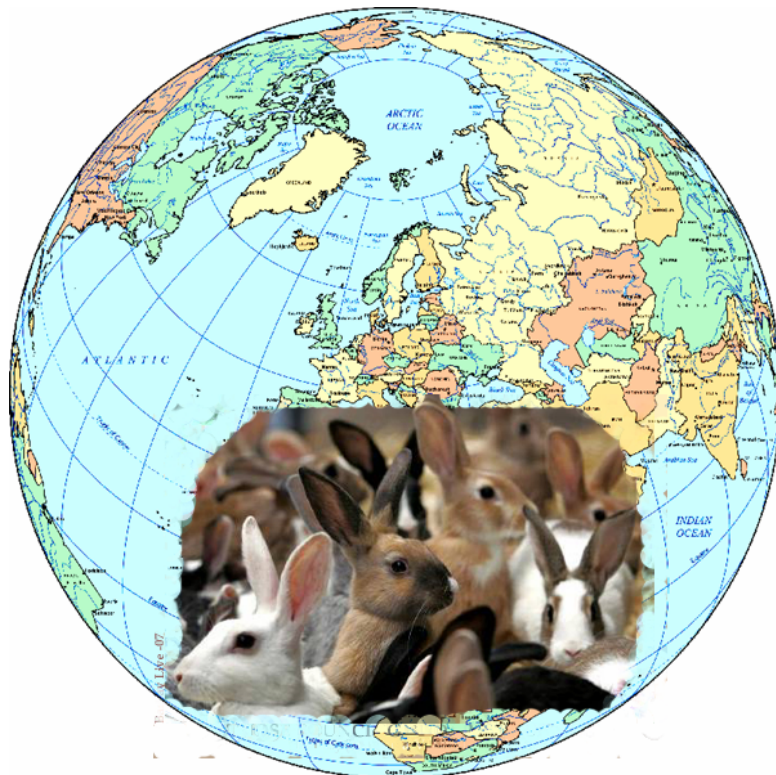


Conference for promotion of rabbit production in Russia, Kazan, 30 October 2009
An initiative of the WRSA Russian Branch

Rabbit production in the World, with a special reference to Western Europe

Quantitative estimation and Methods of production



François LEBAS

**President of the French
Association CUNICULTURE**

**Former General Secretary of the
World Rabbit Science Association
(1988 - 2008)**

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

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

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

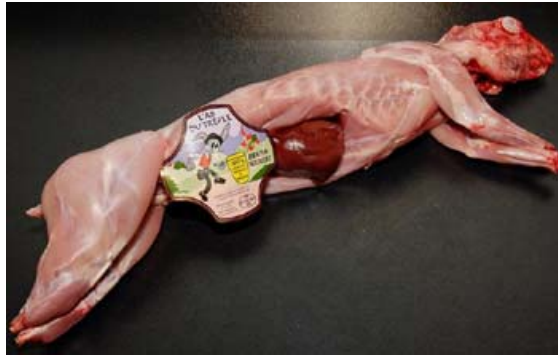
Clear underestimation for

- 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 on country to the other



Classical presentation in France



In England



In North Africa



In Greece & Cyprus



In Vietnam, for traditional presentation, only the hair and the abdominal organs are removed.

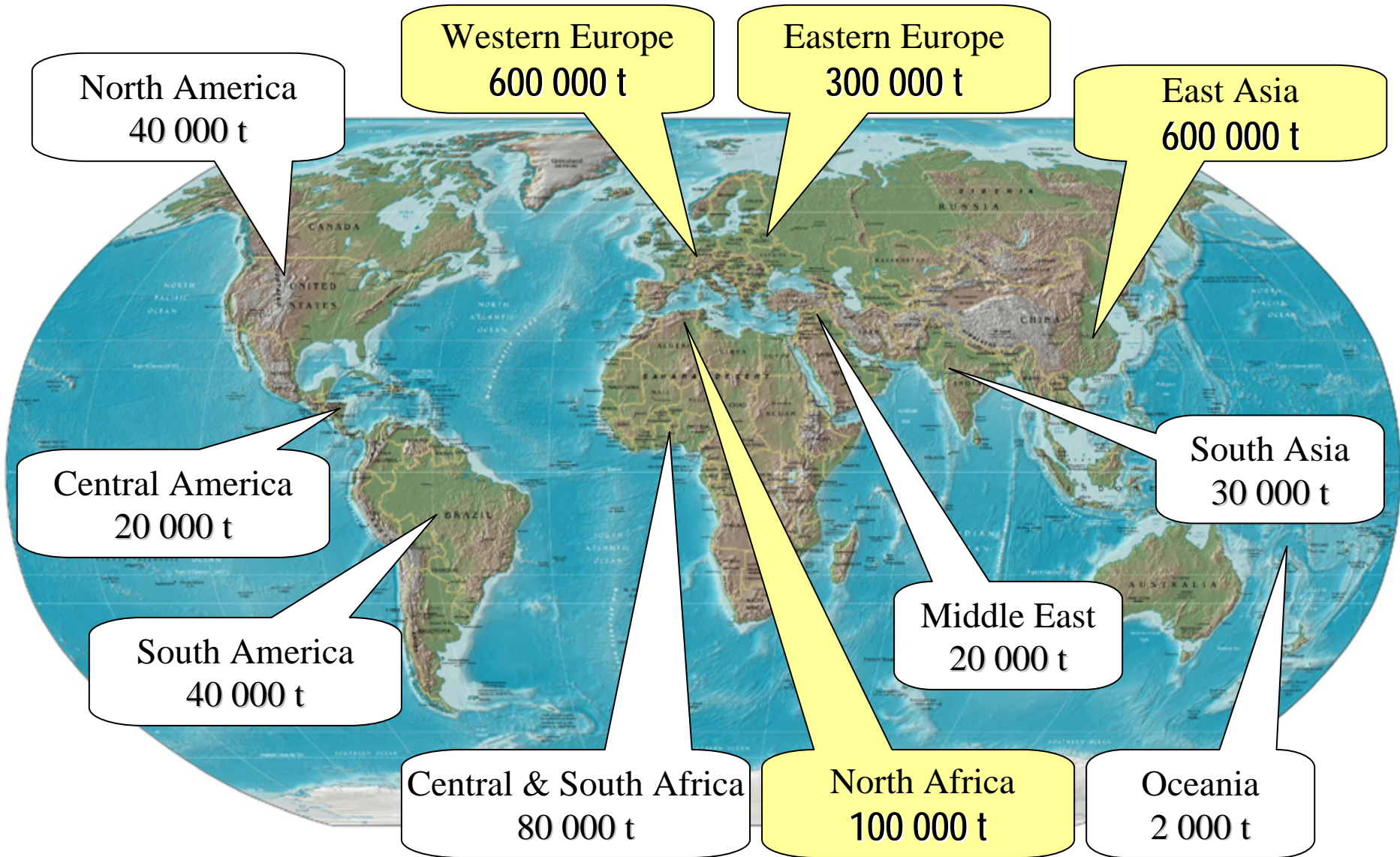
Despite all these sources of uncertainty, the
World rabbit meat production could be
estimated between

