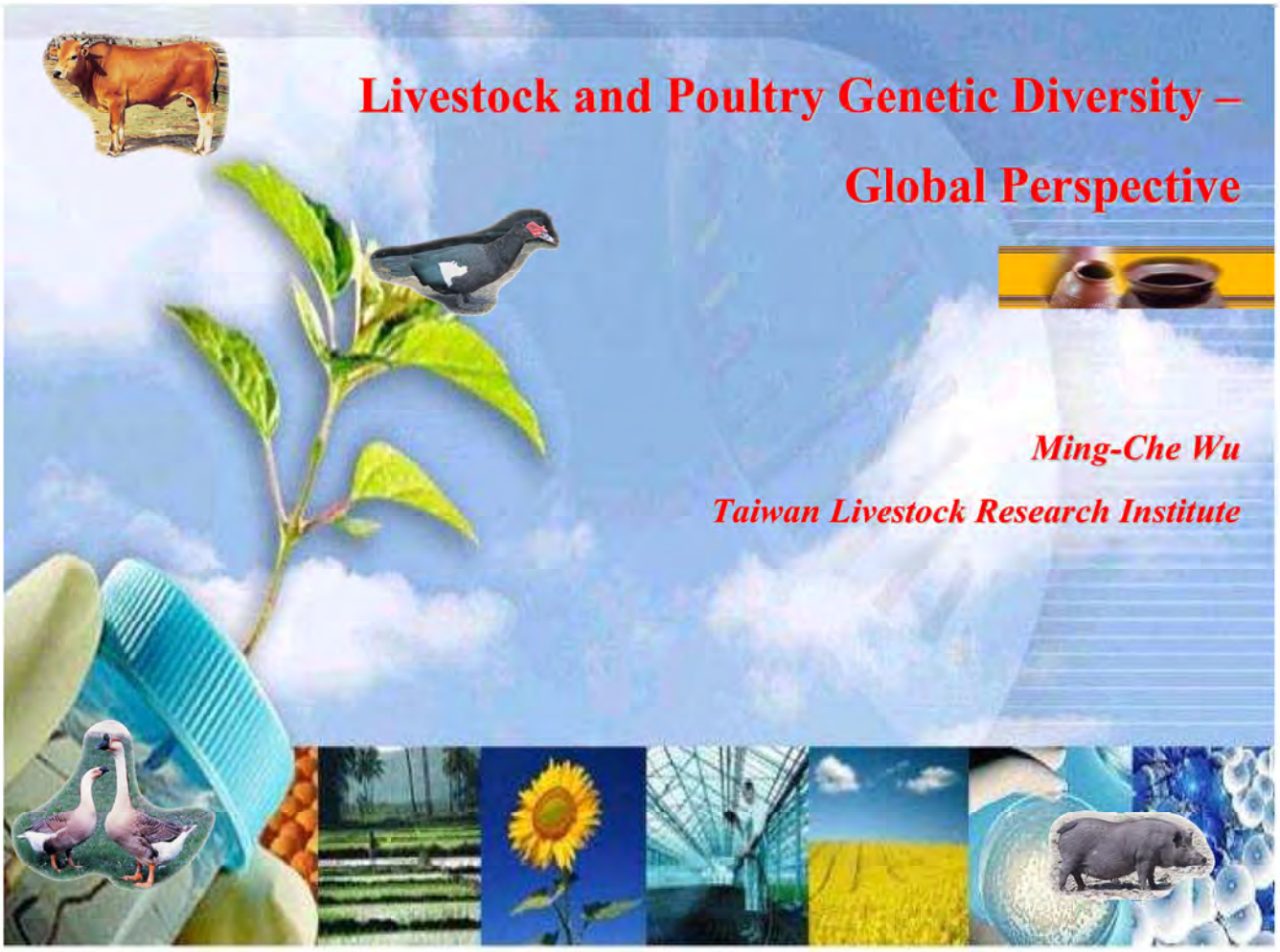
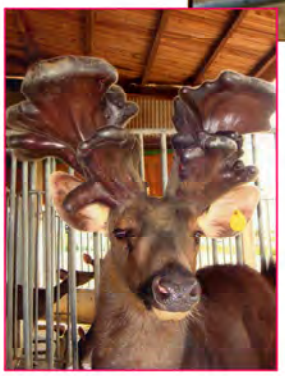
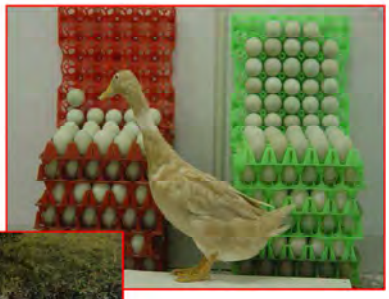


Breed, Quality and Value



- Livestock
- Poultry



العربية 中文 english français español

Food and Agriculture Organization of the United Nations

Global Issues

Biodiversity

Custom Search

- FAO Home
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- Who We Are
- Ecosystems
- Genetic Resources
  - Crops
  - Domestic animals
  - Aquatic
  - Forests
  - Nutrition
- Socio-economic

Genetic Resources

Genetic resources for food and agriculture are the biological basis of world food security and, directly or indirectly, support the livelihoods of every person on Earth. They are the raw materials used in the production of new cultivars and breeds and are a reservoir of genetic adaptability that acts as a buffer against potentially harmful environmental and economic change. Erosion of these resources poses a severe threat to the world's food security in the long term.

