Thursday 14th April 2011 - Conference

Potential for development of animal husbandry and aquaculture in CEMAC zone

Possible interventions for the improvement of animal husbandry in CEMAC

Edi Piasentier University of Udine

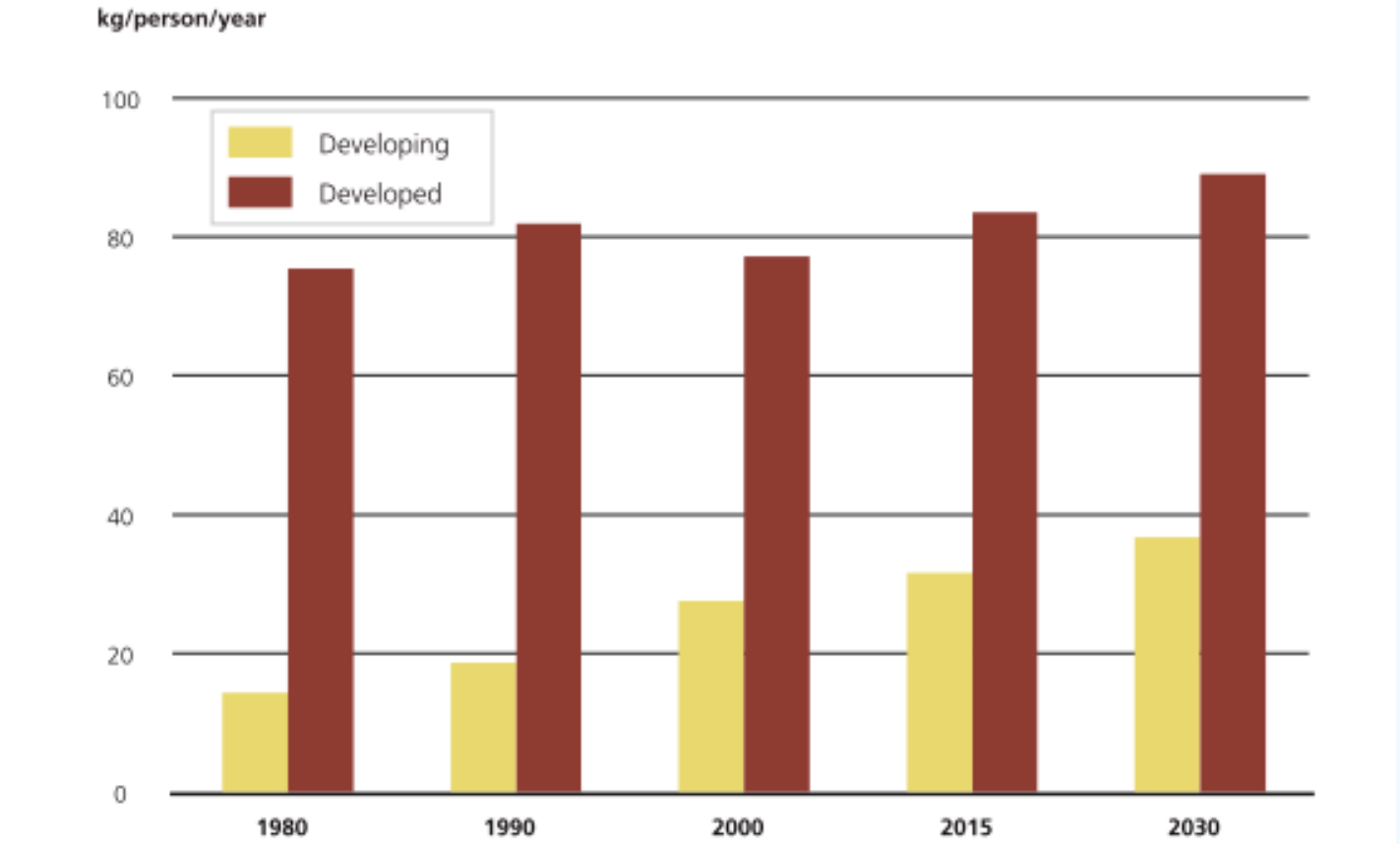
Expected evolution of livestock production

- New livestock functions are emerging, including landscape and vegetation management using grazing animals.
- Consumer choices are increasingly influenced by environmental and welfare concerns, and by tastes for speciality products.
- Environmental challenges that need to be addressed include:
  - emission of greenhouse gases from livestock (ruminants) and their excretions;
  - deforestation for the establishment of pastures and feed production (particularly soybean);
  - pollution of land and water by livestock wastes.

THE LIVESTOCK REVOLUTION

- A significant rise in demand for livestock products in the next future (Delgado et al., 1999)
- as a result of :
  - a rise in human population numbers,
  - urbanization and economic development,
  - especially in developing countries

Changes in the meat consumption



Sources: 1980, 1990 and 2000 figures from FAOSTAT; 2015 and 2030 figures from FAO (2002a).