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*)



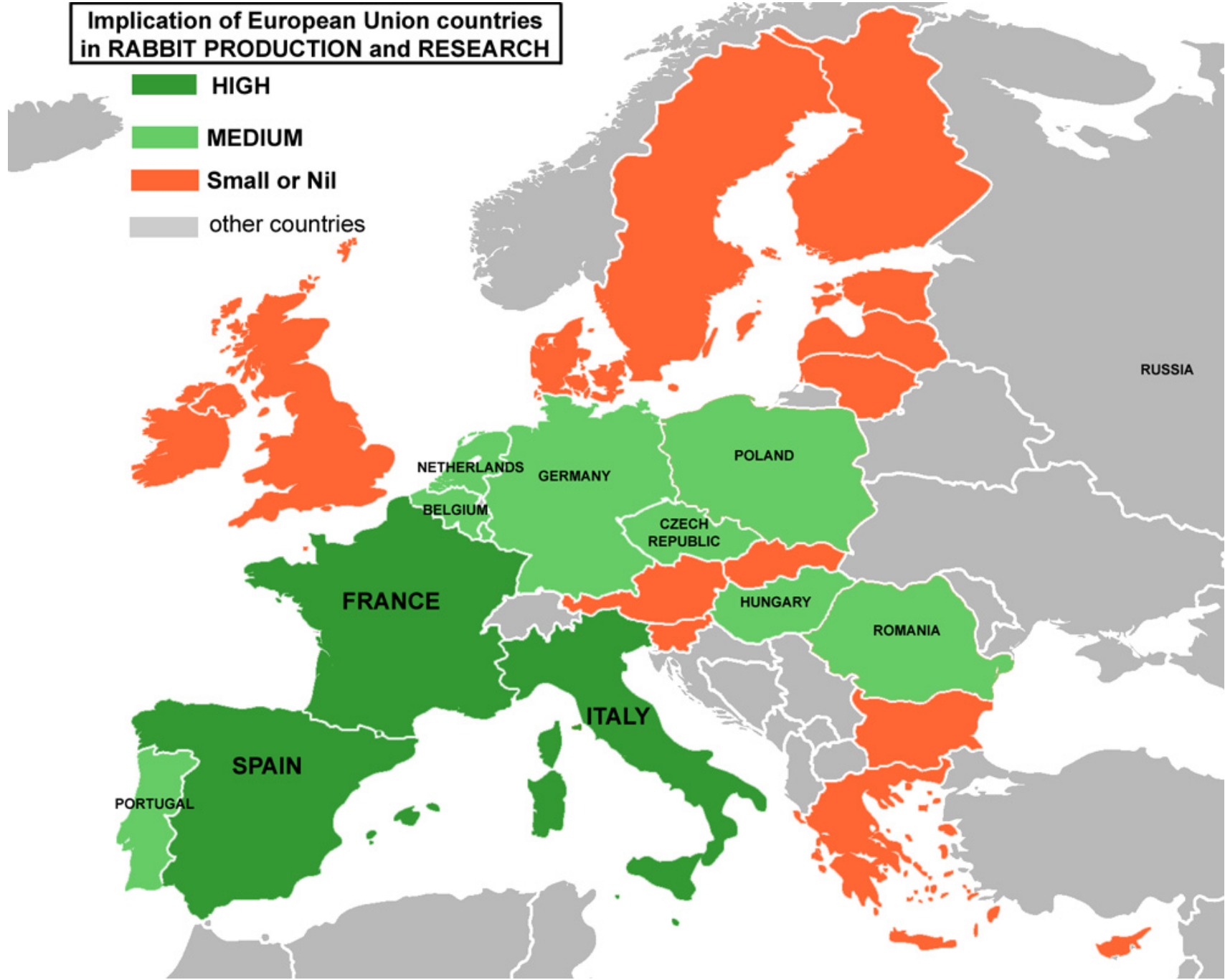
TOTAL 1 800 000 tonnes of rabbit meat

Rabbit production in China : estimation about 550 000 to 600 000 t/year



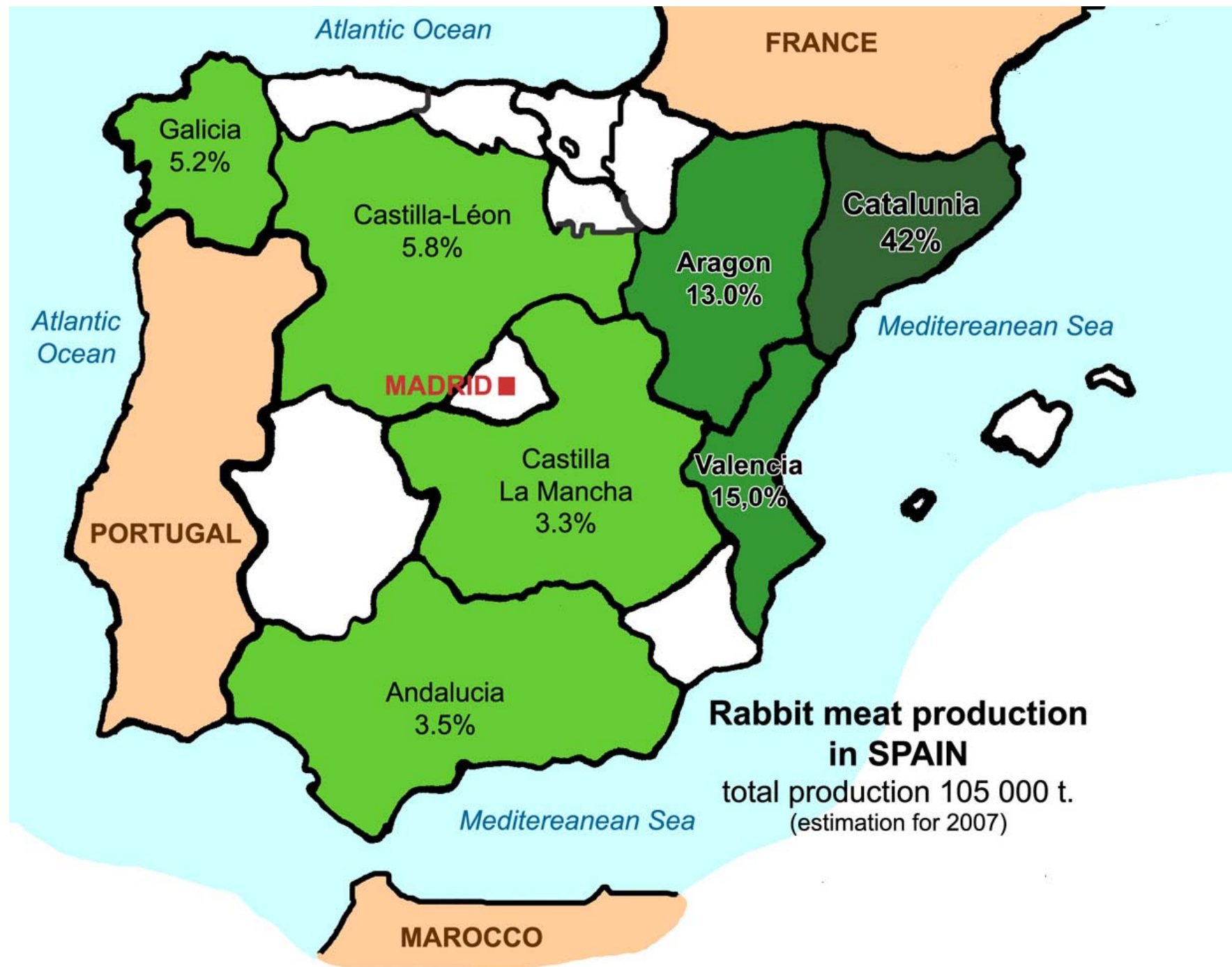
