Rabbit production in the World, with a special reference to Western Europe
Quantitative estimation and Methods of production

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Web site : http://www.cuniculture.info
General plan of the lecture

1 – Quantitative production in the different countries
   - Difficulty of the estimation: official and real situation, carcasses presentation, …
   - Range of estimation of the world production
   - the 4 main countries: China, Italy, Spain and France

2 – Worldwide overview of the methods of production
   - Asia: China, Indonesia, Vietnam, …
   - North America: USA, Canada, Mexico
   - Central and South America: Cuba, Brazil, Argentina,
   - Africa: North and South of Sahara
   - Europe: traditional and intensive commercial production

3 – Description of the production techniques used in Western Europe
   - Cages and buildings - Genetic resources
   - Reproduction & Insemination - Nutrition and Feeding
   - Rabbitries management - Slaughter and commercialization
World Rabbit meat production according to FAO in 2007

<table>
<thead>
<tr>
<th>Rank</th>
<th>Countries</th>
<th>Production tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CHINA</td>
<td>597 000</td>
</tr>
<tr>
<td>2</td>
<td>VENEZUELA</td>
<td>277 000 ???</td>
</tr>
<tr>
<td>3</td>
<td>ITALY</td>
<td>230 000</td>
</tr>
<tr>
<td>4</td>
<td>North KOREA</td>
<td>91 000 ???</td>
</tr>
<tr>
<td>5</td>
<td>SPAIN</td>
<td>71 000</td>
</tr>
<tr>
<td>6</td>
<td>EGYPT</td>
<td>70 000</td>
</tr>
<tr>
<td>7</td>
<td>FRANCE</td>
<td>55 000</td>
</tr>
<tr>
<td>8</td>
<td>GERMANY</td>
<td>32 000</td>
</tr>
<tr>
<td>9</td>
<td>UKRAINE</td>
<td>12 000</td>
</tr>
<tr>
<td>10</td>
<td>RUSSIA</td>
<td>10 000</td>
</tr>
<tr>
<td>11</td>
<td>HUNGARY</td>
<td>9 500</td>
</tr>
<tr>
<td>12</td>
<td>GREECE</td>
<td>8 000</td>
</tr>
<tr>
<td>13</td>
<td>ARGENTINA</td>
<td>7 000</td>
</tr>
<tr>
<td>14</td>
<td>ALGERIA</td>
<td>7 000</td>
</tr>
<tr>
<td>15</td>
<td>KAZAKHSTAN</td>
<td>6 500</td>
</tr>
<tr>
<td>16</td>
<td>POLAND</td>
<td>5 000</td>
</tr>
<tr>
<td>17</td>
<td>MEXICO</td>
<td>4 000</td>
</tr>
<tr>
<td>18</td>
<td>SLOVAKIA</td>
<td>4 000</td>
</tr>
<tr>
<td>19</td>
<td>COLOMBIA</td>
<td>4 000</td>
</tr>
<tr>
<td>20</td>
<td>PERU</td>
<td>3 000</td>
</tr>
</tbody>
</table>

**BUT**

Nothing for
- Belgium 20 000 t
- Portugal 20 000 t
- USA 35 000 t
- Morocco 20 000 t
- etc…

Crazy overestimation for
- Venezuela 6 000 t
- North Korea 1 000 t

Clear underestimation for
- France 80 000 t
- Spain 100 000 t
- Poland 25 000 t
- etc ….

=> NOT SUITABLE
Rabbit meat production is generally expressed as whole carcass weight

But the “carcass” concept correspond to presentations varying widely from one country to the other.

- Classical presentation in France
- In England
- In Greece & Cyprus
- In North Africa
- In Vietnam, for traditional presentation, only the hair and the abdominal organs are removed.
Despite all these sources of uncertainty, the World rabbit meat production could be estimated between

1 200 000 and 1 800 000 tonnes per year

The slaughter rate is presumed to be 58% of live weight
Rabbit meat production in the Great regions of the World
tonnes of carcasses per year (estimation Lebas 2009)

- North America: 40 000 t
- Central America: 20 000 t
- South America: 40 000 t
- Central & South Africa: 80 000 t
- Western Europe: 600 000 t
- Eastern Europe: 300 000 t
- East Asia: 600 000 t
- South Asia: 30 000 t
- Middle East: 20 000 t
- North Africa: 100 000 t
- Oceania: 2 000 t