The wide exchange of genetic resources between farmers, communities and countries is a crucial factor in maintaining viability, and in adapting to unforeseen developments and changing needs. In this context, the sustainable development of agricultural biodiversity must be understood both sectorally and cross-sectorally in an integrated and holistic manner, which takes into account biophysical and socio-economic dimensions.

© FAO/23094/J. Spaull

A reservoir of genetic adaptability acts a buffer against potentially harmful environmental and economic change.

Food security and mileage (Sustainability)

3

TABLE 43 (source:FAO, 2007)

Projected trends in milk consumption from 2000 to 2050

Region	Production			Consumption per capita		
	1999-2001	Growth rate 1999-2001 to 2030	Growth rate 2030 to 2050	1999-2001	Growth rate 1999-2001 to 2030	Growth rate 2030 to 2050
	[1 000 tonnes p.a.]	[% p.a.]	[% p.a.]	[kg p.a.]	[% p.a.]	[% p.a.]
Sub-Saharan Africa	16 722	2.6	2.1	30.6	0.5	0.6
Near East/North Africa	29 278	2.3	1.5	88.5	0.6	0.6
Latin America & the Caribbean	58 203	1.9	1	122.4	0.7	0.5
South Asia	109 533	2.8	1.5	82.3	1.5	0.9
East Asia	17 652	3.0	0.6	13.1	2.1	0.7
Developing world	231 385	2.5	1.4	53.1	1.3	0.7
World	577 494	1.4	0.9	94.2	0.4	0.4

Source: FAO (2006a).

4

By the consciousness of the fact that species continuously disappear from the Earth, advanced countries, one by one, start to preserve genetic material for local living forms.

Evolution—Genetic change in a population or species over generations; all the changes that transform life on Earth; the heritable changes that have produced Earth's diversity of organisms.

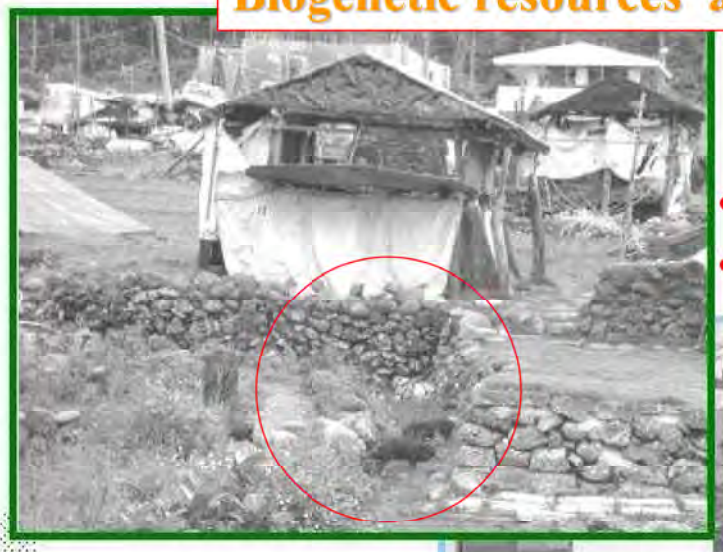
Extinct—The condition when an organism is no longer in existence, when all members of the species have died without leaving a survivor to continue the line.

Feral—A wild animal that originated from domesticated stock.

Food web—A network of interconnecting food chains.

Introduced species—A species that humans move from the species' native location to a new geographic region; sometimes called an exotic species or invasive species.

Biogenetic resources are parts of our life.



Lanyu miniature pig

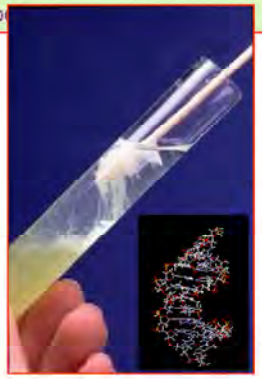
- **habitat loss**
- **social value sinking**

Genetic diversity is threatened by

- **genetic erosion**
- **habitat loss**
- **social value sinking**
- **economic setback**
- **food print mileage**

www.angrin.tlri.gov.tw

From Farm to DNA Bank



7

Farm owner found the phenotypic difference and conserved the new genetic resources under a traditional breeding scheme provided by the Institute.