**Implication of European Union countries
in RABBIT PRODUCTION and RESEARCH**

- HIGH
- MEDIUM
- Small or Nil
- other countries





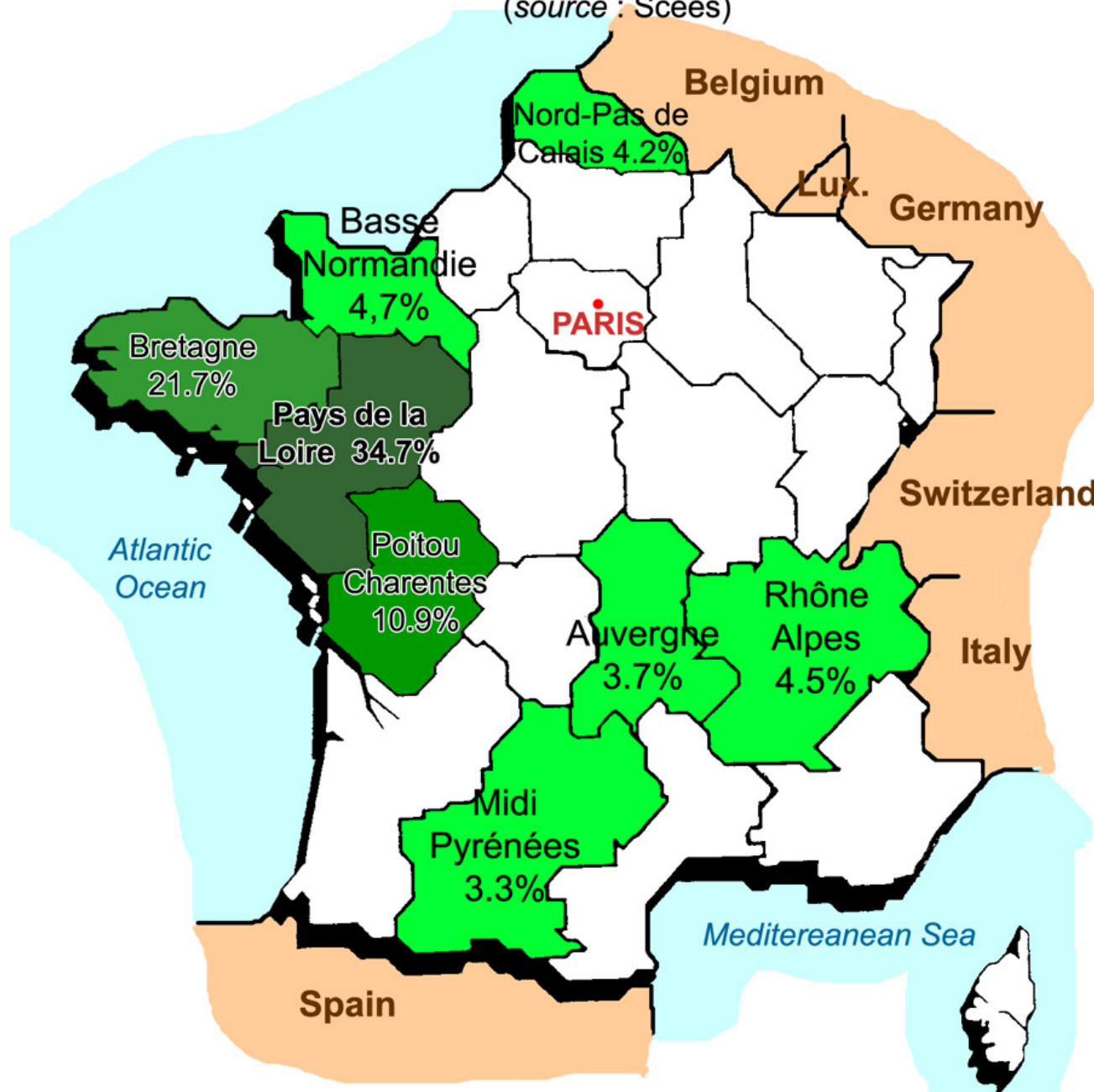
Rabbit production in Italy :
 estimation
 about 220 000 to 250 000 t/year



