

3.1 Definitions

3.1.1 Disinsection - ensemble of actions (means and methods) for insects and accarians control that can convey and transmit parasitic and infecto-contagious diseases to humans and animals provoking lack of comfort and economic damage by decreasing the production, destroying and degrading some materials and packages.

3.1.2 Deratization (Rat control) - all measures taken in order to destroy the damaging rodents in a certain area.

3.1.3 Decontamination (Disinfection) - the complex operation to destroy the pathogenic and pathogenically conditioned microorganisms in a given product or on an area.

3.2 General considerations and recommendations on disinsection, rat control and decontamination in agro zootechnical exploitations

Decontamination, disinsection and rat control represent the main measures for preventing and nonspecific control of vectors or microorganisms and parasites that can produce transmissible diseases and lack of comfort to humans and animals.

Each separate activity is precisely established becoming compulsory for all agro-zootechnical exploitations and is carried out in more stages and operations in a certain succession. The development in time of these operations has its own characteristic rhythm always correlated with the peculiarities and complexity of agro – zootechnical exploitations. Thus, prophylactic disinsection involves pests control (insects, accarians) recorded during the year and the necessity disinfection is performed immediately after the appearance of disease suspicion binding especially the pests which produce lack of comfort or those incriminated in the disease transmission. Considering the first situation, disinfection is carried out periodically and when the damaging insects reappear, as well. In the second situation, disinfection is repeated in accordance with the biologic cycle of the pest. Both types of disinfection are carried out no matter the rhythm of decontamination and rat control is done and very rarely these three activities need to be correlated.

98. Prophylactic rat control is necessary for reducing economic loss produced by rodents and preventing the appearance of diseases in humans and animals. This rat control is developed outside buildings (inside galleries, on the ways the rodents move, the places where they enter the buildings, close to food and water sources, etc) and inside the buildings (by “stations for rodents disintoxications”).

99. On the farms with an intensive system of animals breeding, the main activity to control rodents is carried out in the period between paddocks depopulation and repopulating before decontamination is done. In the holdings populated with animals, the rat control for maintenance is done by “permanent stations for rodents intoxications” which daily control and if it is necessary, it is supplemented by poisoned feeding.

100. Rat control for necessity should be done immediately the suspicion of a contagious disease appears. It is carried out considering a program that is well established by the owner together with a specialized and authorized enterprise and in some cases by their own specialists, attested and authorized by the abillitated organisms.

101. The rat control program aims the destruction of all rodents from the agro – zootechnic area of exploitation so that the rodent's withdrawal to the neighbourhood should be avoided. For fulfilling this purpose, the rat control from one unit should be correlated with the campaigns for rodent's destruction by the neighbouring unit.

102. The program to destroy in time the rodents from the agro – zootechnical exploitations should consider both the rodents biology and especially to avoid the phenomenon of resistance. For obtaining the most efficiency and eliminate the phenomenon of resistance there is the possibility to use either a single rat control chemical (in this case the interval between application will be of at least 6 month) or the use of more substances, rat control substances with insidious action being used at the beginning (furfuril hydramida, anticoagulants) and in the second part on the action the use of the rapid ones like (phosphine, zinc phosphide).

103. The prophylactic decontamination is done either in spring or autumn or sometimes after the depopulation and before the shelters populating.

104. Decontamination of necessity and maintenance are carried out whenever it is necessary either after the withdraw of one or more animals from a stock or when the quarantine is over in case of some transmissible diseases.

3.2.1 Disinsection

105. Due to their life specificity and possibilities to adopt at various microclimatic conditions from various geographic areas, insects and accarians exist in all agro-zootechnical exploitations no matter the system of animals upkeeping, in agro foods store houses, toilets, special spaces for animal or vegetal origin products processing.

106. Considering the purpose and the moment they are carried out, **disinsection** can be **prophylactic** or **for necessity** considering the way they are used classifying them as follows: general, total and partial disinsections.

107. For limiting insects and accarians development and control the following measures should be taken:

- -systematic removed of all animal and vegetal origin materials from shelters or other adherent spaces (wastes, blood, vegetal, remains, etc).

- platforms and garbage store houses arrangement at a distance of 300-500 m, from dwellings and at least 100 m from the shelters where intensive breeding animals are exploited and as far as possible from the shelters with extensive breeding.
- periodic emptying of collecting channels, cleaning and clearing of the draining channels and gutters.
- permanent collecting and controlled storing of fodder remains from shelters, fodder kitchens and canteens;
- proper arrangement of the place it collect and destroy corpses and seized products from the slaughter houses;
- draining for stagnant waters from farms and around them;
- proper keeping of the green space inside the agro-zootechnical exploitations;
- maintenance of the relative humidity of the shelters with permanent litter or fodder deposits below 75%.
- to carry out and permanently maintain a general state of cleaning;
- disinsection in accordance with the specific and destination of buildings in accordance with the legislation in force.

108. **Prophylactic disinsection in animal's shelters** should respect the following good practices:

- disinsection is carried out only after the animals were removed from paddocks, yards or grazing;
- before the mechanic cleaning: the garbage and forage wastes are removed, gutters and channels are cleared and cleaned and the dust and dirt from the walls, windows and pipes are also cleared;
- salt, the recipients and buckets for milking and work tools and inventory objects that should not be in touch with insecticides are removed;
- the insecticide is sprayed all over the surfaces calculating 1 litre of disinfectant solution for 20 m²;
- the doors and windows are closed for 1-2 hours;
- before bringing the animals into the shelters, the toxic substance is neutralized by washing with plenty of water (12 l/m²) all surfaces that are in a direct contact with the animals and especially with the troughs, mangers, feeding recipients, watering place;
- the dead insects are collected and destroyed because animals should eat them.