FAO. 2007. The State of the World's Animal Genetic Resources for Food and Agriculture, edited by Barbara Rischkowsky & Dafydd Pilling. Rome

Projected trends in meat 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	5 564	3.3	2.8	9.5	1.2	1.4
Near East/North Africa	7 382	3.3	2.1	21.9	1.6	1.1
Latin America & the Caribbean	31 608	2.2	1.1	59.5	0.9	0.7
South Asia	7 662	3.9	2.5	5.5	2.7	1.9
East Asia	73 251	2.1	0.9	39.8	1.5	0.9
Developing world	125 466	2.4	1.3	26.7	1.2	0.7
World	229 713	1.7	1.0	37.6	0.7	0.5

Source: FAO (2006a).

FAO. 2007. The State of the World's Animal Genetic Resources for Food and Agriculture, edited by Barbara Rischkowsky & Dafydd Pilling. Rome

Livestock responses

- To meet this demand they have to increase:
  - the number of meat animals globally
  - animal production levels
- by
  - Choosing the suitable livestock resources and
  - improving their genetic value

Available livestock resources

- Thousands of years of animal husbandry and controlled breeding, combined with the effects of natural selection, have given rise to great genetic diversity among the world's livestock populations.
- Today they co-exist :
  - **high-output animals** – intensively bred to supply uniform products under controlled management conditions – with the
  - **multipurpose breeds kept by small-scale** farmers and herders mainly in low external input production systems.

Recent trends and current cattle distribution

- The countries and regions of the world have long been **interdependent in their utilization of genetic resources**
- the scale of transfers and the rate at which the genetic composition of livestock populations is transformed have **increased dramatically in recent decades**
- these transfers have the potential to **narrow the genetic resource base** of the world's animal production.

Distribution of Holstein-Friesian cattle

FAO, 2007. ibidem

- Today, the world's most widespread cattle breed, the Holstein-Friesian, is found in at least 128 countries

New approaches in breeding (animal genetic resource management) programmes

- At both national and international levels, actions should be taken
  - To **promote sustainable utilization**, and, where necessary,
  - **for conservation** of threatened resources.
- **Structured breeding** (**animal genetic resource management**) **programmes** provide a key means to increase production levels and product quality, increase productivity and cost efficiency, maintain genetic diversity and support the conservation and sustainable utilization of specific breeds.

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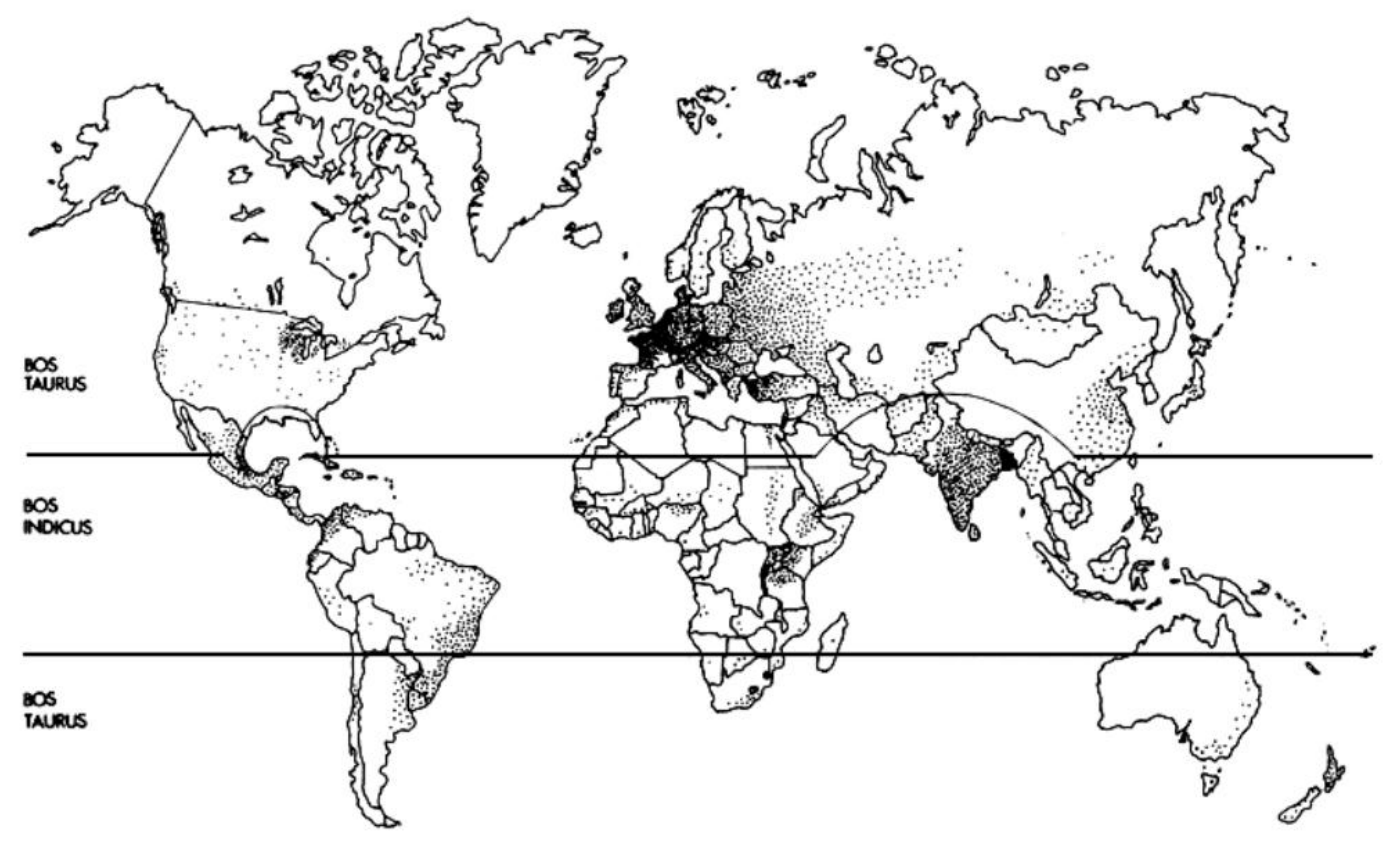
IN CEMAC