Rabbit meat production in FRANCE

Estimation for 2007 : total 80 000 t

(source : Scees)



General plan of the lecture

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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



Artificial insemination in a outdoor rabbitry

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



Rabbit production in China



Indoor rabbitries



Indoor rabbitries with controlled ventilation and heating

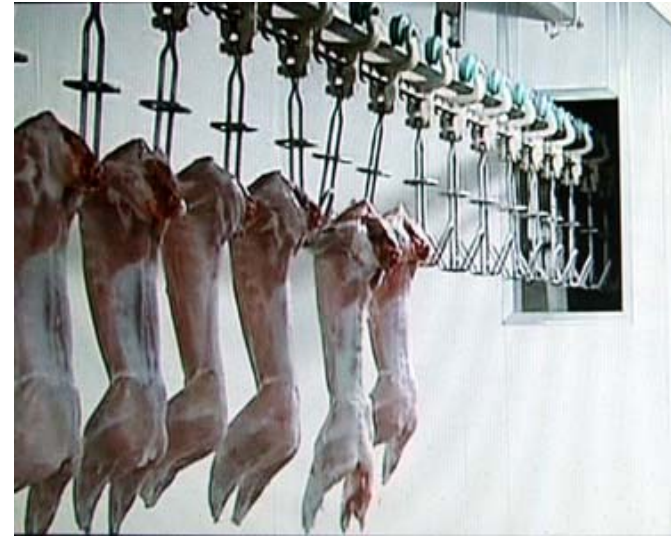


Importation of selected rabbit lines from France in a breeding center

Rabbit production in China



Rabbit slaughtering in Sichuan



Rabbit slaughtering and packaging in Changdong



Rabbit production in VIETNAM



Traditional rabbit hutch



Type of cages proposed for rabbit development in Vietnam



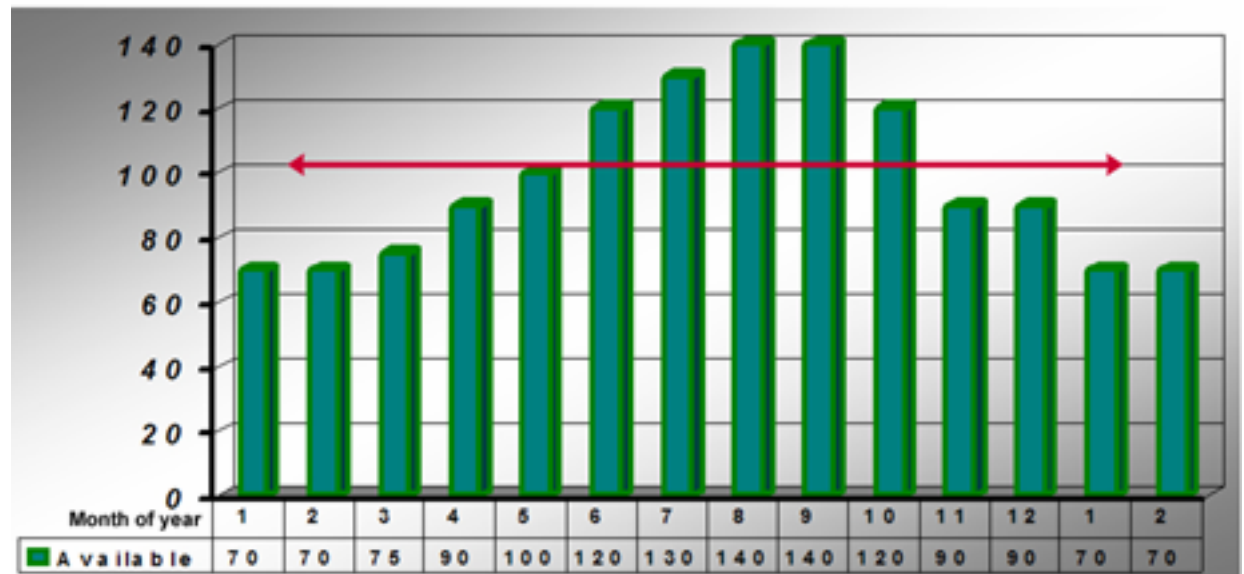
Unit for breeding of selected rabbits

Rabbit production in VIETNAM



Feed resources for rabbit per month of year

In Vietnam green forages are widely used for rabbit feeding. But forage availability is problematic during a part of the year