109. **Disinsection the places for collecting and processing animal origin products:** it is compulsory the maintain clean the places where animal origin products are collected and processed, by a frequent whitewashing for walls, to mount nets for windows against insects, daily removed of organic wastes, etc;

110. *The general disinsection of space is carried out only after the daily work program. The separation for fats cooling and other different appliance that cannot be removed will be covered with plastic material sheets or packing paper.*

111. Pyretroides as solution or aerosols are preferred the insecticides will be applied on walls or doorcases and window frames, floors and even on exterior surfaces of the large equipment that do not get in touch with the raw material.

112. Sticky stripes for flies and toxic baits for beetles are also used for disinfecting the closed space. After the disinfection for interior spaces is over the action is continued for the external walls of the building and on loading and unloading platforms.

113. If package disinfection is necessary, this preparation is done in a different way, considering the type and material they are produced, by scalding, heating at 60-70⁰C in the drying closet or by sprinkling with insecticides.

114. *Necessity disinfection technique have the same stages as for the prophylactic disinfection, is compulsory and is carried out only when it is necessary to interfere for notified contagious infection diseases, together with rat control and decontamination.*

115. Animals shelters disinfection are carried out with the following recommendations:

- Animals are removed from their shelters;
- A solution of 3% sodium hydrate, calculating 1 litre/m², is sprayed over all surfaces without removing wastes, forage remaining and water. After 1-2 hours, the detachable parts of the shelter are removed and will be stored, cleaned and disinfected on a concrete platform or in another clean room;
- The remainings of forage, stable wastes are withdrawn and transported to the garbage place.
- All adherent organic remainings are washed and mechanically removed; The shallow layer (3-5 cm deep) of the ground will be removed and transported to the garbage place.
- The unmounted, cleaned and washed parts are assembled again;
- 3% sodium hydrate solution are applied all over the decontaminable surface of the shelter (in winter 5% sodic chloride is added), using 1litre solution /m²;
- When the whole decontaminable surface is dry, 1 litre insecticide solution/30m² is applied;
- The shelter keep closed for 24 hours. After that it is aired and the contact places for animals (walls boxes, grills, feeding troughs, drinking places 1,5 m high pillars) are abundantly washed with water;
- Only after 48 hours from disinsection, cleaning (washing) and airing of the shelters, the animals are taken back;

116. *The checking up of disinfection efficiency is done by observing the presence of dead insect in the spaces that had been disinfected and the absence of the living ones in the air of the respective space or from the places and surfaces they hide.*

3.2.2. Rat control (Rodents combat)

117. Rodents from agro-zootechnical exploitations (grey rat, black rat and mice) besides they represent contamination source for animals and humans with various microorganisms (bacteria,

viruses) or with parasites, produce important economic damage by consuming the forage, grains and the agro-zoo products. A couple of rats destroy annually over 40 kg agro-food products.

The measures developed for destroying them in the agro-zootehchnical exploitation are compulsory and difficult to carry out due to the biologic peculiarities (a very developed instinct of self preservation, they are very prudent and move at long distances, acting especially during night, migrating in case of danger or famine, they multiply rapidly and are very prolific etc.).

118. The measures for rat control can be grouped as follows:

- ❖ measures to limit and prevent their multiplication;
- ❖ measures to destroy them.

119. The proceedings to destroy rodents are classified as follows:

- ❖ mechanical proceedings;
- ❖ chemical proceedings;
- ❖ biological proceedings.

Rodents control by chemical methods

120. The chemicals used in rodent's control are generically named raticides. They can be represented by organic and inorganic substances (generally of vegetal origin) or synthesis chemicals.

121. Considering the way they act raticides can be:

- ❖ toxic substances by ingestion;
- ❖ toxic substances by breathing (respiration).

122. Raticides belonging the group of toxic substances by ingestion are applied by food toxic baits. These baits consist of mixed forage, cereals, flours, meat pieces, salami, scrapes plus edible oil and some aromatic substances. The powders used for dusting activities represent a special category of toxic substances by ingestion and the most usual support substance is talk powder.

123. Respiratory toxic substances represent the most efficient destroying method for rodents because they are applied especially inside the galleries that do not communicate with the spaces where people and animals live or inside of the limited spaces that can be hermetically closed.

Rat control in animal's farms

124. This activity is performed considering the type of animals unkeeping, the animal breeding in that shelter, the possibility the animal gets in touch with the raticid substance or with the rodents that the raticid substances acted.

Rat control in swine farms

125. The operation should be performed when the animals are taken out of the shelter. In this case, after a mechanical cleaning toxic bites and/or toxic powders are put in the places where

rodents go, in the easy to access galleries and places out of shelter recipients with poisoned water are placed in the shelters.

126. In cases when the animals cannot be evacuated the toxic bites are put in the places when the animals cannot have access (beams that support the roof, the attic, rooms for forage storing etc.). In some situation “stations for intoxication” can be assembled both inside and outside of the shelters.

127. During summer, a special attention should be paid to the green spaces among shelters and their neighbourhood (when rats usually come and dig galleries), draining channels, water and feeding pipes as well as the wastes evacuation channels. It is also possible to introduce gas into the accessible galleries.

Rat control in the shelter for cattle and sheep

128. After the animals are taken out of their shelters or while animals are out for grazing a mechanic cleaning and garbage evacuation are performed, the rat control operation is done using the methods mentioned for pig’s farms.

Rat control in poultry farms

129. It is obligatory done on occasion of a total depopulation after the litter was removed and a general cleaning was done.

130. General recommendations in rat control action:

- the rat control should be carried out simultaneously in all units of the agro-zootechnical exploitation and in all neighbouring units.
- it is absolutely compulsory to be rhythmically performed (usually and quarterly) and ceaselessly.

