PROGRAM:	**ERASMUS+**
ACTION / SUBPROGRAM:	**Key Action 2 / Strategic Partnerships**
PROJECT TITLE:	**"OSH+ for the European Agriculture sector - Stimulating growth in rural areas through capacity building for providers (and beneficiaries) of occupational medicine and OSH services"**
Intellectual Output :	**O4 – Course 1-Safety Experts – Training Materials – Case Study 7**

AGROSH+

C3 / Training Course for Safety Experts in Agriculture

CASE STUDY 7 – POULTRY FARM - BROILERS

Romania

Introduction

It is 20 years now, since **SC PUIUL SRL** performs this activity of intense breeding of poultry for meat using the technology of breeding on the ground on wood chips – permanent bed, in closed sheds.

The company has 7 working locations in Mures and Sibiu Counties where a total number of **297 employees work**, with some 3 mil broilers sold.

The Case Study was elaborated for the farms in:

1. **Location 1, Mureș County**
2. **Location 2, Mureș County – 15 sheds for broilers breeding + 15 incubators**
3. **Location 3, Mureș County – slaughter house, 7 sheds for reproduction**

Location 2, Mureș County

In this location approximately 300.000 broilers are grown / series of 6 cicles/year. Duration of one breeding cycle is 40-45 days, broilers being grown up to a 1.8 kg/piece. Breeding activity unfolds 365 days/year, 24 hours/day, except the sanitary void periods of ca. 10-14 days after each production cycle.

Broilers are grown in 15 sheds – capacity 20.000 heads/shed. Density of poultry is 20 heads per square meter.

Each enclosure has an entrance hall where electronic control systems are installed for temperature measurement, the ventilation system switch-on, the air heating and air-conditioning system switch-on and for the sanitary filter.

Main activities / Operations

1. <u>Populating the breeding sheds with one-day old chickens</u>

The transport of one day-old chicks is done in special boxes from the incubation station by the farm staff.

Population is done after a preliminary check of the microclimate conditions in the shed, in order to ensure the proper temperature and ventilation. The bed (wooden chips) is spread over the entire surface, with a thickness of 5 to 10 cm (on average - about 4 kg / sq m).

Chickens are brought from incubators (see incubation below).

a. Feeding

The chicken feed system will provide the necessary food with 3 feed lines, consisting of sneck conveyors, feed silos (located outside the sheds) and circular feeders.

For the transport of fodders, self-bunkers are used which discharge the feed by mechanical means (screw or pneumatic). Outside, at the end of each shed, the storage bunkers (silos) are located.

The end bunkers at the end of the feeding lines are fed from the outer bunkers by conveyor spirals (made of flattened wire inserted into metal or plastic pipes). The feed is then taken over by the spiral conveyance line and discharged into the plastic nurseries, spaced about 1 m from each other.

At the end of each breeding cycle, bunkers and conveyors disinfection can be done.

Each shed is equipped with external storage for fooder, from which, it automatically enters the feeding facilities in the sheds.

The size of the granules differs according to the age of the chickens:

- *0 - 10 days > breakings;*
- *11 - 28 zile > granules with 2-3 mm diameter;*
- *28 zile - sacrification > granules with 3 mm diameter.*

Fodder is represented by mixturs of maize (50–60%), corn, barley, soy, vegetable oils and supplements (vitamins, minerals and aminoacids).

Workers weigh weekly chicks from multiple groups in the shed and watch the average daily increase. A shed consumes about 70 tons of fodder in a cycle, with about 150 cubic meters of water.

b. Watering

Watering of the chickens will be done with 4 continuous feeding systems at a temperature of 10-12°C. The nipples and nozzles for leakage recovery are provided. The watering system is provided with a pressure regulator and dispenser for medicines and vitamins.