8

BioUtilization

Conservation

Species **Biodiversity**

Selection

Demand **Value add**

Export **Tracking**

Genomic breeding

- **Species** verification
- **New breed/line**
- **Genetic** improvement

9

- Chinese Homepage
- English Homepage
- Publications
- Laws and Regulation
- Videotapes
- Conservation Sites
- Atlas 2004
- Atlas 2007
- Dairy Cattle
- Other Web Sites

APEC-ATCWG Participants visit Animal Germplasm Center (October 15,2008)

Germplasm of Domestic Animals in Taiwan (2007)

No.	Breed	Sum
1	Buffalo	1
2	Cow	7
3	Goat	7
4	Sheep	3
5	Sambar Deer	1
6	Sika Deer	1
7	Pig	12
8	Horse	3
9	Rabbit	2
10	Ortrich	1
11	Chicken	15
12	Turkey	2
13	Duck	3
14	Muscovy	2
15	Goose	4
16	Swan	2
17	Grass	6
18	Microbe	6

臺灣畜產生物

Genetic Resources for Animal Industry in Taiwan

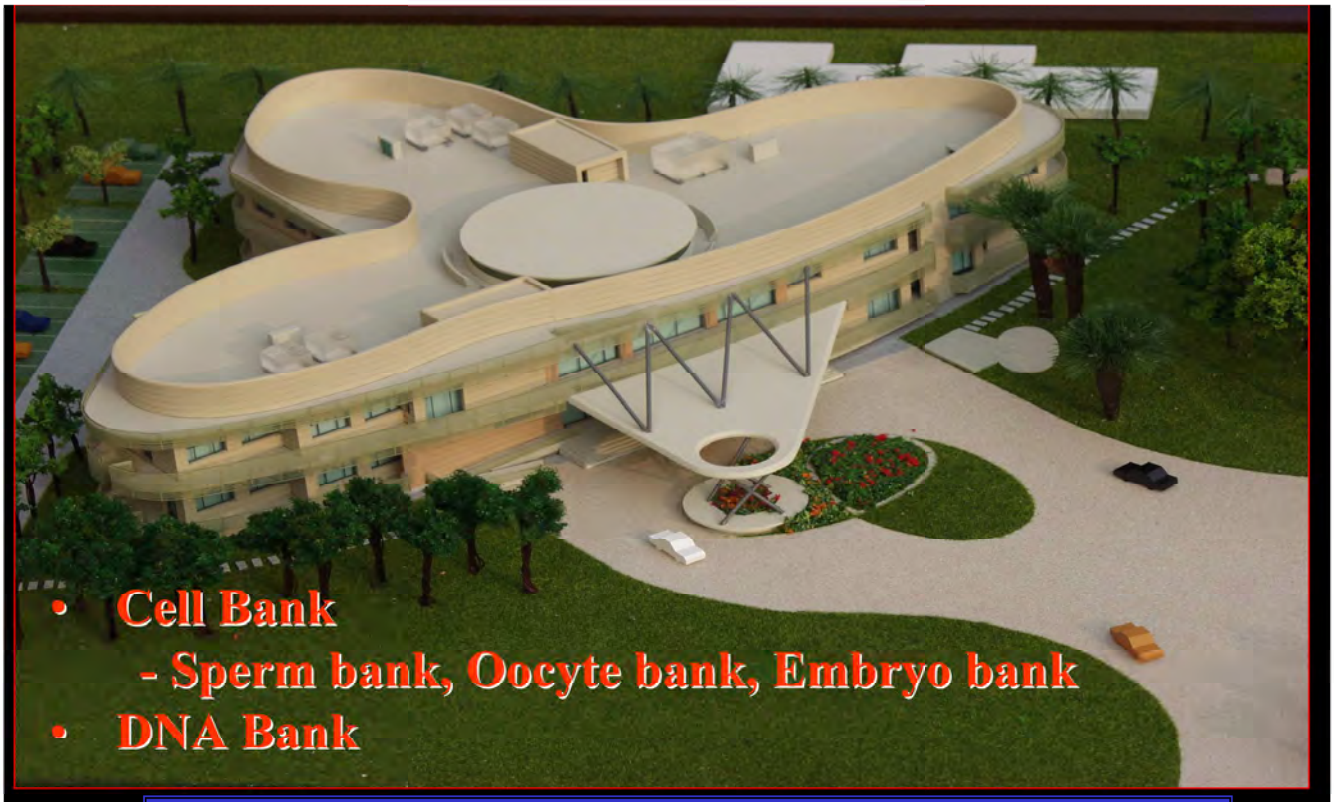
http://www.angrin.tlri.gov.tw

Livestock Research Institute, Council of Agricultrue
TEL:886-6-5911211~9 FAX:886-6-5911784

System for Food Animal Genetics in Taiwan

- Conservation farms
- Web site www.angrin.tlri.gov.tw
- Cryopreservation *Bank*
- Molecular techniques
- Genetic resources exchange

Phase I (1987~1992)：
Conservation farms
Phase II(1993~1998)：
Web site
Phase III(1999~2004)：
Conservation center
Phase IV(2005~2008)：
Research and Utilization
Phase V(2009~2012):
Global Bioidentification System



Taiwan Animal Germplasm Center

http://www.angrin.tlri.gov.tw/

Tissue frozen in high quality can promote permanent preservation of biodiversity as well as provide studying material, including protein, RNA and DNA, for future application in the highly competitive areas of chemistry and biotechnology.