3.2.3. Decontamination (Disinfection)

131. Considering the purpose, decontamination may be **prophylactic decontamination** and for **necessity**.

132. Considering the area where it is performed, it may be partial decontamination (only in certain spaces of a unit); total decontamination (inside the whole unit) or general decontamination (in all units of an agro-zootechnical exploitation).

133. Considering the complexity of the agro-zootechnical exploitation, decontamination may be:

- usual decontamination (in any epidemiologic unit where there are farm animals or animals or vegetal products are processed);
- special decontamination (in keeping units, silkworms and fishery units etc).

134. **Current decontamination technique** should be carried out in following succession:

- ❖ animals are removed from their shelter;
- ❖ the electric appliance of the shelter is decoupled;
- ❖ the whole surface is moistured with water or in other cases with other solutions (detergents, cleaning solutions etc.);
- ❖ the rough wastes are removed (fodder, litter, wastes) and are transported with tight recipient to the garbage platform or to a mechanic level of a purifying station;
- ❖ all detachable parts of the shelter are disassembled (small doors, grills, feeding recipients, drinkers, watering apparatus, small carpets etc) and they stored in a special arranged place (a concrete and covered platform, a store house build with concrete, a shelter also build with concrete, all of them connected to a system to collect used waters where they will be cleaned and decontaminated);
- ❖ the surface that should be decontaminated is carefully cleaned of adherent organic remaining under a water jet (pressure being at least 10 atm) for the compressed air, brushes, brooms or other cleaning solutions. In case that surfaces are covered with earth, the superficial level is removed at a depth of 15-20 cm and after its removed it will be replace by fresh earth coming from noncontaminated place with microorganisms or parasites. Before this operation this earth will be mixed with quick lime or lime chloride;
- ❖ current necessary repairing will be carried out in accordance with the production process, breeding technology and sanitary-veterinary provisions;
- ❖ mechanical cleaning is done again,
- ❖ detachable parts which were decontaminated are reassembled;
- ❖ the most efficient decontaminating substance is used considering the type of the shelter and animal species etc.

135. The technique to apply the decontaminant substance:

- ❖ the specific decontaminant substance is chosen and concentration and the way it use it is established;
- ❖ the whole surface to be contaminated is calculated and all means for decontamination are ensured establishing and ensuring work protection materials;
- ❖ the decontaminating solution is prepared in accordance with the established concentration and quantity;
- ❖ water from drinkers appliance, excavations and holes from floors is removed, electric appliance doors are opened, windows are closed and taps are turned off etc., the whole operation is done in accordance with the recommendations to use the decontaminant solution (preheating, tight operation, moistening, etc.).
- ❖ the whole quantity of the solution calculated for the whole unit is divided, using it from top to bottom and from the opposite part of the exit. The solution is sprayed uniformly in the whole surface to be decontaminated in order to ensure an efficient concentration of the decontaminating solution for each m².
- ❖ the unit is closed and sealed and at the entrance there is a note with: **“Look out!, Chemical decontamination, Danger, Entrance forbidden!”**.

- ❖ a sanitary-veterinary decontamination document is done;
- ❖ the contact time for each decontaminating substance is indicated, type of unit and decontamination method.

3.3. Considerations on regime of used products

3.3.1. Chemicals used for decontamination

136. Chlorine and its compounds

- Gaseous chlorine can be used either for water or some object disinfection in zootechnical farms. The active concentration is 1/10000, which is obtained with 1.55 g liquid chlorine/m³. For obtaining the decontaminant effect, the contact time is a least one hour on condition that the spaces the operation is performed should be tight.
- Chloramine is better established than other compounds of chlorine. There are pills (Chloramine B), powder (Chloramine I). Pill of Chloramine B, contains 0.50 g of active chlorine. For preparing 1 litre of decontaminating solution 1% active chlorine, 20 pills of Chloramine B are necessary. A better effect is obtained when Chloramine B is associated with ammonium chloride, in 1/1 ratio.
- Calcic hypochlorite (bleaching powder). The commercial product contains calcium chloride, calcic hypochlorite and calcium hydroxid. It is a strong decontaminant both dues to gaseous chlorine inside of it and to its oxidation capacity. It is corrosive and strong decolorant. The efficacy of the clear solution of calcic hypochlorite decreases in the presence of organic substances. For decontamination a clear solution of calcic hypochlorite containing 3% or 5% chlorine in quantity of 1 l/m² is used.
- Sodium hypochlorite is commercialized as a 12% active chlorite solution. It is used for the decontamination of milking equipment as well as for milk keeping containers, processing and transport. A solution containing 250 mg active chlorine per 1 l of water at 75°C is used prophylactically in milk processing industry. Sodium hypochlorite can be also used for the decontamination of shelters or surfaces. A 3% active chlorine solution is used for necessity decontamination of surfaces.

137. Potassium hypermanganate

A solution of 0.2 – 2 % is used for animals body decontamination and 2 – 4 % solution is used for wool, meat transport packages decontamination with 3 hours contact time. Formalin added to this solution can be also used in the decontamination of incubators.

138. Copper sulphate

It is a fungicide and has deodoriser effect. It is used in a concentration of 5% for the decontamination of refrigerators and cooling rooms. It can also used for moistening the bedding of the cows with infection diseases.

139. Corrosive sublimate (mercuric chloride)

It is used for the decontamination of hands in 1% concentration and 2% concentration for harness and surfaces decontamination.

140. **Sodium hydroxide**

It is a wide action spectrum decontaminant. It is used for bacteria (being also active in spore's control), viruses, microscopic fungi control as well as for parasite destruction, usual concentration of 3 – 5 %. When the temperature of environment is very low, to avoid the solution freezing, it is mixed with 5 – 15 % common salt. One litre of 3 – 5 % sodium hydroxide solution is used for 1 m² decontamination surface.