Appropriate consumption should be calculated to at least 15 ml / chicken in the first 24 hours and the watering systems are cleaned daily to prevent the bacteria from growing as a result of:

- Inappropriate cleaning of drinking lines, abundant use of vitamins and electrolytes in drinking water, the use of low levels of acidifiers, milk replacers and milk used for vaccination, as well as some minerals in water such as iron and sulfur, make the number of bacteria to grow in drinking water;
- Drinking water is treated with disinfectants and drugs are added to existing collection tanks in each shed;
- Biofilm that forms inside the water pipes in the shed can protect pathogenic bacteria (ex. Salmonella can survive weeks in biofilm);
- Air from water lines favors aerobic bacteria (sulfuric bacteria)
- Water filters of the system are cleaned weekly.

c. Assuring the microclimate

Sheds warming is done by radiators (6-7 per shed) working on natural gas.

Ventilation is done by 4 fans / shed with a 43.000 mc/h flow, with programs adapted for summer and winter.

The maximum allowable speed of the airflow in the shed is 0.1-0.3 m / s, which must be strictly correlated with the room temperature and the age of the chickens. Inside the shed, there are

temperature and humidity sensors, which provide the necessary information for the automatic microclimate control system. Correction of microclimate parameters is done automatically, but there is the possibility of manual operation of each equipment.

The shed is foreseen with an automated cooling system.

- the ammonia concentration [NH (3)] does not exceed 20 ppm (25 ppm causes eyelid irritation, tears, nasal irritation). The maximum ammonia load is above the floor bed, at the chickens level;
- the concentration of carbon dioxide [CO (2)] is max. 3,000 ppm, measured at the height of the heads of the chickens;
- for hydrogen sulphide a concentration of up to 5 ppm is allowed and for carbon monoxide, max. 40 ppm;
- concentration in harmful gases is determined by the ventilation rate, which should be higher in summer and lower in winter. Good ventilation means ensuring an O2 content of 16%.
- the inside temperature does not exceed the outside temperature by more than 3 ° C when the outside temperature measured in the shade exceeds 30°C;
- the average relative humidity measured within the shelter for 48 hours does not exceed 70% when the outside temperature is below 10°C.

Internal factors influencing the level of noxes in the enclosure:

- size of peep / number of chickens, weight of broilers,
- ventilation rate,
- indoor temperature,
- inadequate operation of ventilation equipment,
- floor bed quality

External factors influencing the level of noxes in the enclosure:

- low or high external temperatures
- wind
- precipitation (rain/snow).

Lighting

The light intensity is 20 lucsi, which is necessary to stimulate a chicken activity level without creating health and wellbeing problems.

After 7 days, a light program of 18 hours light and 6 hours dark, with alternating light and dark periods, is introduced. The minimum of continuous darkness is 4 hours.

The interior lighting of the sheds is made with fluorescent or incandescent bulbs. For power supply, transformer stations and air or underground transmission lines are used.

d. Vaccination (valid as well for the chickens grown in sheds from Sincai locality)

There are 20 vaccinations, all when chickens are young, some in group, by water or spraying, others, individually, with eye drops or injections.

20 people (male) work to perform individual vaccines.

By spraying: the process is similar to that of plant spraying from left to right, above the chickens. EIP: overalls, gloves, bonnet, mask.

e. Broilers delivery to the slaughter house at the end of the cycle

At the end of a production cycle (42-45 days) chickens arriving at the slaughter weight (average 1.9 kg, max. 2.2 kg) are loaded manually in cages. A cage has a max. 10 chickens.

The boxes are transported by forklifts

All equipment used (including means of transport, cages, gripping frames and nets) must be clean and in good working order. When catching birds, all feeding and watering lines rise to about two meters in order to avoid obstructing birds or staff.

The chickens are transported to the slaughterhouse of the Craiesti village, Mures County, with certified sanitary-veterinary transport (82 km).

The cages are loaded on a conveyor belt and then two more employees take the chickens out of the boxes and hook them upside down into the moving metallic chain.

The capacity of the slaughterhouse is 1000 birds / hour.

Slaughter house

Upon arrival at the slaughterhouse, fans and sprayers are used to maintain adequate bird temperature while waiting for processing.

1. Electrical stunning

Scarification line starts with the electrified bath (100 mA and 6V) in which chickens hanged on the metal rails are sank.

2. Sacrification – bleeding

Operation performed manually by 1 worker (with a knife). Blood is collected in a sewer which is connected to a tank. This is then taken over by PROTAN. For 1000 broilers/day, the result is aprox. 360 kg/day.