In tropical and sub-tropical regions Zebù cattle (*Bos indicus*) is main type of cattle both in economic and cultural terms



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Zebu breeds

Goudali

Red Fulani

White Fulani

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Cattle origin and migration routes in Africa

D: *Centre(s) of domestication*

Migration routes:

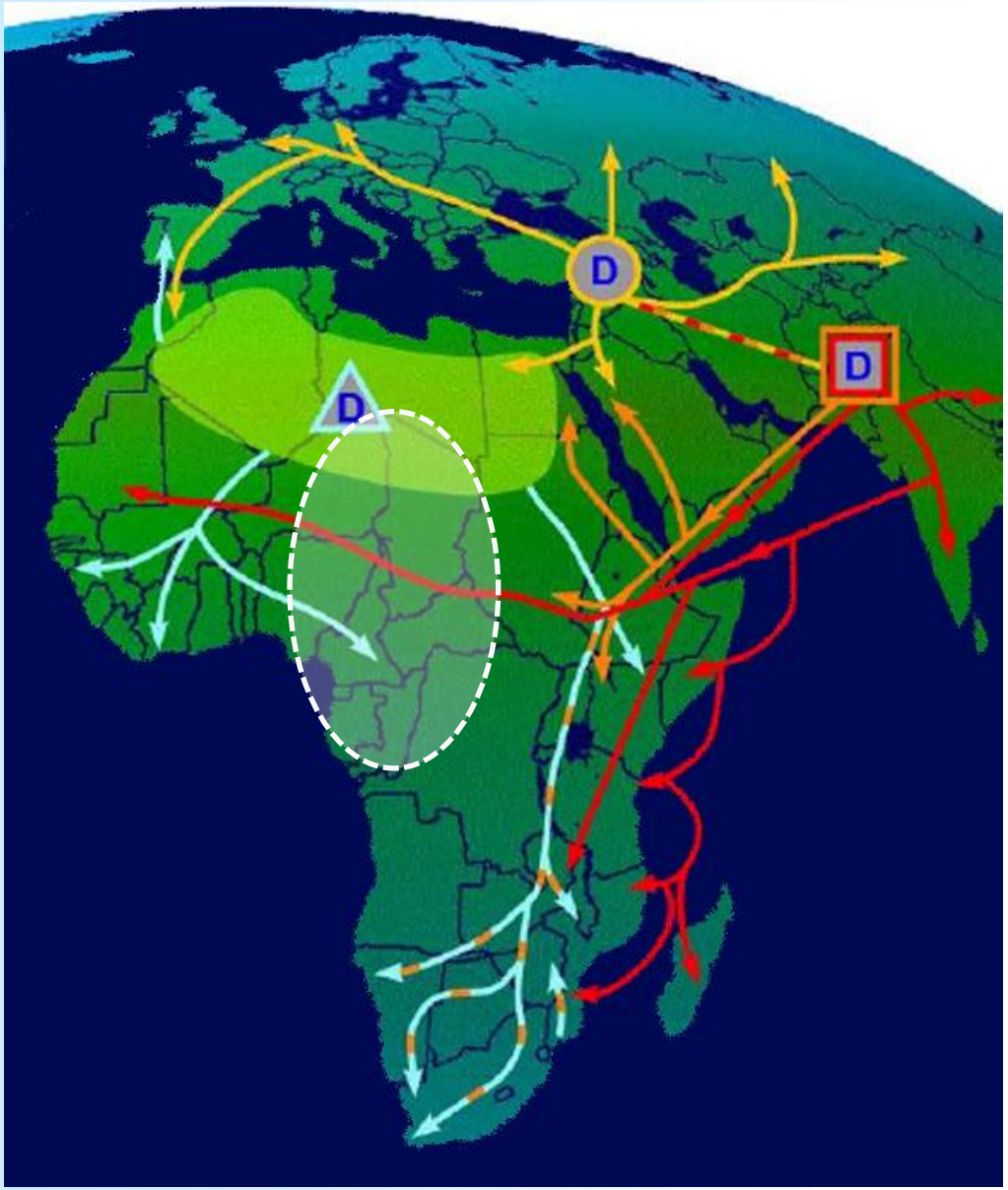
European *B. taurus* (longhorn/shorthorn) (yellow) 6000 - 2500 BC