141. **Sulphuric acid**

It is used for hide's decontamination from animals suspicioned of anthrax and for manure when it contains bacteria with spores, in 5% concentration.

142. **Calcium oxide**

It is used only as a suspension of fresh slaked lime (10 – 20 %). It is a good decontaminant for most microorganisms that find in animal's shelters, no matter the species.

143. **Atlantol 9/4**

It is liquid, 14 pH and contains potassium hydroxide and sodium hypochlorite (at least 4.5 % active chlorine). It is slight corrosive for most metals, enamel, glass and synthetic materials but it corrodes copper, duralumin and its alloys. It is not toxic in a diluted solution but in a concentrated solution can produce severe burns. In contact with acids it produces a toxic gas. It is an ideal decontaminant for closed circuit appliance (dairy factories, milking appliance and beer factories). It is not influenced by water hardness. During the decontamination operation the contact time is at least 30 minutes.

144. **OO-CIDE**

It is a granulated powder in two distinct packets and they are combined only when the decontaminating solution is prepared: a packet contains ammonium chloride, polyethanoxyl-ether, phenolphthaleine and the other packet containing a sodium hydroxide and dichlorofen. For space decontamination, 0.5 – 1 % solutions are used. Are necessary 0.5 l solution/m².

145. **Formalin**

It is the commercial name of the product containing 40% formaldehyde. It is a wide action spectrum and its efficacy is influenced by numerous factors among which the most important are temperature and humidity of environment. Formaldehyde has a deodorant effect. Formalin can be used to decontaminante cereal storehouses or for small quantities of feed stuff by fumigation or vaporization. Before animal shelters are decontaminated, they should be correctly cleaned and washed because the formaldehyde is slightly inactivated by the ammonia released and the solution used should have 25 – 30°C and the shelter temperature at least 17°C.

146. Usually 3% formalin solution is used in decontaminations in quantity of 1 l / m². When the temperature of the shelters is below 17°C, the 3% solution is mixed with 2% bromocet. In tuberculosis infestation, the 3% formalin solution is associated with the 3% sodium hydrate solution. In this case, the decontamination is performed for 3 times consecutively at 1 – 2 hours interval ensuring a contact time of at least 3 hours since the last spraying. For each m², 1 l of disinfectant solution is used for all those three sprayings.

147. Formalin is an irritating very toxic substance. It can be lethal if it is swallowed inhaled or absorbed by skin. Considering the international standards it is a neoplastic substance.

148. **Anhydrous sodium carbonate**

149. **Cetilpiridinium bromide**

This substance is commercially named – bromocet, cetazol, aseptol, etc. It has a wide action spectrum; it is not corrosive and does not stain. It is incompatible with soaps and anionic detergent. For decontaminating smooth surfaces and hands, a 1% solution is used. The decontamination is done by a fine spraying of 0.3 – 0.5 l solution / m².

150. **Vircon**

It is a buffered and stabilized mixture of peroxidic and surfactant compounds, organic acids and inorganic salts. It is also a detergent. It is used for the decontamination of spaces, objects, equipment, air and water. It has a strong virulicid effect. This disadvantage is then the temperature below 4°C and hard water annuls the decontaminant effect. 0.3 l/m² solution is used and the contact time is at least 24 hours.

151. **Long life 250 S**

It belongs at the same family of decontaminants with Vircon having the same properties and utilization.

152. **Valdezin**

It is liquid containing aluminium chloride, sodium chloride, ethanol and formaldehyde 3 – 6% solution as decontaminant. In necessity decontamination 0.8 l/m² solution is used and for prophylaxis 0.4 l/m². It works perfectly at temperature of 0°C – 35°C and the contact time is between 3 – 12 hours. For the spores destruction it is necessary to associate 10% Valdezin solution with 2% cationic decontaminant.

153. It is also indicated to use this decontaminant for shelters in the presence of animals or other persons as aerosols of 0.16 – 0.3 ml 5% solution l/m².

154. **Catiorom**

It is a liquid, containing alchil metil – benzil ammonium – 40% active substance. It is used inside workspaces from food industry and for decontamination of transport means. 0.5 ml/m² work solution contains 2.5% active substance. The contact time is at least 3 hours. It is incompatible with soap and anionic detergents.

155. **Iodofors**

They are products obtained by iodine solubilization into nonionic tensioactive substances from polyethilen glycols group. They have different commercial names. In Romania, Septorom is the most known. They are not toxic but corrosive. Besides iodine there is also phosphoric acid in the chemical composition of septorom. It is used as decontaminant especially in food industry, in the decontamination of transport means, protection equipment. A 5% solution, 0.5 l / m², is used for absorbent spaces and 0.25 l / m² in case of non-absorbent spaces. The contact time is at least 3 hours. The product keeps its decontaminant activity at temperature between 0 – 40°C.

156. Its disadvantage is that it can stain in brown objects and spaces made of plastic material and hard water misses the decontaminant properties.

157. **Sanajod**

It is a red, dense liquid. It contains as active principles iodine and phosphoric acid. It has antiseptic, decontaminant and deodorant action. It is not corrosive, doesn't stain and produce

specific odours but it has detergent properties. It is used in concentration of 0.25 – 1% for the decontamination of shelters, incubators, technologic equipment, means of transportation, protection material, slaughtering houses, dairy factories, laboratories, etc. The contact time is at least 3 hours.

158. **Quatersan**

It is a clear, colourless liquid, containing 20% alchil – trimetil ammonium chlorite. It is inactivated by soap and the products containing sulphur. It is used in 0.3% concentration for necessity decontamination: shelters, incubators, technologic equipment, means of transportation, protection materials. 2% concentration is used for necessity decontamination in tuberculosis stamping out. It may be also used in water decontamination 0.1% final concentration and 0.4% as deodorant.