TOTAL 1 800 000 tonnes of rabbit meat
Rabbit production in China: estimation about 550,000 to 600,000 t/year.
Rabbit production in Italy: estimation about 220,000 to 250,000 t/year.
Rabbit meat production in SPAIN

- Catalunia: 42%
- Aragon: 13.0%
- Valencia: 15.0%
- Castilla La Mancha: 3.3%
- Andalucia: 3.5%
- Castilla-Léon: 5.8%
- Galicia: 5.2%

Total production 105 000 t.

(estimation for 2007)
Rabbit meat production in FRANCE
Estimation for 2007: total 80 000 t
(source: Scees)

Bretagne 21.7%
Basse Normandie 4.7%
Pays de la Loire 34.7%
Poitou Charentes 10.9%
Midi Pyrénées 3.3%
Rhône Alpes 4.5%
Auvergne 3.7%
Nord-Pas de Calais 4.2%
General plan of the lecture

1 – Quantitative production in the different countries

2 – Worldwide overview of the methods of production

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- Europe : traditional and intensive commercial production
Rabbit production in China

Meat rabbits production in Sichuan

Angora rabbit production south of Shanghai
Rabbit production in China

A farm with 6000 does in concrete cages in Changdong for meat production
Rabbit production in China

In winter time, nest boxes may be removed from does cages and stored together in a heated room. They return to mother’s cages only one time per 24 h. for suckling.

Artificial insemination in a outdoor rabbitry
Rabbit production in China

- Indoor rabbitries
- Importation of selected rabbit lines from France in a breeding center

Indoor rabbitries with controlled ventilation and heating
Rabbit production in China

Rabbit slaughtering and packaging in Changdong

Rabbit slaughtering in Sichuan
Rabbit production in VIETNAM

Traditional rabbit hutch

Type of cages proposed for rabbit development in Vietnam

Unit for breeding of selected rabbits
In Vietnam green forages are widely used for rabbit feeding. But forage availability is problematic during a part of the year.
Rabbit production in Indonesia

Examples of cages used in Indonesia

Hand-crafted cages

Use of bamboo duckboards for cage’s floor is very common in Indonesia
Rabbit production in Indonesia

As in Vietnam, green forages are widely used, but must be frequently completed by pelleted feed.

An important effort is made for rabbit meat promotion in restaurants or along the roads.

KELINCI = RABBIT
Rabbit production in North America

In Canada, methods utilized for commercial rabbit production are those used in Western Europe, except artificial insemination.
Rabbit production in North America

In the USA, rabbit breeding is more oriented toward pet rabbits and presentation of beautiful rabbits in shows than to commercial production.
Rabbit production in Central America

Rabbit unit in **El Salvador**

Rabbit unit in **Haïti**

Rabbit unit in **Cuba**

Rabbit unit in **La Martinique** (French West Indies)
Rabbit production in South America

Modern concrete cages and outdoor cages in **Argentina**

Half-outdoor commercial unit in **Argentina**

Family units in **Argentina**
Rabbit production in South America

Outdoor production unit in Brazil

Commercial unit in Brazil

Brazilian rabbit doe

Modern Brazilian breeds

Fawn colored Brazilian rabbit
Rabbit production in Sub-Saharan Africa

Medium and small scale commercial units in Benin
Rabbit production in Sub-Saharan Africa

Small and medium scale production units in Ghana

Home made cages in Central Africa

Cabbage cultivation in Liberia
Waste are used for rabbit feeding
Rabbit production in Sub-Saharan Africa

Colony breeding in Togo

Cages used for the promotion of rabbit production in Tanzania or in Togo
Rabbit production in North Africa

Traditional backyard unit in **Morocco**

Reproduction in a shaft in **Tunisia**

Colony breeding in **Algeria**

Commercial units of production in **Tunisia** and in **Algeria**
Rabbit production in North Africa

Public selection unit in Algeria

Private selection unit in Algeria

Private selection units in Tunisia
Rabbit production in Europe

Traditional concrete cages were used in Europe until years 1960-1970 for family but also for commercial rabbit production.