African *B. taurus* (blue)
5000 BC - 500 AD

Zebu, *B. indicus* - 1st wave (orange)
>2000 BC

Zebu, *B. indicus* - 2nd wave(red)
>700 AD

Source: Graphics unit, ILRI (2006)



FAO, 2007. ibidem

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N'Dama

Long horned African taurine breed

The origin of this breed is located in the highlands of Guinea.
It has spread in the Sudanian and Guinean regions.

- N'Dama is a **medium size** type breed (100 cm at shoulder height for cows; 120 cm for bulls) with a large and strong head and with lyre-shaped horns.
- Birth weight : 14-20 kg. **Weight** at 4-5 years old: 250 kg (cows) and 350 kg (bull).
- Production performances. Cows produce only 2-3 liters milk per day during 7-8 months. This breed is used for meat and the ratio **carcass/liveweight** is around **50%.**

Breed risk status in Africa

- In Africa, 59% percent and 60% percent of mammalian and avian breeds, respectively, are classified as being of unknown risk status.
- Cattle have 16% the proportions of at-risk breeds.
- Cattle are the species with the highest number of breeds reported as extinct (209).

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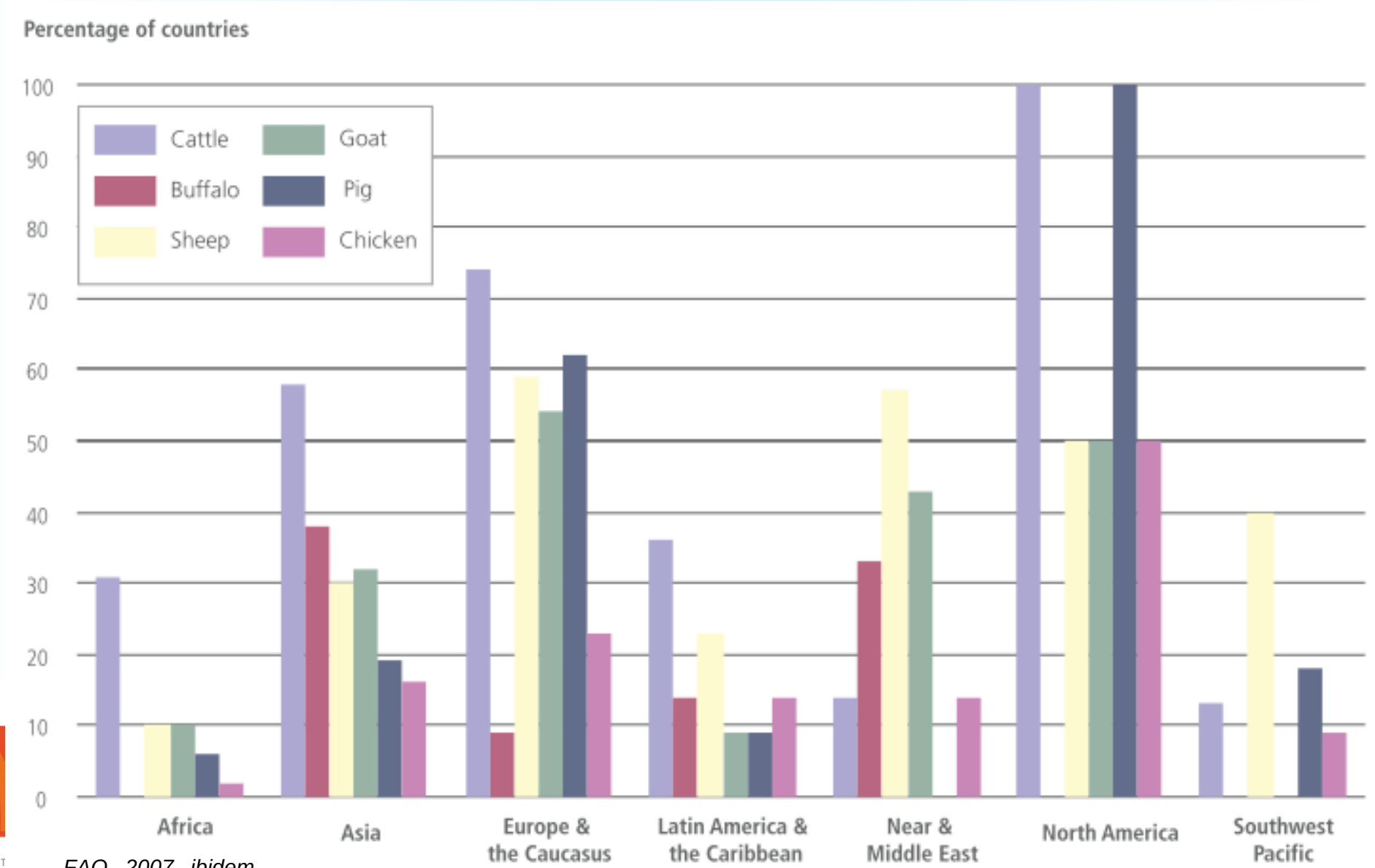
Structured breeding activities