159. **Alcafoam**

It is an alkaline detergent and disinfectant with a high degree foaming. It is used in dairy industry. It is a transparent yellowish liquid, containing sodium hydroxide, organic combinations of phosphorus, active chlorine. It is used in a concentration of 1 – 3%, at 50 – 70°C temperatures. It develops warmth and chlorine in contact with acids. It is corrosive producing burnings, 90% biodegradable.

3.3.2 Products used for disinfections

3.3.2.1 Products used for mosquito's control

160. **Vectobac 12 AS (U.S.A.)**

It consists from granules containing *Bacillus thuringiensis*. Destroys any mosquito larvae or the black fly. For utilization 200 g substance is rendered soluble in 5 l liquid and this solution is sprayed on an about 500 m² area. It is for mosquito control inside the humid basements, in canals, cereals field. It has long time remanence belonging to the 4th group of toxicity.

161. **Abate 50 WP (U.S.A.)**

The product contains temephos. It is used in mosquito control in quantity of 200 g / 5 l liquid, necessary for about 500 m². Its remanence is for 15 – 21 days. It belongs to the 4th group of toxicity.

162. **Diacap 300 C.S. (Switzerland)**

It is a yellowish liquid, without odour. It is used in quantity of 100 ml active substance for every 250 m², after dilution in 2.5 l water. It belongs to the 3th group of toxicity with 1 – 3 month remanence.

163. **Reslin (U.S.A.)**

It is a product containing sinergizing pyrethroides and drives away the pests.

3.3.2.2. Products used for other damaging insect's control

164. Maxforce–R (U.S.A.)

It is a gel containing 1.9% hydramethilon, used in controlling beetles, flees, bugs from houses, shelters, public buildings, hospitals, aeroplanes, etc. During the disinfection process persons, animals and birds are not evacuated.

165. Ficam – R – Plus (U.S.A.)

The product contains: bendiocarb, pyretrins, piperonil butoxide, without odour, doesn't stain, it is not corrosive and has a long time remanence.

166. Master (Israel)

It is a gel, containing chloropyrifos as active substance. The product is efficient for any crawling insect and is used for disinfections of hospitals, public buildings, storehouses, animal's shelters, etc.

167. Crakdown (Germany)

The product contains 2.55 g/l deltamethrin and 2.02 g/l bioallethrin. It is used for controlling insects in hospitals, public buildings, animal's shelters, etc.

168. Icon (England)

It contains lambda cyhalothrin as active substance. It is recommended in controlling of all species of insects. May be used in any spaces and in the presence of people and animals.

169. Coopex WP (U.S.A.)

It contains permethrin and is used in the control of all crawling insects' species.

170. Drione (U.S.A.)

It contains synergizing natural pyretrins and amorphous silico gel. It is a white colour powder.

171. K – othrine S.C. 25 flow (Germany)

The product contains deltamethrin, 25 g/l active substance, used for beetles, bugs, ants, flees, flies, mosquitoes, etc.

172. Sanivos 20 CE (Romania)

The product contains dichlorovos. It is a liquid with strong smell and brownish colour. It is an insecticide for shocks, used in kitchen and appliance beetles control. It is used only in closed spaces. The disinfection is repeated at 14 days.

3.3.3. Products used for rat controls

173. For rats control many commercial products are used, generally represented by chemical substances called rodenticides

3.3.3.1. Coumarine derivates

174. Most of rat control substances consist of coumarine derivates with various commercial names. The well known coumarine rat control substance Warfarina is component of many commercial products such as: Compound 42, Broumolin, Rodina, Warfarat, Actosin, Horatin,

Zoocoumarina, Cumafen, Ratitox, Delicia, Coumafene, Coumafuril, Rozitox, Coumaton, Contofit, Rastop, etc.

175. These products are either oil consistence or white crystalline, grey or yellowish powder insoluble in water, alcohol or acetone, soluble in alkaline solutions or organic solvents. The persistence of these chemical compounds maintains a few years. They are used in rat controls as baits or dust.

176. These products have a cumulating activity, and do not create resistance and do not have an unpleasant taste or smell. They work over blood vessels, especially the capillary vessels, producing bleeding by their anticoagulant effect. They are not absorbed by skin and do not produce allergies.

3.3.3.2. Alphanaphtilurea derivates

177. Alphanaphtilurea is a synthetic compound being a component of more rat control substances as they following: Naphtiltiocarbamide, Antu, Ant, Antan, Anturat, Mouritanil, Antirax, Deratan, Deratox 20, etc. The technical product contains 80 – 90 % active substance being a grey, grey-brown or grey-violet powder, bitter, slight smell of faeces, soluble in water, nonhygroscopic. Presents selective action especially over the grey rat. It has no toxic lethal effect over the house and field mouse.

178. In many countries, these products are not used any more because it was demonstrated that naphtilamine has neoplastic effect.

3.3.3.3. Phosphorus derivates

179. In order to control mice and rats, phosphorus derivatives are frequently used: Zinc phosphide and phosphide paste. Zinc phosphide is a dark grey powder containing 15 – 18% active phosphorus and 70 – 80% zinc. In contact with humidity, air and carbon dioxide, zinc phosphide decomposes and in a short time misses its toxicity. The main commercial products based on zinc phosphide are: Arvalin, Zintan, Hydro, Rodox, Avamarins, Arrex E, Mausex, Detia, and Zincofid.

180. Phosphorus paste (Rodol) is a mixture of white phosphorus, glycerine, fats that's protects from the oxidation and facilitates the absorption at the level of blood. It is a blue, black or green of aniline (aminobenzene) paste, smelling of garlic a smell that rodents like very much. It is absorbed by intact skin.