3. Scalding

- Stainless steel basin with 50-52°C water
- Birds are completely immersed in water
- The vapors are sucked in and bubbled into the water in order to smooth the scalding temperature;
- Water level remains constant due to float valves
- The scald temperature is monitored automatically

4. Plucking

- automatic, with pluckers provided with rubber fingers,
- results approx. 960 kg feathers / day. They get to waste.

5. Separation of head and legs

- Operations performed manually with a knife

- 2 workers (female)

6. Evisceration

- 18 workers (mostly women)
- Manual operation. Knives are used

7. Drying and cooling

Birds are kept between 2 and 2.5 hours. For cooling, spray with cold air is used and thus the carcasses from 35^{o}C reach 10-15^{o}C.

8. Cutting and packing

- 24 workers
- Manual operation. Knives are used

9. Refrigeration – maintenance

Produsele de carne de pasare preambalate in pungi, tavite, in cutii de carton sau vracuri sunt mentinute si lotizate la temperature de 0 – 2C.

Poultry products pre-packaged in bags, trays, cardboard boxes or bulk are kept and prepared in batches at 0-2°C.

f. Sheds preparation for repopulation – sanitary void (1-2 weeks)

After the depopulation of the 15 sheds, these are prepared for the new cycle by removing the floor bed blended with manure (mechanized operation) and manual cleaning, washing and igienization of the sheds.

Operations during the sanitary void are the following:

- chickens are delivered from the sheds to the slaughterhouse (the company's own one);
- evacuating the bed and performing mechanical and manual cleaning;
- wash the shelter with water jet under pressure to remove dirt;
- repair and complete all defective equipment and systems in the sheds;
- disinfection of the sheds (walls, floors) and of the equipment in the shed (fans, feeding & watering equipment, lighting);
- the disinfection of the enclosure and of the access ways is performed;
- the farm is disinfected and rid of mice.
- laboratory samples are sent to control the sanitation, in terms of germs and fungi;

depending on the results of sanitation obtained from the laboratory, the disinfection is repeated or not. For disinfection, chemical substances and preparations approved for use in poultry farms are used.

Dead birds are temporarily stored in a refrigerator and are taken over periodically by SC PROTAN SA, with which the company has a contract.

Chemical substances for dizinfection:

- Virakil NG/ disinfectant for animals' habitat and for all the equipments used in animal breeding: Alkyl dimethyl benzyl ammonium glutaraldehyde chloride. R 50; R42/43 R20/22 R35. C –corosive = 400-450l/year.

It is very toxic for the aquatic organisms. It can cause sensibilization through inhalation or contact with skin. It is noxious in case of inhalation or swallowing. It causes harmful, serious burns. Tensionactive agents in the preparation are conformal to the biodegradability criteria foreseen by Regulation (EC) no 648/2004 for detergents.

- Ox–Virin/dizinfectant. Risk of decomposition by exposure to sunlight and in contact with flammable materials. It can cause fires, burns. It is toxic for ingeration.
- Ecocid S /biocid: oxidant, corrosive, toxic, harmful. Irritating to eyes, respiratory system and skin.
- Intra Hydrocare/detergent. Risk of very serious ocular injuries. Irritating to respiratory system and skin.
- Keno San/ detergent. Causes serious burns. Corrosive to eyes, respiratory system and skin.

Incubation Stand

The incubation stand/station consists of: 15 incubators with the capacity of 47,520 eggs / incubator and 9 hatters with the capacity of 25,000 eggs / hatcher.

The incubation stand is equipped with automatic control systems for: temperature, humidity, ventilation and egg turn

Technological flow in the incubation station:

- there are 15 incubators 30,000 – 45,000 eggs entering the incubators in one cycle. 9 hatters, with the capacity of 25,000 eggs / hatcher
- Egg delivery: they are collected directly from the adult sheds on a rubber band with holes for fixing them (the installation passes through a metal tunnel across all the sheds and transports the eggs to the sorting station).
- Reception, sorting of eggs, storage of eggs. Eggs are controlled not to have cracks, not to be dirty. The operation is done by 2 female workers. They are stored in long plastic frames (site) and the frames are placed in metal trolleys. Eggs are not washed!
- The eggs are disinfected by fumigation with formalin (the formalin solution is heated on an electric resistor and boils for 30 minutes) and stored at 17-18°C and 70-75% humidity, no more than 10 days

Formaldehid and Concentr. methyl alcohol preparation 37 % T –toxic R 23/24/25- 34- 39/23/24/25 - 40-43 = 25 kg/year.