Regional distribution for the main livestock species



FAO, 2007. ibidem

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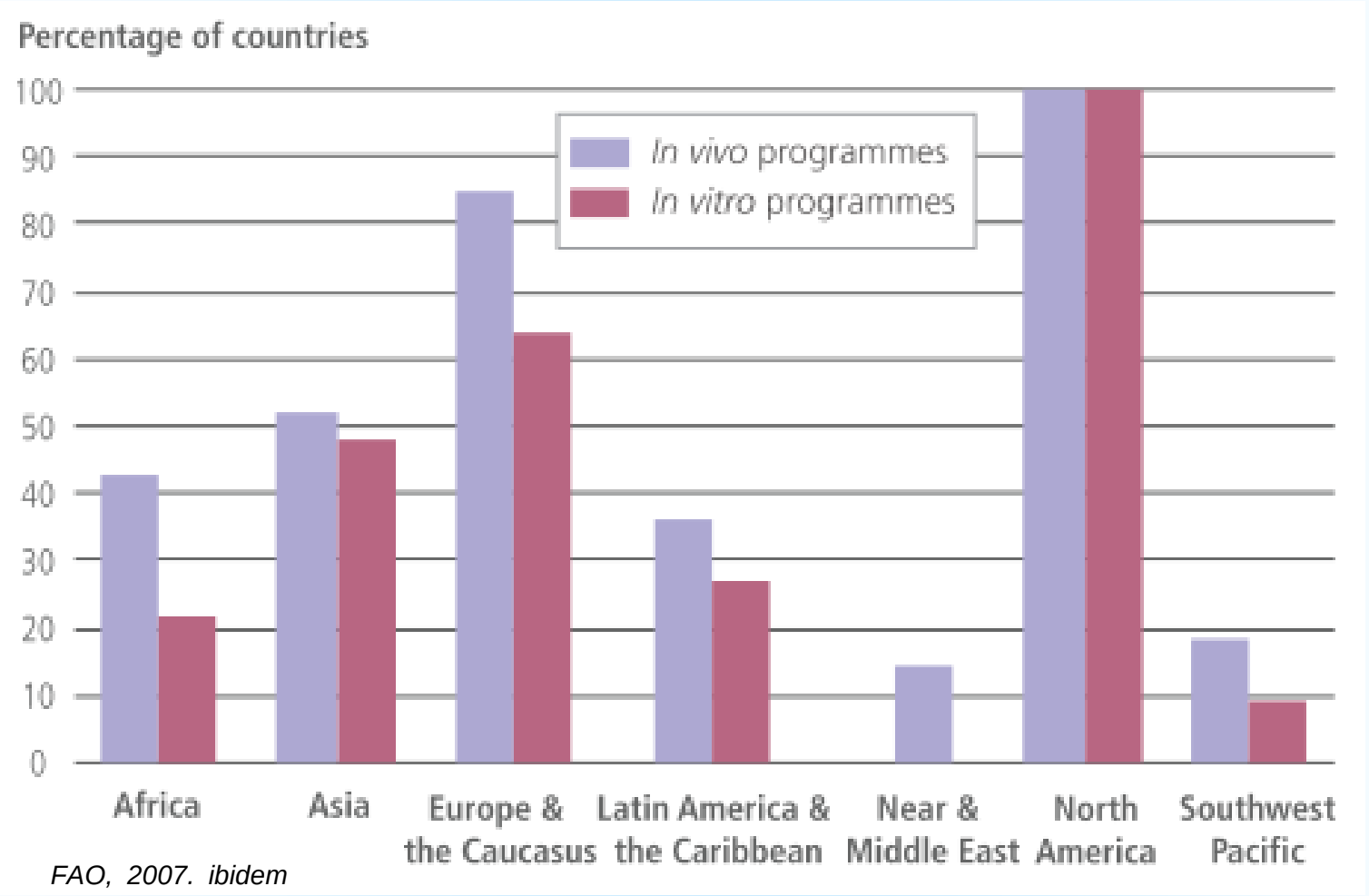
Regional distribution of conservation programmes



FAO, 2007. ibidem

Animal identification systems and rules

- Systems for animal identification, registration and performance
- recording are important for:
  - structured genetic improvement programmes
  - disease control,
  - traceability, and
  - administration of conservation programmes
- In many developing countries there is the need for improved tools and regulation in this field.