3.3.3.4. Thallium products

181. Thallium is considered a good rat control product, frequently as thallium acetate or sulphate. The main commercial products with rat control effect containing thallium are the following: Suruk, Ramor, Soril, Zelio, etc.

3.3.3.5. Rat control products based on sea onion

182. The main commercialized products used for mice and rats control containing sea onion (Scale maritime) are: Squillred, Rasail, and Raxon. The toxic effect is due to glycoside scilirozide, very toxic for rodents and less toxic for farm animals and non-toxic for birds.

183. It paralyzes the diaphragm and produces atrioventricular block. It doesn't accumulate in the body.

3.3.3.6. Other rat control products

184. Castrix (Crimidin, N - 49) is a pyrimidinic derivative very toxic for the field mouse and rat. The selenic product is a brown wax, insoluble in water, soluble in diluted acids and organic solvents. The baits are made of wheat grains impregnated with 0.1% active substance. It doesn't accumulate in soil. The toxic action appears in a couple of minutes after ingestion.

3.4 Storage

185. Most products utilized for decontaminations, disinsections and rat control present a more reduced or a higher degree of toxicity for humans and other species of animals existing in the agro-zootechnical exploitations. Considering this fact, the storing should be done in special spaces destined to this purpose with certain conditions of temperature, dryness and ventilation. In these spaces it is necessary there shouldn't exist large variation of temperature, the optimum temperature being between +4°C and +24°C.

186. In such spaces, the substances should be protected by the direct influence of light or sunrays, placed at a certain distance from the heating sources. All decontaminant, disinsection and rat control substances are preserved in original containers, hermetically closed and with original labels. In these spaces, children and nonauthorized persons are forbidden and warning plates with "Death danger", "Poisoning danger" are set on the door. The rooms for storing these products must have metal doors, grills at windows, special and sealed locks for doors and the keys are kept only by the responsible person authorized by the beneficiary keeping a strict evidence of consumptions. The substances storing is under the incidence of decree 466/1979.

3.5 Application of used products and water and soil protection

187. In agro-zootechnical exploitations, soil and waters pollution represent the consequence of non-obeying the legal provisions regarding their setting, organization and administration by the owners. The main sources of waters and soil pollution are residual waters where besides residual waters, pathogenic microorganisms and numerous toxic chemical substances are accumulated.

188. Considering the facts present above, a special care should be paid to the residual waters collection, removal and cure before they are overflow in the receptors and their use as a fertilizer. Thus, according to the standards in force, veterinary surgeons must permanently survey the way of residual water purification from the zootechnical units and to decide their use as fertilizers. At the same time, there are measures imposed for the inactivation of wastes, secretions and excretions from the animals in the zootechnical farms, slaughtering houses and dairy units.

189. The approval for using the dejections is given only after the necessary period for stocking them, according to the fermentation type (aerobic, anaerobic or mixt) and after the depolluting and neutralization parameters in the technology for spaces purification are realized.

190. For avoiding soil and waters pollution with toxic substances by activities from zootechnical exploitations it is necessary:

- the store and use of decontaminat, disinfecting and rat control chemical substances are necessary to obey the legal provisions,
- the beneficiary shell nominate a responsible person for each objective in the exploitation, who shell know the measures that must obey to these actions,
- all agro zootechnical exploitations should have the necessary appliance (systems for draining, collecting and transport for used waters, purification, stations, special places for collecting and neutralizing chemical substances) to prevent soil or surface waters pollution.

3.6 Regime of technological equipment

191. To apply the disinfection and disinsection solutions in the productive and auxiliary spaces on agricultural and animal husbandry farm, the special equipment and machines are used. Regardless their type, process parameters and operation principles, these equipment's and machines include: solution reservoirs, system for pressure generation provided with regulation and protection apparatus, pipes, pulverization devices.

192. Generally, the disinfection and disinsection solutions are corrosive; therefore, all the components of these equipment that are in contact with solution should be resistant to corrosion.

193. Unfulfilment of this requirement leads not only to early equipment degradation up to getting it out of order, but also to the degradation of the work quality.

Equipment for disinfection and disinsection

194. The reservoirs of the apparatus carried by man have a small capacity. They are either closed, with pressure or opened in direct connection with the atmosphere. The pumps for generating the pressure are manually operated; for the some of them, the pressure is previously generated; for other, the pump is handled during the operation. In some cases, as for the disinfection and disinsection in auxiliary spaces, the used apparatus can be an apparatus carried by man hand put in action by an internal combustion engine, in fact, usually used for the horticultural operations. All these apparatus work at the low pressures of 4-5 bars and with small discharges.

195. The pulverization devices with the regulation of jet are recommended because so it is possible to obtain different lengths and, therefore, different diameters of the area contacted with the room walls. It is compulsory to wash the apparatus after the use. The same precaution rules should be respected as in the case where the chemicals are applied for plant protection.

Ecological equipment to combat flies

196. An alternative of the chemical disinfection is offered by the apparatus with electrical impulses of a high voltage. The insects attracted by the lamp in the apparatus box reach the grill with the wires that are under the impulses of high voltage. The electrical discharge energy is high and it is not supported by the insects whose mass is very small. The generator of the electrical impulses is similar with that used for the electrical fences on the pastures.

Equipment for washing and disinfection in the animal shelters

197. This equipment is used after the depopulation and before a new population of animal shelters, and they include the same components as the equipment for disinfecting, but they are different by the following characteristics: higher pressures and discharges. All the pumps of this equipment are provided with the electric motors.