Toxic by inhalation, in contact with skin or swallowing. Danger of very serious irreversible effects on health through inhalation, in contact with skin and ingestion. Possible carcinogenic effect.

- Verification of fertilization: A sample of approx. 30 eggs from a shed (shed where there are laying hens of the same age) is formed. They are kept in a small incubator and for 3 days they break the bark and check whether or not the embryo has been formed. 1 employee. PPE: dressing gown, surgical gloves, bucket for throwing eggs. The percentage of fertility should be

80-85%. If eggs do not go in, they're neutralized and collected by Protan. Usually the percentage is 95-97%.

- Incubation of eggs: 18 days. All incubators are monitored and if there are deviations from temperature or humidity, an alarm is triggered throughout the building. The temperature is periodically checked for the eggs with an auricular thermometer. These must have 37.8°C. In the incubator are 37.5°C and 51.11% humidity.

In the middle of the incubation period, the embryo of each chick (mirage) is checked. 3 female workers pass each tray / sieve onto a strip in which bulbs are mounted underneath. Noise from fans and water vapor from sprayers. A tray weighs apox. 9 kg. Eggs are transferred to cardboard formwork. Water breaks are made every hour. In approx. 3 hours, an entire incubator is scanned.

- Transfer to hatcheries. 9 incubator-like cabins where the chikens come out of the booth. Temperature and humidity are monitored. The hatching process takes 3 days.
- Harvesting and sorting day-old chickens and storing in 100 heads capacity boxes.
- Vaccinating chickens and transferring them to the one day-old chicken warehouse.
- Washing and disinfection: sieves, trolleys, hatcheries, boxes, alveoli in which the eggs were transported.

The yield of the incubation station is 90% viable chickens.

Sanitary filters:

- In the administrative building. Men's / women's cloakroom for workers and visitors. Protective clothing: T-shirts, overalls, new footwear (espadrilles), bonnet. Carpet with disinfectant, hand disinfectant.
- At the entrance of each shed: Disinfectant carpet + disposable botoshes + hand disinfectant.
- When accessing the farm, at the gate: all vehicles are disinfected: with high power sprayers.

Wastes Collecting and Disposal

The garbage collection and disposal, materialized by permanent bedding in the shed, is mechanized and takes place at the end of each breeding cycle. After being evacuated from the shelters, the garbage is stored for at least 6 months in order to bio-sterilize the 1200cm capacity waste tank.

At the end of a breeding cycle, bedding materials are discharged using blade tractors and loaded onto the vehicles of the company, with which they are transported to the manure platform or, as the case may be, to the agricultural producers, and after a sterilization period of 3 months are used as fertilizer in agriculture.

The butter waste discharged from the collection shed into trailers is to be transported to the temporary storage facility specially designed for storage until direct use as a fertilizer for agriculture.

Measures for the disposal of waste and manure

→ Dead Birds: The collection and disposal of dead birds is made by contract with specialized units for processing this waste (PROTAN). When transported to Protan for incineration, dead birds are properly packaged and transported by appropriate means.

→ Farm manure is transferred to a specially arranged warehouse where it is delivered in the form of fertilizer for agricultural land

Type of waste	Annual quantity	Temporary storage procedure
Farm manure, including used floor bedding	3000 t	It is stored in the farm for ca. 3 months on a platform
Dead birds	27t	Stationary just for few hours, packed in polyethilen bags until loaded in the transport means
Egg shells and dead embryos	0.8 t	These are loaded directly in PROTAN's tank
Drugs packaging and carton boxes	150 kg (estimated)	Specially arranged place, in plastic bags
Vaccines packaging: glass bottles (hazardous waste)		Periculor H9 Specially arranged place – after-sterilization with whitewash
Packaging from disinfectant materials	50 kg	Periculor H5 Specially arranged place
General waste	1t/an (estimated)	in metal containers, specially arranged places

Riscuri

Chemical risk

- In order to prepare the sheds for repopulation, these enter in a sanitary void period in which they are cleaned, dizinfected, rid of mice, all by using chemical substances (see above).
- For preparing the eggs for incubation, these are dizinfected with formalin (details included above).
- In sheds populated with chicken, there are used substances like ammonia and carbon dioxide (concentrations given bellow).
- In the slaughter house, there are used substances for cleaning and dizinfection of work surfaces, floors, tools and equipment used.