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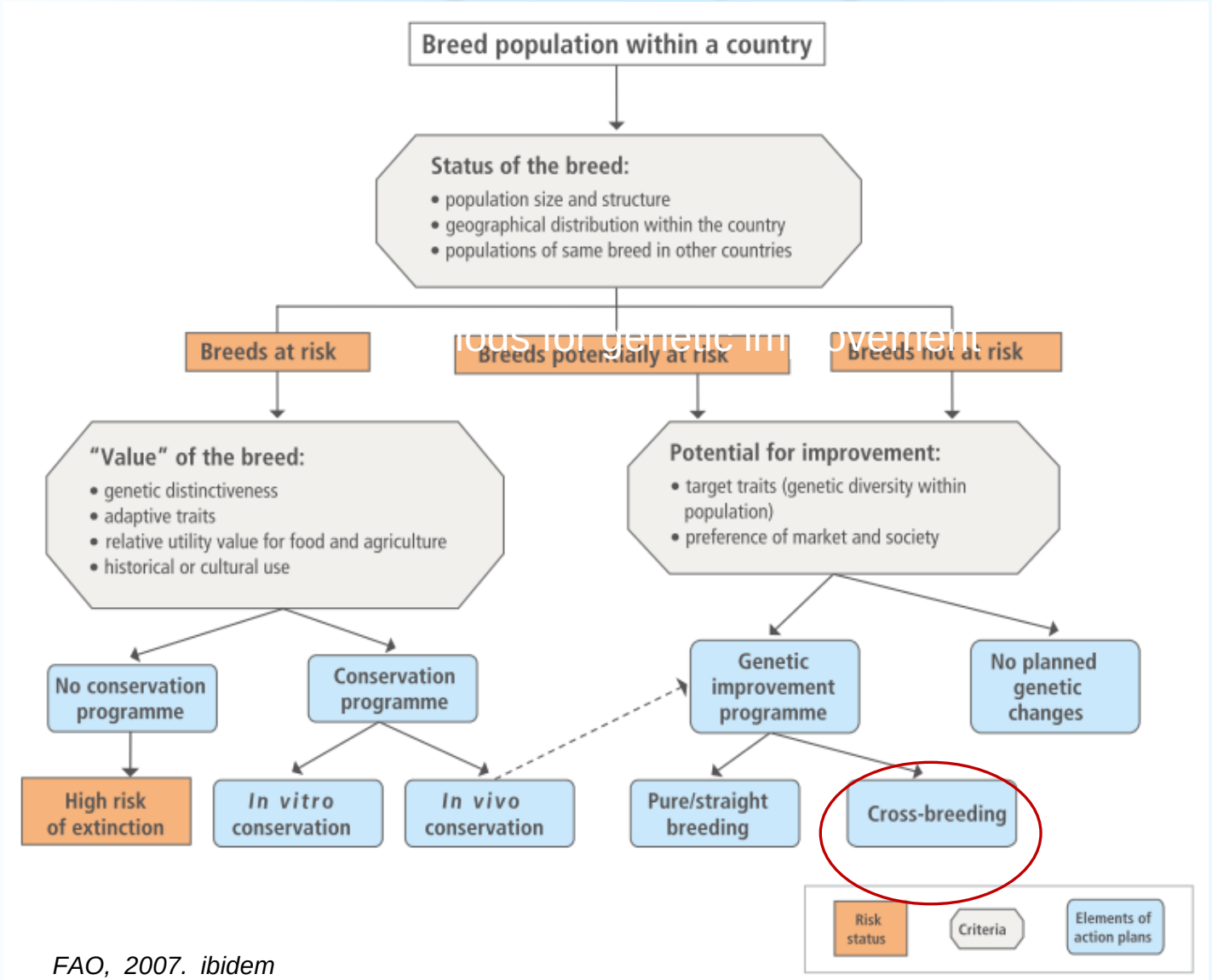
Reproductive biotechnologies

- Artificial insemination and embryo transfer
  - **speed up genetic progress,**
  - **reduce the risk of disease transmission and**
  - **expand the number of animals that can be bred from a superior parent.**
- The availability of these technologies varies greatly from country to country and between regions.
- **Capacity is generally much weaker in developing countries**
- Expand the use of these technologies because of their potential contribution to meeting demands for increased output of animal products.
- Affordability and access have to be **addressed to poorer livestock keepers**

Animal genetic resources management programme



FAO, 2007. ibidem

Cross-breeding

Objectives

Crossbreeding beef cattle offers two primary advantages relative to the use of only one breed:

1) cross-bred animals exhibit **heterosis** (hybrid vigor), and

2) crossbred animals **combine the strengths** of the various breeds used to form the cross.

The goal of a well-designed, systematic crossbreeding program is to simultaneously optimize these advantages of heterosis and breed complementarity.

Stable cross-breeding programmes should involve the maintenance of pure-bred herds of local breeds

Potential advantages of heterosis

Individual Heterosis: Advantage of the Crossbred Calf[1]

Trait	Observed Improvement	% Heterosis
Calving rate, %	3.2	4.4
Survival to weaning, %	1.4	1.9
Birth weight, lb.	1.7	2.4
Weaning weight, lb.	16.3	3.9
ADG, lb./d	.08	2.6
Yearling weight, lb.	29.1	3.8

[1]Adapted from Cundiff and Gregory, 1999.