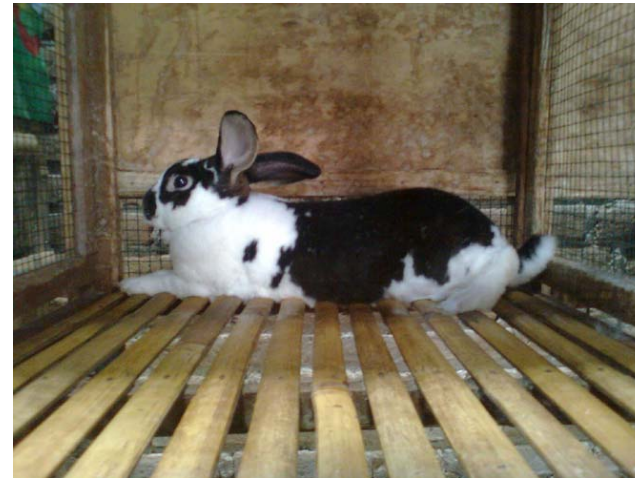
Rabbit production in Indonesia



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



KELINCI = RABBIT



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

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



Commercial unit of production

Rabbit production in Central America



Rabbit unit in **El Salvador**



Rabbit unit in **Haiti**



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

Fawn colored Brazilian rabbit



Modern **Brazilian** breeds

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**



Colony breeding in **Algeria**



Reproduction in a shaft in **Tunisia**



Commercial units of production in **Tunisia**



and in **Algeria**

Rabbit production in North Africa



Public selection unit in **Algeria**



Private selection unit in **Algeria**

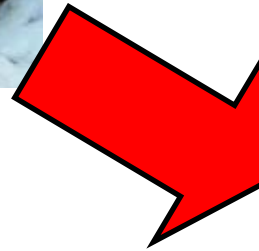


Private selection units in **Tunisia**

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

**Rabbit production in the World,
with a special reference to Western Europe**

Quantitative estimation and Methods of production



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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)

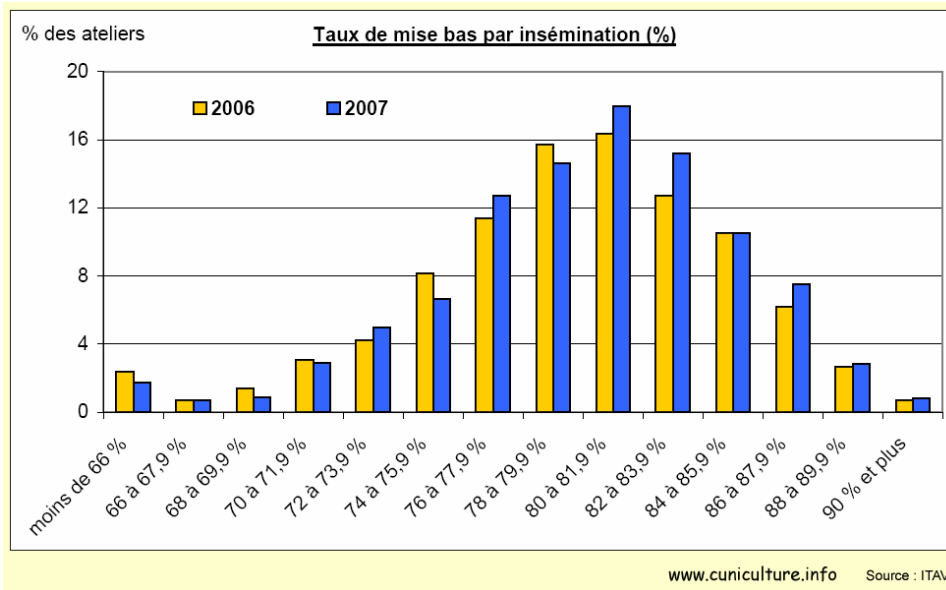
1131 units controlled = 580 000 rabbit does in control

- % fertile inseminations	80.2%
- Number of litters /doe /year	6.98
- Litter size at birth - total (alive)	10.26 (9.63)
- Young slaughtered /doe / year	51.8
- Slaughter weight	2.47 kg
- Age at slaughter	74 days
- Global feed efficiency (kg feed / kg live weight)	3.56
- Live weight produced /Artif. Insem.	14.5 kg
- Slaughter rate	57.4%

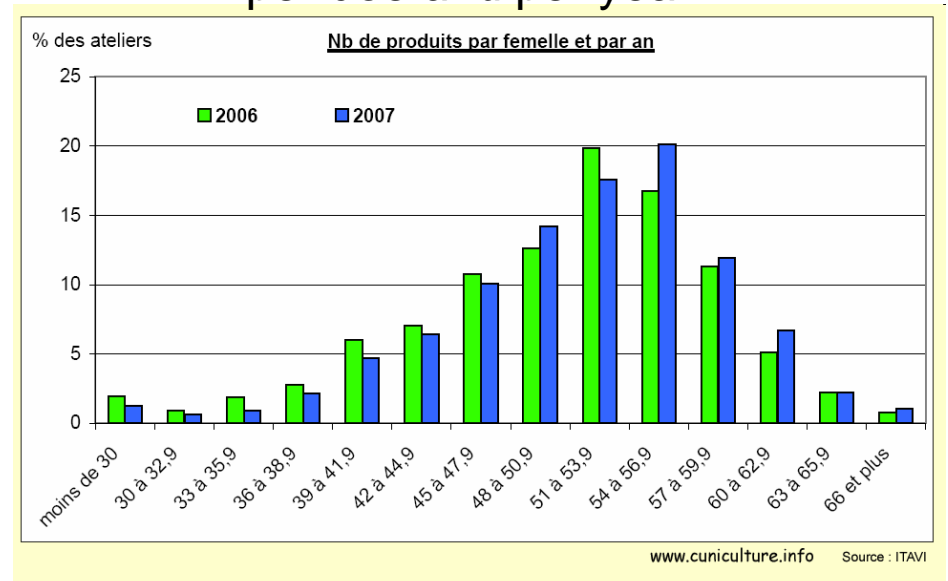
Average productivity of commercial rabbit units in France (year 2007)