Smells

- Smells are mainly generated by: ammonia and methane gas emissions in the production sheds
- Emisions in the shed atmosphere

	CH4	N2O	Inhalable powders
Factor of emission (kg / location / year)	0.021 – 0.043 (average = 0,032)	0.014 – 0.021 (average = 0.018)	0.03
Emission kg / year	3064.32	1723.68	2872.8

Other emisions:

- NO2, CO and SO2 arise from associated activities like the burning process of combustible materials from the shed air-heaters and from the heating station with which the sanitary filter is equipped;
- Powders can appear both in the sheds – due to the floor bedding, and from the fodder manipulation activities.

Risc biologic:

- When eggs are checked and prepared for the incubation, some eggs can break.

- In incubators when sample eggs fertility is verified by separation and verification of the embrio (eggs are broken and checked)
- In incubators, in the verification in light period, there is the chance for the eggs to break.
- Contact with dangerous wastes – vaccins packaging (glass flasks), there is the risk of accidental injection, other medication. These are stored in whitewash after use.
- Dead birds – are stored in special containers for short periods of time, until capacity of a transport is reached – being then sent to SC PROTAN SA for neutralization through proessing.
- In the slaughter house as well as in sheds: risk for the employees manipulating the broilers to be scuffed, pinched, accidentaly cut, et. Generally, breeding activities can facilitate the development of insects and rosarial; thes constitute vectors for the propagation of biologic pollution.

At the same time, manure that is applied on the field as fertilizer can constitute a soure of bateriologi pollution.

Risc fizic:

Noise

Noise and vibrations within the enclosure can generate phonic pollution; the soures can be:
- fans in the sheds of production;
- compressors, pumping stations, etc.

Soure of noise	**Duration**	**Frequency**	**Tyoe of activity**	**Level of noise [dB(A)]**	**Level of continuous equivalent noise [dB(A)]**
fans in the sheds	Continuu/ intermitent	Year round	Daytime and at night	43	
Fans and automated installations for birds transport to the slaughter house, in all the sections: reception, plucking, etc	continuu	Year round	Daytime	High level. All employees wear headphones	
Loading/unloading the birds, vaccination included as well	6 – 56 hours	6 times a year	Daytime		57 - 60
Bunkers filling with fodder	1 hour	2 – 3 times a weeks	Daytime	92 (5 meters away from the soure)	
Manipulation of solid manure	Once a year	Daytime			
Washing / cleaning the sheds		6 times a year	Daytime		

Movie with one day-old chicken vaccination https://youtu.be/xo5-fU7ohIM
9 chicken in 16 seconds / 4 employees! 45,000 eggs in a cycle – 10 hours

Electricity

- In sheds, at te comand panels of the lines for feeding, watering, the electric panels for fans, lighting and warmth, etc
- Command panels for the conveyors transporting th eggs to the warehouse, so as to be then transported to the incubators.
- Incubators: switchpanels
- Slaughterhouses with specific equipment

Sequipments and machinery electrically activated are checked each day before put under power. Remedy will be performed by an authorized electrician.

High temperatures

- In incubators: when check under light is conducted, temperature is 37.5°C and 51.11% humidity. 3 employees. 3 hours/incubator. Breaks each and every hour.
- During summer: there are employees who work in the open space to unload the fodder, pack and transfer the wastes (used bedding), sheds dizinfection – related activities.

Low temperatures

In the cold room, where broilers are stored in boxes.

Ergonomic risks:

- Reception of one day old chicken. Manipulation of boxes with 100 chickens each.
- Catching the adult birds for the transfer to the slaughter house: 6 employees, 28,000 chickens, 1 chicken/1.8 kg.