Under the consideration of importance and preservation value of species as well as the difficulties of specimen collection, the principles for genetic material storage and collection are:

(1) Endemic species and subspecies are prior to non-endemic species.
(2) Resident species is prior to non-resident species, such as migrants.
(3) Genus or family with a single subordinate is prior to genus or family with multiple subordinates.
(4) Conservative species is prior to non-conservative species.
(5) Species that are more susceptible to environmental changes is prior to species with a stabilized population.

Operation Guidelines for the Conservation and Utilization of Farm Animal and Forage Genetic Resources

Livestock Research Institute, Council of Agriculture, Taiwan

Passed by the Augmented Institute Meeting, LRI on September 5, 2005 .
Accepted to be kept on record Document No. 0940155300 and 0950124331 (English Version), issued by Council of Agriculture, October 14, 2005 and May 3,2006

Provision 3 updated by the Augmented Institute Meeting, LRI on Dec. 28, 2006 and record Document No. 0962300511 of COA on Jan. 19, 2007

1. **In order to facilitate the collection, conservation, utilization, exchange, rehabilitation and research of farm animal and forage genetic resources, as well as solidify the operation and management of farm animal and forage genetic resources, these guidelines are set up by the Livestock Research Institute (LRI), Council of Agriculture, Executive Yuan.**
2. **Farm animal and forage genetic resources include farm animal, forage and microorganism. Farm animal and forage genetic material includes tissue, embryo, cell, sperm, egg, fertilized egg, seed, microorganism and nucleic acid, as well as the derivative transferred from genetic material.**
3. **Genetic material collected and conserved by LRI belongs to the government, while the original provider retains the preferential right to take back a part of conserved genetic material. On the condition, the genetic material stored at national backup inventories of risk management is retained by the preferential right to take back all of conserved genetic material by the original provider.**
4. **Before the genetic material is deposited, a provider is obliged to submit the basic information, the conservation condition and other information concerned to LRI. The submitted information will be put on farm animal and forage genetic resources website (http://www.angrin.tlri.gov.tw) for research and inquiry.**

5. The provider of genetic material includes:

(1) A research institute which executes the conservation and utilization of farm animal and forage genetic resources.

(2) A working unit which executes the breeding, genetic improvement, propagation and extension of farm animal and forage genetic resources.

(3) A research institute which executes the transfer of genetic material.

(4) A person who executes the genetic introduction and international genetic material exchange project of Council of Agriculture, Executive Yuan.

(5) A domestic or foreign donator, civil group or individual, who has entered into an agreement with LRI.

(6) In accordance with the related regulations of Council of Agriculture, Executive Yuan, a person who is obliged to provide the genetic material for conservation.

6. The user of genetic material includes:

(1) An original provider.

(2) A commutator of exchange of the same kind genetic material.

(3) A person who executes a livestock research project of Council of Agriculture, Executive Yuan.

(4) A person who executes a project of Council of Agriculture, Executive Yuan.

(5) A person who executes a project of National Science Council, Executive Yuan.

(6) A person who carries out scientific research, or science promotion for mutual benefit, on material other than those which are not allowed to be exported or are subject to certain limitations.

(7) A person who executes related mapping, identification and analysis according to the regulation.

7. When a person wants to use the genetic material stored in LRI, he shall complete the application form with a genetic material utilization proposal, and submit it to LRI for approval.

8. The review for approval of the utilization of genetic material shall be based on the power and responsibility of the authority as follows:

(1) Application submitted by the original provider or the commutator shall be approved by LRI.

(2) Application from a person who executes a project of Council of Agriculture or National Science Council, Executive Yuan shall be approved by LRI.