Present type of unit used for commercial production in Europe (France, Italy, Spain, Portugal, Belgium, ...)

The techniques now used in Europe will be the object of the 3rd part of this lecture.
General plan of the lecture

1 – Quantitative production in the different countries

2 – Worldwide overview of the methods of production

3 – Description of the production techniques used in Western Europe
   - average productivity of commercial units
   - Cages and buildings
   - Genetic resources
   - Reproduction & Insemination
   - Nutrition and Feeding
   - Rabbitries management
   - Slaughter and commercialization
   - Conditions to succeed in Rabbit production
## Average productivity of commercial rabbit units in France (year 2007)

513 does / unit on average

All commercial units conducted with artificial insemination (the 3% with natural mating excluded)
1131 units controlled = 580 000 rabbit does in control

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>% fertile inseminations</td>
<td>80.2%</td>
</tr>
<tr>
<td>Number of litters / doe / year</td>
<td>6.98</td>
</tr>
<tr>
<td>Litter size at birth - total (alive)</td>
<td>10.26 (9.63)</td>
</tr>
<tr>
<td>Young slaughtered / doe / year</td>
<td>51.8</td>
</tr>
<tr>
<td>Slaughter weight</td>
<td>2.47 kg</td>
</tr>
<tr>
<td>Age at slaughter</td>
<td>74 days</td>
</tr>
<tr>
<td>Global feed efficiency</td>
<td>3.56</td>
</tr>
<tr>
<td>(kg feed / kg live weight)</td>
<td></td>
</tr>
<tr>
<td>Live weight produced / Artif. Insem.</td>
<td>14.5 kg</td>
</tr>
<tr>
<td>Slaughter rate</td>
<td>57.4%</td>
</tr>
</tbody>
</table>
Average productivity of commercial rabbit units in France (year 2007)

Dispersion of some criteria between units

% kindling / insemination (year average)

Young rabbits produced per doe and per year
Numerical productivity is similar in France, Spain or Italy.

But, weight and age at slaughter are different between European countries because of the differences in local market demands.

<table>
<thead>
<tr>
<th>Country</th>
<th>Live weight</th>
<th>Carcass weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>2.4 – 2.5 kg</td>
<td>1.4 – 1.5 kg</td>
</tr>
<tr>
<td>Spain</td>
<td>1.9 – 2.0 kg</td>
<td>1.0 – 1.1 kg</td>
</tr>
<tr>
<td>North Italy</td>
<td>2.7 – 2.8 kg</td>
<td>1.6 – 1.8 kg</td>
</tr>
<tr>
<td>South Italy</td>
<td>2.0 kg</td>
<td>1.1 kg</td>
</tr>
</tbody>
</table>
Cages and buildings

The same cage could be used alternatively **for reproduction** (kindling and lactation) and **for fattening**: it’s called “multipurpose cage”.

**Reproduction**

0.40 m² => 1 doe and her litter

=> 6-7 rabbits until slaughter (40kg/m²)

**Fattening** (3 cages in the middle of the cage set)
Cages and buildings

Multipurpose cages on one level

Multipurpose cages in the lower level and cages for empty does or young growing does in the upper level, or for some fatteners when used for fattening period. The upper cages could be quickly modified to receive a doe and a nest box for kindling.
In the buildings, cages are arranged in line of up to 30-40 m

Cages for outdoor fattening with automatic distribution of pelleted feeds

Frequently after some years of utilization of his outdoor fattening cages, the farmer built a shed above the cages in order to work himself sheltered from the weather.
Cages and buildings

Many types of buildings are used for rabbit production. They have all in common
- relatively small width and great length
- high degree of isolation
- regular evacuation of droppings with a scraper
- artificial ventilation (low air speed)
- heating in winter and cooling in summer
- artificial lighting (16h/24h for does – 6-8 h for fatteners)
- easy to clean and disinfect (floor, walls and ceiling, …)
- easy to accede for the farmer but not for the others

For cages
- automatic watering
- more and more: Automatic feeding
Objectives for the regulation of internal ambiance of the building