Equipments & Machiney used:

In sheds:

- Automatic feed dispensers (control panels). In each shed there is a bunker that is automatically fed with the fodder in the silo near each shed
- Automatic water supply installations (control panels)
- Installations for maintaining the microclimate: fans, radiators, water spray devices.
- For populating, forklift trucks are used to carry one day old chicks
- A spraying device is used to administer medication
- For the cleaning and disinfection of the sheds: scraper blade tractor to cleand the sed bedding, brushes, water jet pumps, scraper to remove difficult residues, disinfectant sprayer.

Main administrative divisions of the company (departments, productive areas, offices, etc.)

- The entrance. A small establishment were **all** the vehicle are disinfected by pulverization. The access to the farm is controlled!!
- Offices (manager office, Vet office, the sanitary filter, lockers and showers for personal and visitors) – 1 building
- 15 Sheds (production area). Each shed has an administrative area were the control panels for the ventilation, heating, illuminating, feeding and watering are. Here is also a third sanitary filter: disinfected mat, disposable boots, and disinfectant for hands.

Working time / Night shifts / Irregular work (seasonal work, temporary workers for some peculiar operations like in vineyards, etc.)

- 24/24, working in shifts of 8 hours
- In the periods in which the sheds are cleaned and disinfected (10 – 14 days) some of the employees are taking leave or are transferred to other sections of the farm (incubator)

Types of personnel per profession / specialization

- Farm manager and also the veterinarian
- Responsible for environmental protection (mandatory by law)
- Responsible for production
- Electrician / qualified personnel
- Farmers operators / work qualifid

ROSS 308

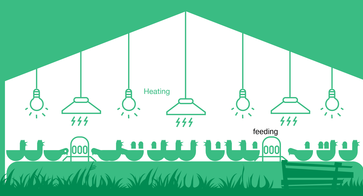
[redacted]

[redacted]

The parents

the parents:
AVIAGEN,
Germania

Livrare:
Romania



youth
1 d → 18-19 w.

3 Hale

rooster & hens
separated
(1 r.: 10 c)

Light:
8 ore

Vaccine:
20

adults:
20 → 64 w.

4 Hale

Light: 14 h
(The intensity increases from 10-15 to 50-60 lls, stimulating the laying)

Productivity:
91-91,5% hens: 1 eg/d
(85-97% are fertile eggs)

Eggs

Incubators
(18 days)

Incubation:
21 days

8 Hale

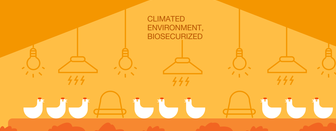
45.000 eggs
/ incubator

Egg:
Kept - 37,8°C

Mirage:
((performed mid-term, opaque eggs are fertilized, translucent red - not fecurdated))

Hatchers
(3 days)

Chicken - broiler



GROWTH:
38-40 days

4 Ferme

Consum/serie:
cca. 70t feed
+ 150 mc apa

A4
min. space:
550 cm2 / pui

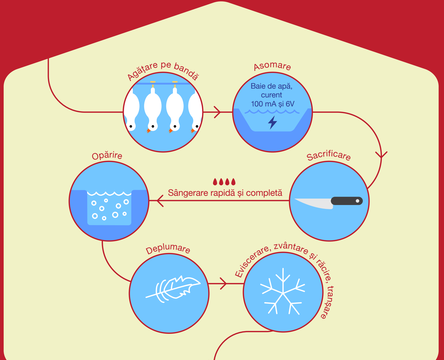
Light:
18 ore

Daily average gain:
60 g / day
(Start from 42 gr
reaches 2.3 - 2.4 kg)

Does not contain proteins of animal origin, hormones or antibiotics..

Food - Combined Nutrition:
Maize (50-60%), wheat, barley, soybeans, vegetable oils and supplements of vitamins, minerals and amino acids.

Slaughterhouse



Packing

Infograficul face parte dintr-un proiect despre afaceri antreprenoriale românești de succes, dezvoltat de către DoR (Decât o Revistă) la inițiativa BRD Groupe Société Générale.

Grafica: Mircea Drăgoi