198. The use of the equipment with operation pressure of 15 - 25 bars, accompanied by high discharges allows to remove the dejecta and dirt from the walls of boxes, batteries and other fixed equipment in shelters, as well as on the slatted or not slatted floor, and to move the dirty water through the channels and collecting fosses. The same equipment can be used for the disinfection, too by applying some relatively large discharges of solution with a lower concentration.

199. The equipment for washing with very high pressures of 80 - 150 bars and jets with relatively low discharges is recommended especially for cleaning after the depopulation of the fixed equipment in the animal shelters, particularly when the areas present many edges and channels that accumulate the dirty, and when the dirty crust is more compacted and more difficult to be dislocated and removed. This equipment with strong jet and very high pressure is not suitable for the application of the disinfection solutions.

Technical means for washing and disinfection of milking installations

200. All the milking installations are provided with washing and disinfection equipment on the milk flow, after milking all the cows. Disinfections of the milking machine after milking each cow is an exception practised only with some milking installations provided with carts, and with milking robots, the both situations are not in the Romanian dairy farms.

201. The equipment for washing and disinfection after milking assure different levels of mechanization and automatization:

- In the case of milking installation with the can, the washing and disinfection allows to wash and disinfect in a closed circuit of the following components of the milking machine: milking hose, milk collector, short and long flexible pipes for milk. The milk cans and the bigger vessels for milk are manually washed and disinfected.
- In the case of milking with the milk conduit under the shelter or on the base, the water or solution circuit is: milking hose, milk collector, short and long flexible pipes for milk, milk conduit, transferring system. The washing is carried out with water at the normal temperature, then with warm water at about 40⁰C, and then the disinfection solution is recirculated. In the case of some modern installations, the hot water has a temperature of 85⁰C, without affecting the condition of the components, which are

contacted. The washing with cold water follows, having as a main purpose to remove the disinfectant solution. This phase is of a particular importance, because no trace of the disinfectant is allowed in the milk obtained in the next milking operation.

202. The washing and disinfection program of milking installation may be manually or automatically carried out. The automatic systems with program assure not only the start of the washing and disinfection phases and their duration, but also the temperature regulation and preparation of disinfectant solutions.

203. In the case of many washing and disinfection systems, the disinfectant solution is recovered and may be reused several times. The disinfecting solutions are specially prepared for the milking systems and they can not be replaced in any case with detergent or disinfectants provided for other purposes. They should be fulfil a series of demands regarding both the milk hygiene and the installation, namely, they should have a bactericide action, good detergent properties, no toxicity, no influence on organoleptic properties of milk, no corrosive effect on milk installation components, and be easily washed by water.

204. When the disinfectant solution is no longer used, it is not allowed to enter, together with other residual waters, the areas where it can pollute the soil and ground water.

Equipment to wash the udder before milking

205. Some milking installations on the milking parlour are provided with shower flexible pipes handled by milker for washing with warm water the udder before fixing the milking cups.

Technical means for udder disinfection after milking

206. Besides the special devices of funnel form, handled by the milker, there some systems of installations with pulverization nozzles located on floor in the passage way of the milking parlour and which are automatically put in operation when the animal passes through.

IV WASTES AND RESIDUES FROM THE AGRICULTURAL AND ANIMAL HUSBANDRY FARMS

In the agricultural and animal husbandry farms, besides the wastes with fertilizing value - manure, liquid and fluid slurry (presented in vol. I, chapter X), may result also other wastes and residues that, inadequately treated, can become polluting agents of soil, water and air. In this category there are included different liquid and solid slurries resulted, for example, from milking of animals, their slaughtering, wastewater from the hygienic operations in the animal shelters, etc. All these should be managed with very high attention to avoid the water and soil pollution by some dangerous and toxic substances they contain (pathogenic agents, heavy metals, detergents, chemicals used for the disinsection, disinfection, etc.)

207. These waste types should be treated in the treatments plants and, after reaching the provided depollution and neutralization parameters, they can be used, if it is recommended, as fertilizing materials or stored as wastes according to the rules in force.

208. All the large agricultural and animal husbandry farms should have installations to assure the operations for the decontamination and neutralization of the wastes and residues coming from the agricultural and animal husbandry farms (sewage systems, collecting and transporting, treatment plants, and storage places).

209. The disposal of the waste waters to the drainage canals, or, if it is the case, to the irrigation canals, or to the agricultural lands will be performed only under the conditions of an adequate treatment.

210. A particular treatment should be given to the dead animals in the farm and the farm animals died during the transit. Their carcasses cannot be deposited at random, because they represent centers of contagion of some diseases and pollution sources of ground and surface waters.

211. Any owner of animals should notify the veterinary surgeon on a dead animal: The veterinary surgeon, after examination, will recommended the most adequate procedure to disposal or treatment for the notified situation. The treatment of such types of wastes is fulfilled in specialized units, approved by the National Sanitary-Veterinary Agency.

212. The empowered authority may decide to dispose of carcasses with a high risk degree by incineration in crematorium or by burying them, when:

- a) there is a danger to propagate the healthy risk during the transportation;
- b) there is the suspicion that the pathogenic agents could resist to the wastes of such a type;
- c) the respective animal carcasses are coming from places where the access is difficult;
- d) the quantity and distance that should be covered do not justify the measure to collect the wastes of such a type.

213. The burying of the dead animal carcasses should be carried out at a sufficient depth (at least 1 m) to prevent their digging up by the carnivorous animals or birds and also to avoid the air pollution with unpleasant odours, as well as the pollution of water sources. Before the

burying, the carcasses should be spread with an adequate disinfectant. In the case of the sick animals, the whole dead animal body (including the skin and internal organs) should be buried.

214. The location of the burying place should have in view that it should be at least 500 m far from the settlement, and at least 20 m far from the wells, boreholes or springs providing water for people and animals. Also, the floor of the pit should be dry, that is, it should not be covered with water layer.