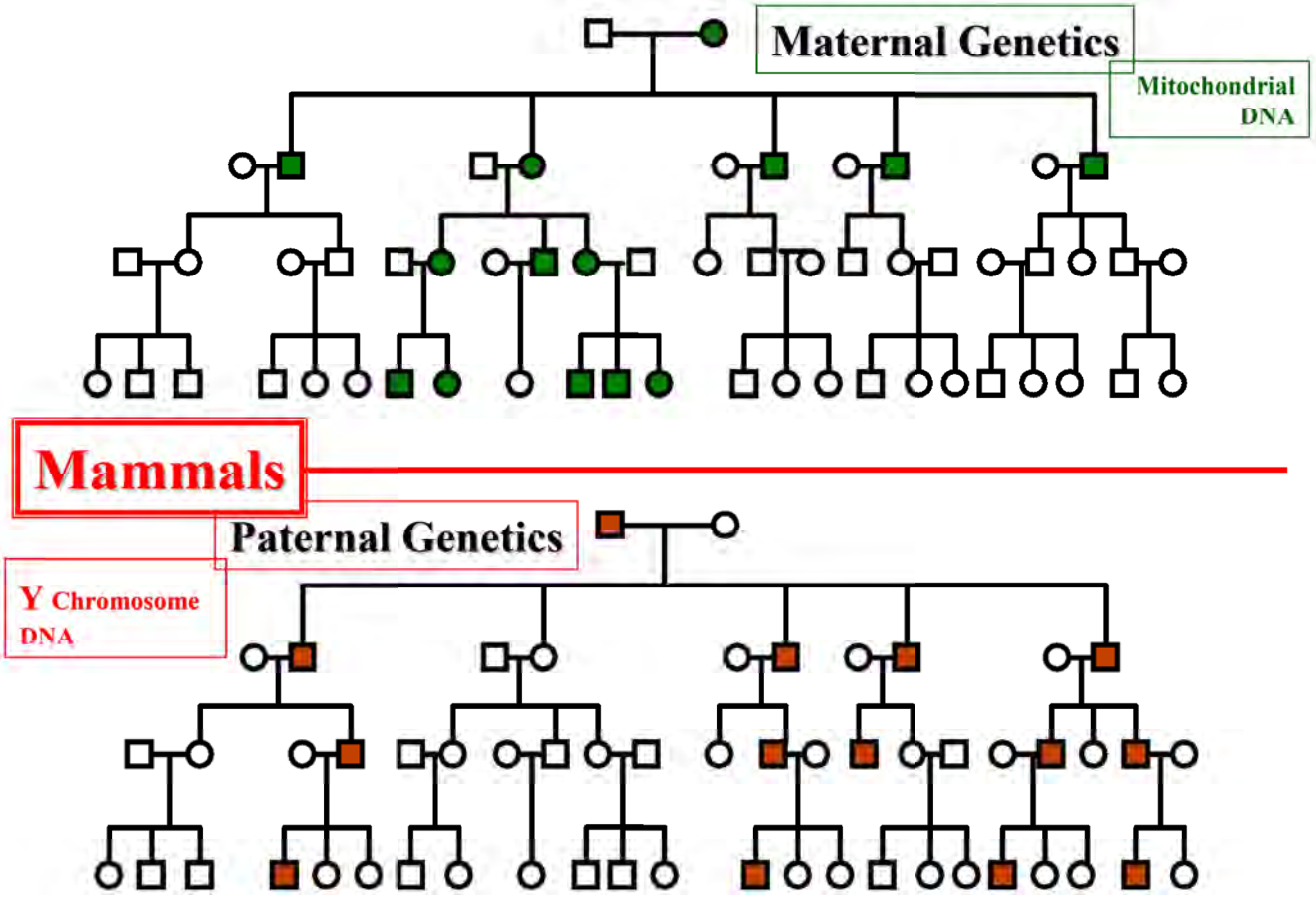
(3) Application from a person who carries out scientific research or science promotion task domestically shall be approved by LRI.