NB: these values are not necessary suitable for outdoor breeding

**TEMPERATURE**
- Maternity: 16° to 20°C
- Nests: 28° to 30°C
- Growth: 15° to 18°C
- Daily variation <4°C

**HUMIDITY**
- between 55% and 75%
- Stable if possible

**Air SPEED in Cages**
- 0.10 à 0.5 m/s according to temperature

**Air QUALITY**
- CO₂: <1000 ppm (0.10%)
- NH₃: < 10 ppm

**AIR RENEWAL**
- From 1 to 8 m³ of air / kg live weight according to temperature

**LIGHTING**
- measured inside of cages
- Maternity: 90 lux, 16h/day (about 2 W/m² en tube fluo)
- Growth: 50 lux, 6-8 h/day (i.e. 1,2 W/m² with neon lighting, or natural rythm)
Cages and buildings

Examples of closed buildings used for rabbit production
Cages and buildings

Examples of half-outdoor buildings for rabbit production

But this type of building is progressively replaced by closed building on order to obtain a more regular production
Western rabbit production is dominated by 3 French selection companies. They cover about 70 – 80% of the European market.

- Grimaud Frères (HYPLUS)
- Eurolap (HYLA)
- Hycole C° (HYCOLE)

In Spain lines produced by the University of Valencia are effectively used. In Germany: Zika rabbits (heavy rabbits) and in Hungary: Pannon White

All these companies propose hybrid rabbits which represent 85 to 90% of the rabbits used for commercial rabbit production in Europe.
Common breeding scheme

MALE LINES

LINE A
GGP A
Selected on:
- Growth ++
- Semen ++

LINE B
GGP B
Selected on:
- Growth ++
- Slaughter rate ++

LINE C
GGP C
Selected on:
- Prolificity +++
- Homogeneity at birth +

LINE D
AGP D
Selected on:
- Weight at weaning +++
- Homogeneity +++
- Prolificity =

FEMALE LINES

GGP A
Selected on:
- Growth ++
- Semen ++

GGP B
Selected on:
- Growth ++
- Slaughter rate ++

GGP C
Selected on:
- Prolificity +++
- Homogeneity at birth +

AGP D
Selected on:
- Weight at weaning +++
- Homogeneity +++
- Prolificity =

MULTIPLICATION

GP A
AI CENTER
MULTIPLICATION

GP B
AI CENTER
MULTIPLICATION

GP C
AI CENTER
MULTIPLICATION

GP D
MULTIPLICATION

Hybrid male
AI CENTER

Hybrid female
FARMS

SLAUGHTER HOUSE

TERMINAL PRODUCT
HYBRID ABCD
THE MOST EFFECTIVE METHOD IS USED:

⇒ BLUP Animal Model

What is ANIMAL MODEL?

It’s taking into account of all the performances of ancestors, related rabbits and progeny

The classical criteria: litter size, growth rate, litter and individual weight at weaning.

The additional criteria: does longevity, litter size and individual weight homogeneity at birth or weaning, slaughter rate, resistance to specific diseases (pasteurellosis) etc…
What is the benefit for rabbit farmers in the use of these « hybrid » rabbits by comparison with purebred rabbits?

The global benefit is about

15 – 20 % productivity + 5-10% in feed efficiency of the rabbitry

Constraints are mainly the dependence of farmers from selected rabbits providers and the impossibility to sell rabbits for reproduction.
Reproduction and Insemination

**Artificial insemination** is the normal way of reproduction for commercial meat rabbit production in Europe.
Reproduction and Insemination

Semen control

Insemination alone or with an assistant, and don’t forget the hormon injection
Reproduction and Insemination

In most cases, **insemination** of the does is made **every 42 days** and non pregnant does (20% on average) wait empty until the next insemination.