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

Country	Live weight	Carcass weight
France	2.4 – 2.5 kg	1.4 – 1.5 kg
Spain	1.9 – 2.0 kg	1.0 – 1.1 kg
North Italy	2.7 – 2.8 kg	1.6 – 1.8 kg
South Italy	2.0 kg	1.1 kg

Cages and buildings



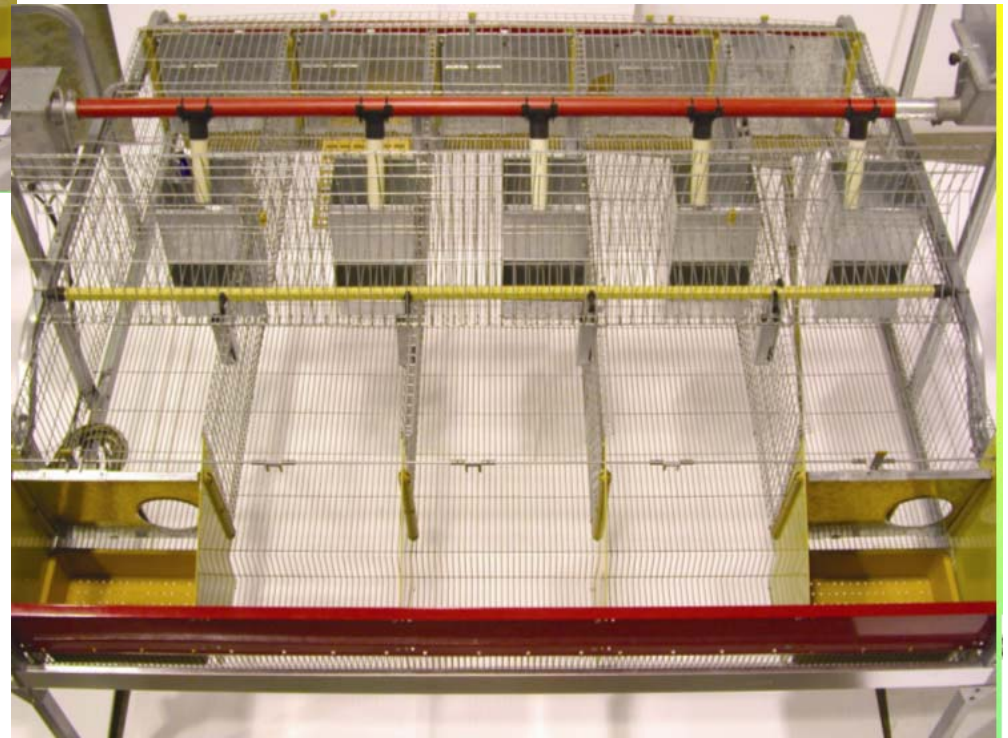
Reproduction

0.40 m² => 1 doe and her litter

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

The same cage could be used alternatively **for reproduction** (kindling and lactation) and **for fattening** : it's called "multipurpose cage"

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

Cages and buildings



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



GENETIC RESOURCES

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

FEMALE LINES

LINE A

LINE B

LINE C

LINE D

SELECTION

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

GP B
MULTIPLICATION

GP C
AI CENTER

GP D
MULTIPLICATION

FARM

Hybrid male
AI CENTER

Hybrid female
FARMS

SLAUGHTER HOUSE

TERMINAL PRODUCT
HYBRID ABCD

GENETIC RESOURCES

How are select the rabbits ?

THE MOST EFFECTIVE METHOD IS USED:

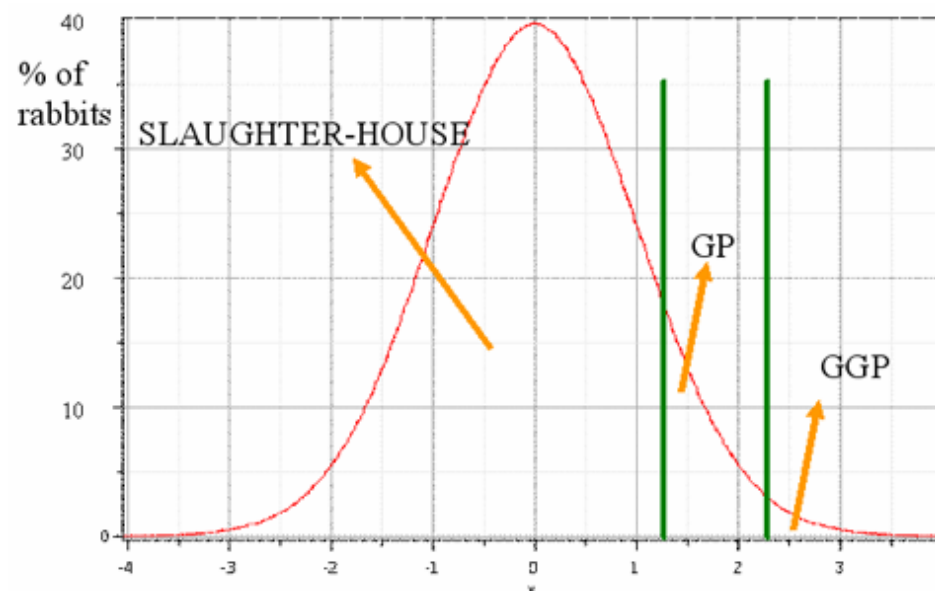
⇒ BLUP Animal Model

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...



Dispersion around the average on the **calculated genetic value**

GENETIC RESOURCES

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



Artificial vagina



Semen collection



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)



NUTRITION and FEEDING

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

NUTRITION and FEEDING

Table 1 : Nutrients recommendation for rabbit feeding.