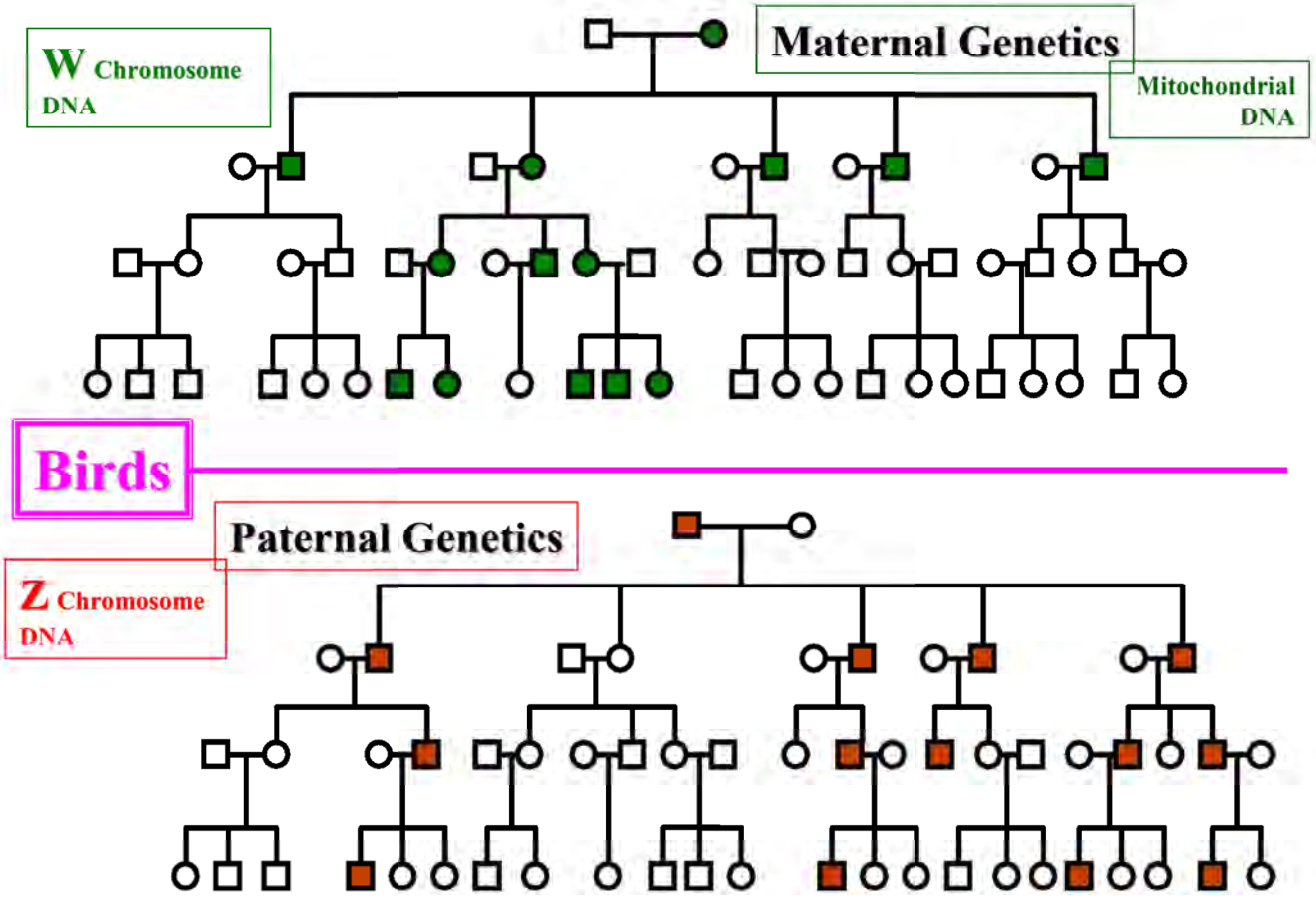
(4) Application for international donation shall be approved by Council of Agriculture, Executive Yuan.

(5) Application from a person who executes related mapping, identification and analysis according to the regulation shall be approved by Council of Agriculture, Executive Yuan.

9. When the utilization of biological material involves the intellectual property right, the operation shall be proceeded in accordance with ''the regulation for the belongings and utilization method of scientific research and development achievements,'' promulgated by the Council of Agriculture, Executive Yuan. The recipient shall notify LRI of the utilization result of genetic material, and shall proclaim that the original provider of material is LRI when a new breed is cultivated therefrom or the related research report is published.

10. The conservation and utilization condition of genetic material will be compiled into a volume annually by LRI, and if required, it will be sent to the original provider for reference.


Maternal Genetics
Mitochondrial DNA
Mammals
Paternal Genetics
Y Chromosome DNA


W Chromosome DNA
Maternal Genetics
Mitochondrial DNA
Birds
Paternal Genetics
Z Chromosome DNA

MMFFAARR

2-3-5-Z

PRL-ESR-HSP70-PRLR

NNEEBBPP

Chicken genome

2-3-5-Z-mtDNA

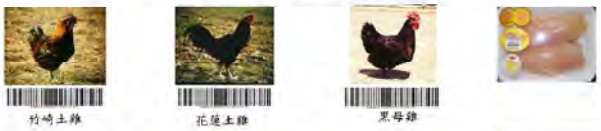
PRL-ESR-HSP70-PRLR-CoI

MMEEAAPP CCGGTCC

Native Chicken Barcode
土雞品種的基因身分證

一、紅羽土雞系列 **(Red feather)**

二、黑羽土雞系列 **(Black feather)**



三、絲羽烏骨雞系列 **(Silky feather/Black meat)**

四、白肉雞進口種系列

Broiler

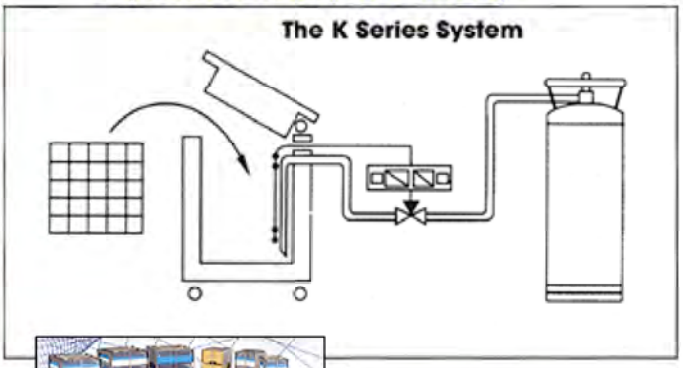
雞肉細胞內有天然的條碼，就是基因，是無法假冒的，可藉由基因條碼作為土雞特有的基因身分證。

21

22

Small LN Tank

•K Series - Liquid nitrogen storage with controllable temperatures between (-100˚C to -196˚C)



-185℃ Vapor storage

-80℃ Freezer

•designed for large vial capacities up to **6000** vials (2 ml vial) in box type racks.