**The consequences are numerous**

- Insemination 11 days after kindling (female parturition)
- Diagnostic of gestation by abdominal palpation is made only to prepare the parturitions (nest boxes, additional cages,…)
- All does kindle within 2-3 days
- Fostering and litter size homogenization are possible
- All litters are weaned on the same day at 32-35 day maxi.
- All rabbit are sent in the same day to the slaughter house

Some experiments are done with more intensive reproduction (**35 days** between inseminations) or less intensive (**49 or 56 days** between inseminations). But at present time these rhythms appeared less economic than the 42 days rhythm.
NUTRITION and FEEDING

All rabbits receive exclusively

- **Water** (automatic system)
- **Pelleted feed** (frequently with automatic distribution)
Composition of feeds is formulated on 3 main basis:

1. **Energy** => digestible energy, maximum starch for weaners,
2. **Protein content** => Protein level and amino-acid composition, ratio / energy
3. **Fiber** => level of components: lignins, cellulose, hemicelluloses, digestible fiber

Most generally 3 types of feed are used in a farm

- **Breeding does** (lactating)
- **Weaners**: before and after weaning (22-45 days)
- **Fattening**: until slaughter

Empty adult does, young replacement does and males use most generally the fattening diet
The list of parameters which must be included in the diets formulation is long.

This table is for example available in the WRSA Website

http://world-rabbit-science.com

Section «Rabbit Congress Proceedings»
=> 8th World Rabbit Congress Puebla
=> Feeding & Nutrition => Invited paper
NUTRITION and FEEDING

Pelleted feeds automatic distribution

Schematic representation of automatic rabbit feeding system
NUTRITION and FEEDING

Pelleted feeds automatic distribution

Different types of feeders could be used in rabbit’s cages.

The green example is the most common
NUTRITION and FEEDING

Pelleted feeds automatic distribution

Pellets distribution in the «heads» of lines deserving the cages

Feeding line could be long, but with no bend
Pelleted feed are delivered in bulk from the feed plant to the farms general every 10 to 15 days.
Rabbitry management

As frequently as possible the 42 d. rhythm is used in European Western countries.

In France or Spain the «all-in all-out» system is developing rapidly (slaughter before 75 days of age).

This system suppose the use of 2 identical buildings with multipurpose cages.
Rabbitry management

- At weaning, the does are removed from the cages and young stay in the cage where they were born until departure to slaughter house.

- After young departure, the empty building is cleaned and disinfected.

- Then the does which are at weaning time in the second building are introduced in the cleaned building – The building is completely disinfected every 84 days

With this technique, young does produced for replacement follow the adult does.

Does replacement is made with the fostering of one-day young sent by the selected rabbits provider.

Replacement could be made by introduction of one-day does for direct production (parent does) or of grand parent does producing the parent females in the farm of production.
Rabbitry management

In the **north of Italy** where heavy rabbit are produced (2.7-2.8 kg and 85-90 days) the true all-in all-out system could not be used.

At the age of 60 days about, growing rabbits are introduced in small cages, generally 1 or 2 rabbits in one cage, until slaughter time.

This must be done do avoid fighting of animal when puberty appeared
Rabbits are kept by complete truck in the farm and transported to the slaughter house.

Electric anesthesia

Automatic skinning

Veterinary inspection
SLAUGHTER AND COMMERCIALIZATION

Most of the rabbits are commercialized as whole carcasses. But the proportion of rabbits sold as cuts is increasing (15 to 25%).
Conditions to succeed in Rabbit production

Rabbit production system has 4 main basis,

*All 4 must be evaluated*

- BREEDERS
- RABBITS
- RAISING FACILITIES
- MARKET
It’s quite impossible to succeed alone
Farmers must work as a group

For a group of farmers
3 key points are necessary to succeed collectively.

1 - Autonomy in decision: a group managed by producers in the interest of
the producers themselves. Any project with an external centre of decision has
very few chances to succeed.

2 - Solidarity between members of the group, to create a common project, a
common enterprise.

3 - Training of the farmers: by exchange between farmers and progressive
inclusion of new techniques or management methods observed outside of the
group, the whole group will progress.
A success story in France for group of breeders

1981

11 breeders + 1 half time technician
3200 rabbit does
176,000 slaughter rabbits produced during the 1rst year of activity

2008

220 breeders + 45 employees
135,000 breeding does (x 42)
7.5 millions slaughter rabbits produced / year
1 centre for artificial insemination (30,000 doses per week)
1 centre for selected rabbit lines multiplication (3000 does per week)
participation in 2 big rabbit slaughter and commercialization enterprise

Their secret ? a strict application of the 3 keys points
1 - Autonomy in decision
2 - Solidarity between members
3 - Training of the farmers

Are essential to succeed in rabbit farming whatever the technique employed
Thanks for your attention