Maternal Heterosis: Advantage of the Crossbred Cow[1]

Trait	Observed Improvement	% Heterosis
Calving rate, %	3.5	3.7
Survival to weaning, %	.8	1.5
Birth weight, lb.	1.6	1.8
Weaning weight, lb.	18.0	3.9
Longevity, yr.	1.36	16.2
Cow Lifetime Production:		
No. Calves	.97	17.0
Cumulative Wean. Wt., lb.	600	25.3

[1]Adapted from Cundiff and Gregory, 1999.

Scott P. Greiner, 2008. Crossbreeding beef cattle. Virginia Cooperative Extension. Publication 400-805

Combining breeds traits

- Allows to capture the strengths of two or more breeds and match breeds in a complementary fashion:
  - the heat tolerance and hardiness of the indigenous breed complement
  - the fertility, milking ability and rapid growth of the exotic one

Indiscriminate cross-breeding

- **Indiscriminate cross-breeding** refers to a spectrum of actions ranging from upgrading or cross-breeding to complete replacement of a local breed with imported animal genetic resources in **an unplanned manner and without adequate assessment of the performance** of the respective breeds under relevant production conditions.
- a problem that is considered by many experts to be **a major threat to genetic diversity.**

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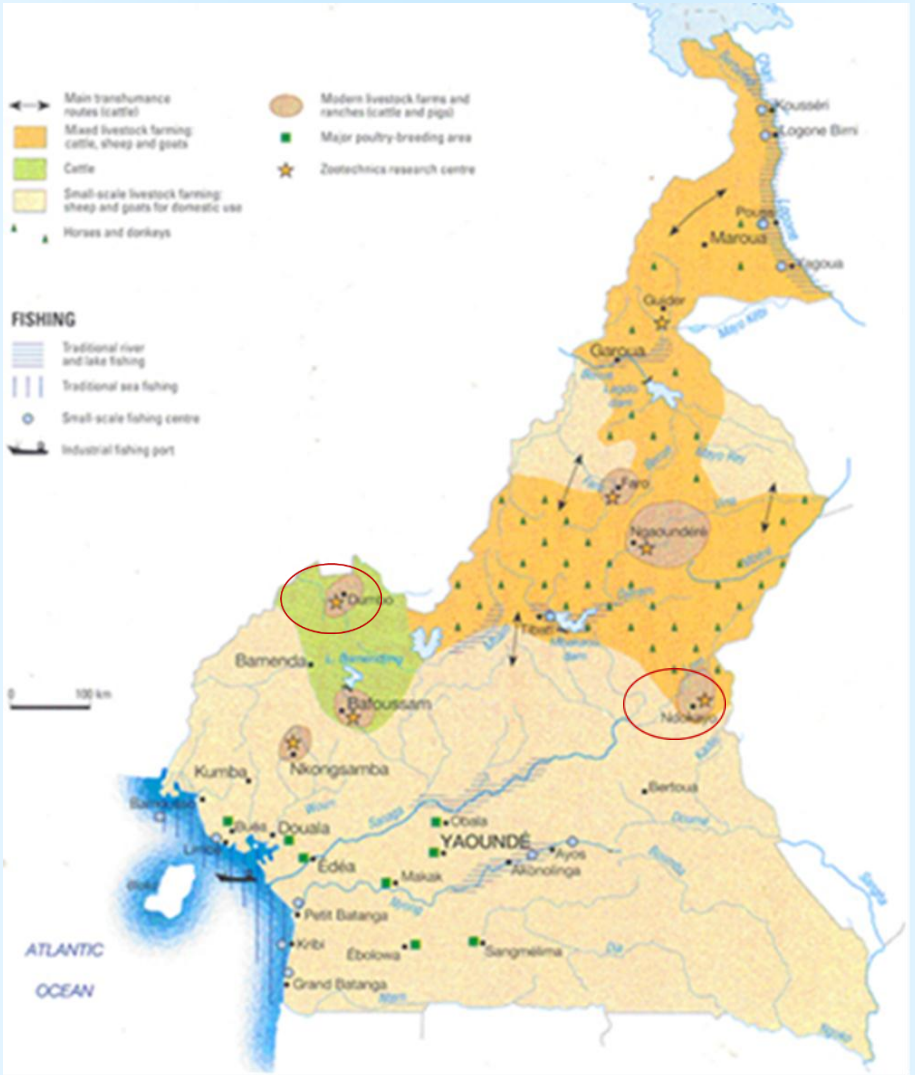
Preliminary Results of a Crossbreeding Program of Autochthonous Goudali (Zebu) Cattle of Cameroon with Italian Simmental

Bessong et al., 2011. Simmental European Congress



Goudali breed

main characteristics:

- heat tolerance
- insect tolerance
- hardiness
- excellent foraging ability
- maternal calving ability
- longevity

Italian Simmental

Dual purpose breed

main characteristics:

- early sexual maturity,
- fertility,
- lactating ability,
- rapid growth
- good beef characteristics
- very docile disposition

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General aims of the project

- The project plans to elaborate a cooperation activity between SODEPA c/o Ministry of Livestock, Fisheries and Animal Industries of the Government of the Republic of Cameroon and Italian partnership to improve on the meat and milk productivity from the Gudali zebu breed in Cameroon.
- Specifically, it is a project-type technical cooperation from Italian Simmental Breeders' Association (Associazione Nazionale Allevatori di Pezzata Rossa Italiana – ANAPRI) and the Udine University.
- It aims for a well-planned introduction and improvement of high quality dual-purpose cattle taking advantage from crossing the Italian Simmental and local Gudali zebu breed, and the increase of productivity by vulgarising:
  - the artificial insemination technique
  - cattle selection practices
  - feeding techniques that ensures high quality feed at all seasons.