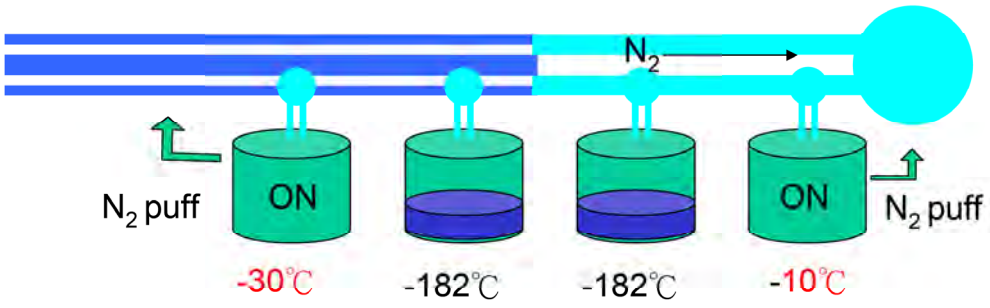
CryoBanking

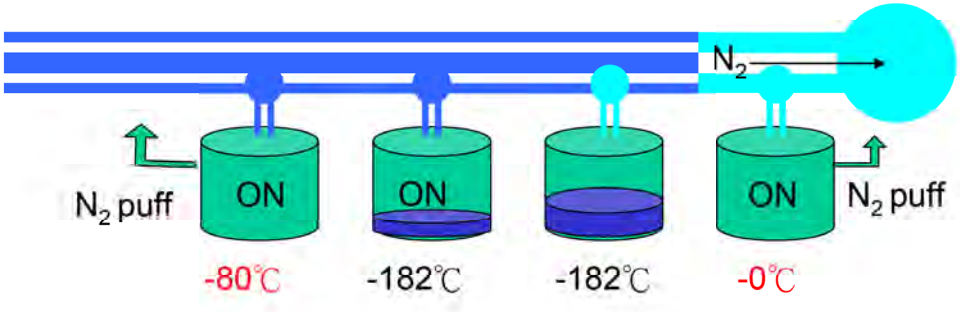
Taiwan Animal Germplasm Center
http://www.angrin.tlri.gov.tw/

Cryotanks: 24K*5 + 38K*17 + 80K*2 = 926K

(CryoArk for Taiwan Biodiversity: 46,000 sp. in total)

LN filling sequencer for CryoSystem





APEC
Asia-Pacific Economic Cooperation

APEC-ATCWG Workshop on
Capacity Building for Development and Implementation of Risk Management Systems on Genetic Resources

- Home
- Program
- Resources paper
- Country report
- Delegates
- Resource Speakers
- Observers
- Photos

Photos

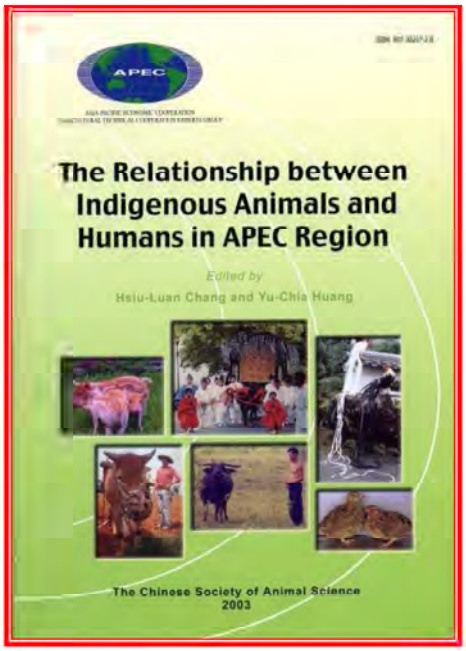
Tuesday, 14 October 2008

Wednesday, 15 October 2008

Thursday, 16 October 2008

Backup System of Gene Cryobanks

Why?	DNA in food chain
Where?	Market to farm
When?	Origin assurance
Who?	Stakeholder
How?	Global responsibility



Development of miniature pig for biomedical research in Taiwan

Ming-Che Wu, PhD
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Development of miniature pig for biomedical research in Taiwan

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PSS free selection

Inbreeding (full-sib mating)

Outbreeding

×

Duroc

GPI-CRC-PGD Genotyped Line (Lanyu 300)

Spotty Lanyu (Lanyu 100)

Inbreeding

Lanyu White (Lanyu 400)

Mitsae (Lanyu 50)
(50% Lanyu + 50% Duroc)