Type or period of production <small>Without any other indication, unit = g/kg as fed (90% DM)</small>	GROWTH		REPRODUCTION (1)		Single feed (2)	
	18 => 42 days	42 => 75-80 days	Intensive	½ intensive		
GROUPE 1 : Recommendations for the highest productivity						
Digestible Energy	(kcal / kg)	2400	2600	2700	2600	2400
	MJoules/ kg	9,5	10,5	11,0	10,5	9,5
Crude Protein		150-160	160-170	180-190	170-175	160
Digestible Protein		110-120	120-130	130-140	120-130	110-125
ratio Digest. Protein / Digestible Energy	(g / 1000 kcal)	45	48	53-54	51-53	48
	(g / 1 MJoule)	10,7	11,5	12,7-13,0	12,0-12,7	11,5-12,0
Lipids		20-25	25-40	40-50	30-40	20-30
<i>Amino acids</i>						
- lysine		7,5	8,0	8,5	8,2	8,0
- sulfur amino acids (methio.+cyst.)		5,5	6,0	6,2	6,0	6,0
- threonine		5,6	5,8	7,0	7,0	6,0
- tryptophan		1,2	1,4	1,5	1,5	1,4
- arginine		8,0	9,0	8,0	8,0	8,0
<i>Minerals</i>						
- calcium		7,0	8,0	12,0	12,0	11,0
- phosphorus		4,0	4,5	6,0	6,0	5,0
- sodium		2,2	2,2	2,5	2,5	2,2
- potassium		< 15	< 20	< 18	< 18	< 18
- chloride		2,8	2,8	3,5	3,5	3,0
- magnesium		3,0	3,0	4,0	3,0	3,0
- sulphur		2,5	2,5	2,5	2,5	2,5
- iron (ppm)		50	50	100	100	80
- copper (ppm)		6	6	10	10	10
- zinc (ppm)		25	25	50	50	40
- manganese (ppm)		8	8	12	12	10
<i>Fat-soluble Vitamins</i>						
- vitamin A (UI / kg)		6 000	6 000	10 000	10 000	10 000
- vitamin D (UI / kg)		1 000	1 000	1000 (<1500)	1000 (<1500)	1000 (<1500)
- vitamin E (mg / kg)		≥30	≥30	≥50	≥50	≥50
- vitamin K (mg / kg)		1	1	2	2	2
GROUPE 2 : Recommendation for the best health possible for rabbits						
Ligno-cellulose (ADF)		≥ 190	≥ 170	≥ 135	≥ 150	≥ 160
Lignins (ADL)		≥ 55	≥ 50	≥ 30	≥ 30	≥ 50
Cellulose (ADF - ADL)		≥ 130	≥ 110	≥ 90	≥ 90	≥ 110
ratio lignins / cellulose		≥ 0,40	≥ 0,40	≥ 0,35	≥ 0,40	≥ 0,40
NDF (Neutral Detergent Fiber)		≥ 320	≥ 310	≥ 300	≥ 315	≥ 310
Hemicelluloses (NDF - ADF)		≥ 120	≥ 100	≥ 85	≥ 90	≥ 100
ratio (hemicelluloses+pectins) / ADF		≤ 1,3	≤ 1,3	≤ 1,3	≤ 1,3	≤ 1,3
Starch		≤ 140	≤ 200	≤ 200	≤ 200	≤ 160
<i>Water soluble Vitamins</i>						
- vitamin C (ppm)		250	250	200	200	200
- vitamin B ₁ (ppm)		2	2	2	2	2
- vitamin B ₂ (ppm)		6	6	6	6	6
- nicotinamid (vitamin PP) (ppm)		50	50	40	40	40
- pantothenic acid (ppm)		20	20	20	20	20
- vitamin B ₄ (ppm)		2	2	2	2	2
- folic acid (ppm)		5	5	5	5	5
- vitamin B ₁₂ (ppm)		0,01	0,01	0,01	0,01	0,01
- choline (ppm)		200	200	100	100	100

(1) For does, ½ intensive production means a average yearly production of 40-50 weaned kits in the rabbitry, and an intensive production corresponds to a higher productivity (more than 50 kits /doe/year). (2) The single feed recommendation corresponds to a diet used for all rabbits in the rabbitry. It is a compromise between requirements of the different categories of rabbits.

The list of parameters which must be included in the diets formulation is long.

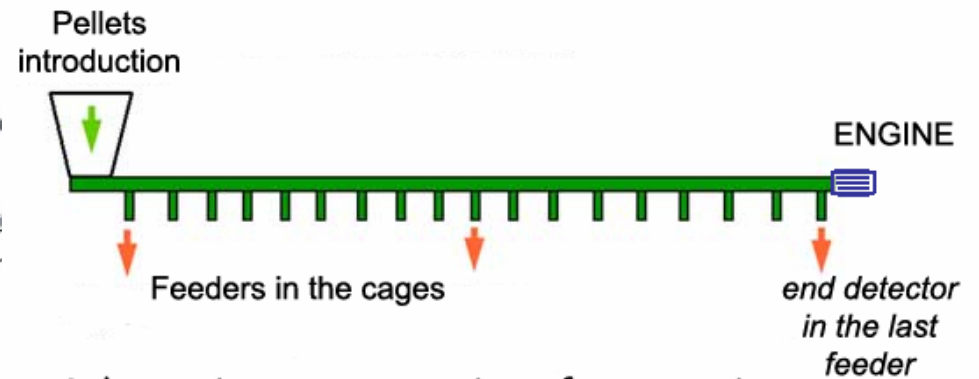
This table is for example available in the WRSA Website

<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

NUTRITION and FEEDING



Pelleted feed are delivered in bulk from the feed plant to the farms general every 10 to 15 days