215. It is forbidden to throw the dead animals to the garbage base or to the composting platform or among the abandoned and degraded buildings.

216. The same recommendations are also applied to dispose of the dead poultry.

V WASTES AND WASTE WATERS FROM THE SECTOR PROCESSING THE AGRICULTURAL AND ANIMAL PRODUCT

The waste waters and residues coming from the sector processing the agricultural and animal products usually have a high and very specific loading of potentially polluting substances, mainly of the organic origin - carbohydrates (sugar, starch), fats, proteins, etc. They can also present a significant loading of pathogenic agents, especially those coming from the sector processing the animal husbandry products.

217. The waste waters coming from the about mentioned sectors are not directly spilled to the surface waters or in the network of irrigation or drainage canals, because they have an rapid and intensive effect of pollution especially due to the very high biochemical oxygen demand. According to the legislative rules, all the units processing vegetal products (sugar factories, factories for canning the vegetables, fruit juices, oil, etc) and animal products (slaughteries, sausage factories, factories for canning the meat, milk processing, etc.) should be provided just in designing phase with waste water treatment plants and technologies specific to each type of unit.

218. The observance of the waste treatments and the adequate maintenance of the waste water treatment plants are measures of nature to lead to obtaining some clean waters that can be spilled then in the sewage system or can be used, if they are qualitatively adequate, for crop irrigation.

219. The sewage sludge cakes from the waste water treatment plants can be used, after composting, to fertilize the crops, if there are no constrains concerning their use (for instance, a load of heavy metals or other dangerous substances over the maximum allowable limit). Their administration can be carried out only after their analysis in the specialized laboratories.

220. Other residues coming from the units processing animal husbandry products should processed according to the legal rules, in specialized units authorized by the National Sanitary - Veterinary Agency, by their processing, products for feeding pets, fish, or different technical or pharmaceutical products can be obtained.

221. The central sanitary-veterinary authority, under exceptional circumstances and the veterinary surveillance carried out by the competent authorities, may authorize the use of wastes of animal origin for scientific purposes.

222. The wastes unsuitable for processing are disposed of by incineration or burying in an adequate soil to prevent the contamination of watercourses or environmental pollution.

VI PRODUCTS OF MINERAL OIL

The modern agricultural farms, both vegetal and animal, presume many mechanical operations for soil and crop management, animal raising, processing the products, transport, etc. The main objective of them is to work as efficiently as possible and to diminish the physical effort of the farm staff. Among the energy sources used to carry out the mechanized operations, the most important is represented by the oil fuels (mainly diesel and gasoline). In addition, there are lubricants of the same origin being used for maintenance (lubrication) of different mechanisms. All these products, if they are not reasonably managed, can cause severe pollution phenomena both to soil and aquatic environment. The following recommendations of good agricultural practices have in view to prevent or mitigate such negative effects

223. The tanks for the oil products are recommended to be above ground, in a place available for the supplying machines, far from the water sources, especially from soil water drains, or channels for water draining.
224. Below- ground tanks are not recommended if there is the risk that the leaks could pollute ground water or the soil presents corrosion-prone properties.
225. The fuel tank location site should be provided with special measures for fire prevention.
226. Absorbent materials should be provided near the site of tanks with oil fuel to soak up any eventual spillage. Overfilling of the machine tanks should be avoided.
227. The tanks are regularly checked and they are repaired as soon as the leaks appear.
228. The mobile tanks are used with care, especially when the irrigation pumps are refueled next to watercourses.
229. The technical condition of the equipment, especially engines, pipes and connections should be periodically checked in order to reduce at a minimum the fuel leakage.
230. The technical interventions on the system of supplying the fuels carried out in the field, as for example, replacing the fuel filter or flexible pipe and other, are operations that can generate fuel leakage on the soil. Measures to limit these losses should be taken.
231. In Romania, the most severe way to pollute the soil with diesel is caused by technical system to eliminate the air from the system supplying fuel for tractor engines. The tractor that are used in the Romania agriculture for several decades are provided, by construction, with a system with air bubbles to outside pumping the diesel spilling in the soil without possibilities to be recovered. This operation is recommended to be fulfilled as much as possible on bases especially fitted up, preferably covered with asphalt.
232. When the significant losses of oil products occur, the first measure is to reduce the risk of fire and to prevent their entering canals, watercourses or ground water: The next step is to avoid as much as possible the spreading of material so that the remained quantity can be decayed by the microorganisms or volatilized. The recovered material is stored in the places for special residues or is treated.

233. When the light oil products, as diesel or black oil, penetrated the surficial layer of soil, but they have been retained in subsoil or ground water, a drilling can be carried out to drain these products that then are pumped out. The drilling should not exceed the layer containing the respective products. The water or detergents are not used for washing these products and also these products are not burned at the soil surface.

234. The heavy oil products (mineral lubricants with higher density) remain at the soil surface in the case of spilling. They should be left to get solid, and then they are scraped paying attention to avoid them with as less soil as possible. The resulted material should be stored (in authorized places for such residues and subject to the bioamelioration treatments).

235. The next stage to remedial the soil consists in the creation of some suitable conditions so that the microorganisms decay the rest of the residues remained in soil, that is, a pH over 7, a suitable temperature and an adequate content of water, oxygen and nutrients. Their decay is facilitated by surficial work of soil and mineral fertilization with nitrogen and phosphorus, measures that assure more oxygen and nutrients for microorganisms. The soils contaminated with petroleum products are not fertilized with organic fertilizers because these increase the oxygen demand of the microorganisms, affecting the cultivated plants.

236. The complete recovering of the soils polluted with oil products can lasts two years in the case of coarse soils and up to five years in the case of fine soils, according to the soil type and the used remediation method.