Body Size of Lanyu Series of Miniature Pig

	Lanyu 300	Lanyu 100	Lanyu 50
At birth (0.6~0.8 Kg)			
56 Days of age (5~7 Kg)			
150 Days of age (20~25 Kg)			
Two years of age (~70 Kg)			

Development of miniature pig for biomedical research in Taiwan

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Conservation to Bio-utilization (1987-2008)

Lanyu 300
Lanyu 50
Lanyu 100

Lanyu 300
Lanyu 100
Lanyu 400

Face off

Face exchange between Lanyu Black and Lanyu White of miniature pig breeds

高雄長庚完成小豬變臉的手術，圖中的迷你小黑豬被換上白臉。（郭耀仁醫師提供）

2008-8-30

黑豬換白臉 高雄長庚成功變臉

〔記者方志賢／高縣報導〕

目前全世界僅有三例變臉手術，而台灣變臉移植手術在許多醫生努力下，技術也已日趨成熟。

高雄長庚醫院完成全球醫學文獻首例的大動物迷你豬變臉手術，這項手術日前發表於美國外科研究雜誌，題目為「**豬臉移植大動物模型臨床前研究**」，郭耀仁(高雄長庚整形外科主任)以顯微手術，幫迷你小黑豬換上白臉，棕色迷你豬則換黑臉，這些迷你豬變臉後存活五、六週，最後雖因排斥喪命，但卻成了世界醫學文獻上豬變臉首例。

臉部移植比肝、心、腎臟移植更困難。

自由時報 電子報
The Liberty Times

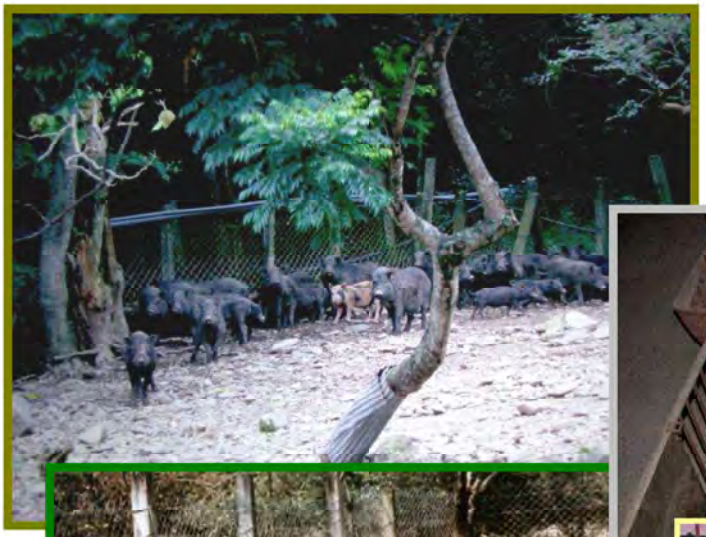
Mitasi minipig was developed from sib-mating on hybrid of Duroc and Lanyu breed.

Lanyu 50

	棕黑條紋	棕白條紋	全黑	全棕	有雜斑	
第一代 (F1)	72.5%	0%	1.3%	0%	26.2%	1989 1990
第二代 (F2)	31.0%	7.5%	43.5%	18.0%	0%	1991
第三代 (F3)	41.6%	25.3%	1.4%	31.8%	0%	1992
第四代 (F4)	21.1%	72.8%	1.7%	4.4%	0%	1993
第五代 (F5)	0%	91.9%	0%	8.1%	0%	1994
第六代 (F6)	0%	100%	0%	0%	0%	1995 (Lanyu 50)

Fullsib Mating on coat color selection

Lanyu 100



Fullsib Mating on coat color selection

Lanyu 400

Chromosome Number of Pig Species of Sus

Pig species of Sus	2N	Chromosomes
Sus scrofa (歐亞野生豬種)		
Sus scrofa wild (Asia)	36	16/17 centric fusion translocation
Sus scrofa wild (Europe)	36	15/17 centric fusion translocation
Sus scrofa domestica	38	submetacentric: 1-7th autosomes metacentric: 8-12th autosomes, the X and Y chromosome acrocentric: 13-18th autosomes
Sus salvaninus (侏儒豬種)	38	centromeric region of acrocentric chromosomes have extra band
Sus verrucosus (爪哇疣豬種)	38	similar to dom. pig except Chromosome 10 and the Y chromosome
Sus barbatus (鬍鬚豬種)	38	similar to domestica pig
Sus celebensis (東印尼豬種)	38	similar to domestica pig except the Y chromosome

Semen collection and storage

Ex situ conservation of minipig

Semen collection and storage

Ex situ conservation of minipig





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  - Mr. Yun-Yu Lai
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  - Dr. Kan-Jiang Chen
  - Prof. Feng-Pang Cheng
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  - Prof. Harris Lewin, UIUC
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  - **TLRI**
  - **NAIF**