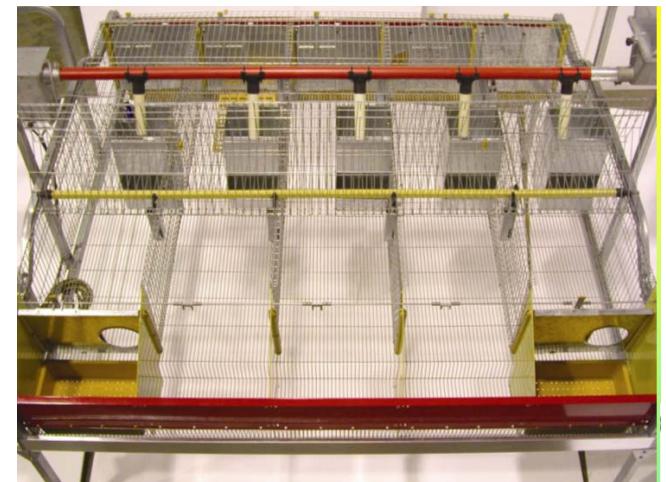


Rabbitry management

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**



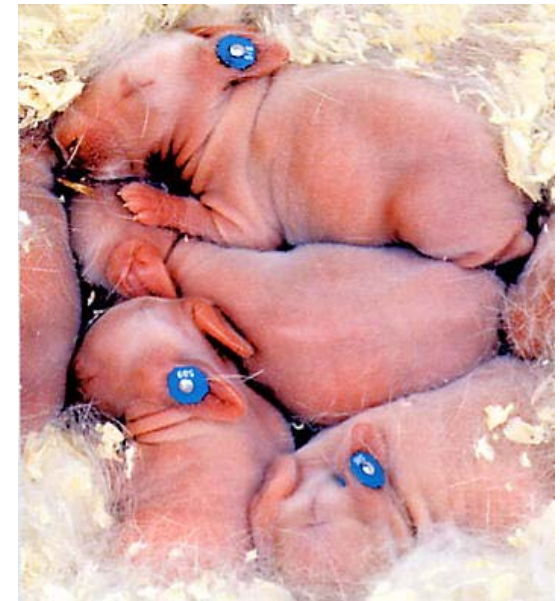
Rabbitry management

- 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



SLAUGHTER AND COMMERCIALIZATION



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**



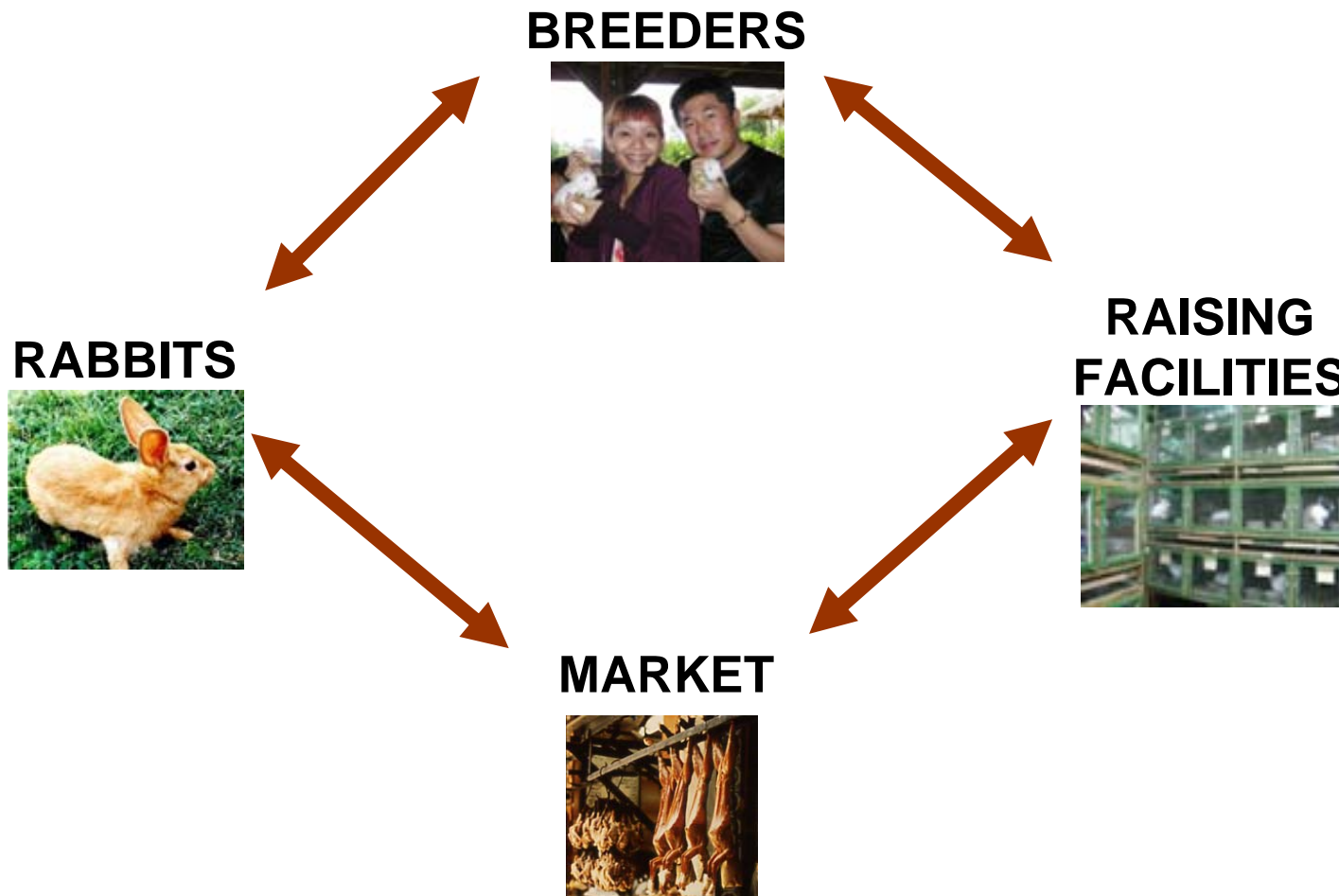
But the proportion of rabbits sold as **cuts** is increasing (15 to 25%)



Conditions to succeed in Rabbit production

Rabbit production system has 4 main basis,

All 4 must be evaluated



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 1st 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