Justification

-Problem of inadequate food security

-Education / Scientific purposes

-Cooperation and capacity enhancement

-Promoting and improve good management of the local breeds in the country for excellent exploitation

-Be able to maintain the WHO/ FAO recommendation 18kg/inhabitant/year for meat consumption

Specific Objectives

- To enhance learning within SODEPA to increase its competence to support smallholder cattle farmers and local people.
- To establish and maintain a nucleus herd of dual purpose crossbreed cattle comprising SIMGOUD crosses by
  - a planned and controlled introduction of Italian Simmental semen in selected local GOUDALI cattle
  - alternative crossbreeding systems
- To allow the exploitation of heterosis and complementary traits from cross breeding between the Zebu and the Italian Simmental, to obtain more productive cattle adapted to the different production systems in Cameroon.

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Goudali cattle at Ndokayo Ranch

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Individual animal identification system

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Cows ear-tagged and provided of ruminal transponders

Training SODEPA technicians on assessing cows reproductive status and AI at Ndokayo Ranch in May 2008

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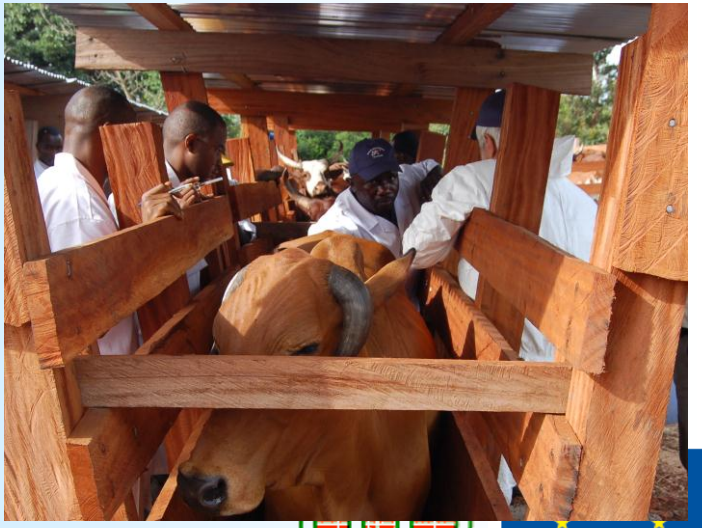
Nine technical staff of SODEPA actively participated in the artificial insemination activity.

They acquired skills on management of cryogenic containers, semen preservation and transportation, thawing of straws for insemination, restraint of animals in breeding boxes and provision of assistance to inseminators.



Feeding improvement

Re- seeding of Guatemala grass on natural pasture and improved grass pasture at the Dumbo-Jakiri Ranch

Feeding improvement

Vitamin and mineral supplement distribution at Dumbo ranch

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Goudali cattle at Dumbo Ranch

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An experimental (without hump) and a control (humped) calf, both in their first month of life

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Health Management

Action	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Premunition against Trypanosomosis				X							X	
Anthelmintic				X	X	X	X	X	X	X	X	X
Micro-Mineral	X	X	X	X	X	X	X	X	X	X	X	X
Contagious Bovine Pleuropneumonia										X		
Acaricide	X	X	X	X	X	X	X	X	X	X	X	X
Nodular Dermatitis			X									
Black quarter										X		
Pasteurellosis										X		

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RESULTS

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Reproductive performance

Dumbo Herd Situation as at September 2010

Herd Number	No Cows[1]	SIMGOUD Calves		No Cows Pregnant	No Cows w 2nd calve
		No	% Female		
AI-1	63	53	56.6	35	2
AI-2	78	48	33.3	16	1
AI-3	79	55	43.6	24	2
AI-4	63	56	46.4	26	0
AI-5	84	46	45.7	21	0
Total	367	258	45.3	122	5

Number of services (AI) per calved cow and its relationship with body condition score at AI

Body Condition Score	No Calved Cows	No Cows conceived at				Inseminations/ Calved Cow
		1st AI	2nd AI	3rd AI	4th AI	
F+	15	8	4	3	0	1.67
F	74	53	16	5	0	1.35
F-	71	45	15	8	3	1.56
M+	25	11	10	3	1	1.76
M	14	9	3	1	1	1.57
M-	1	0	1	0	0	2.00
Total	200	126	49	20	5	1.52

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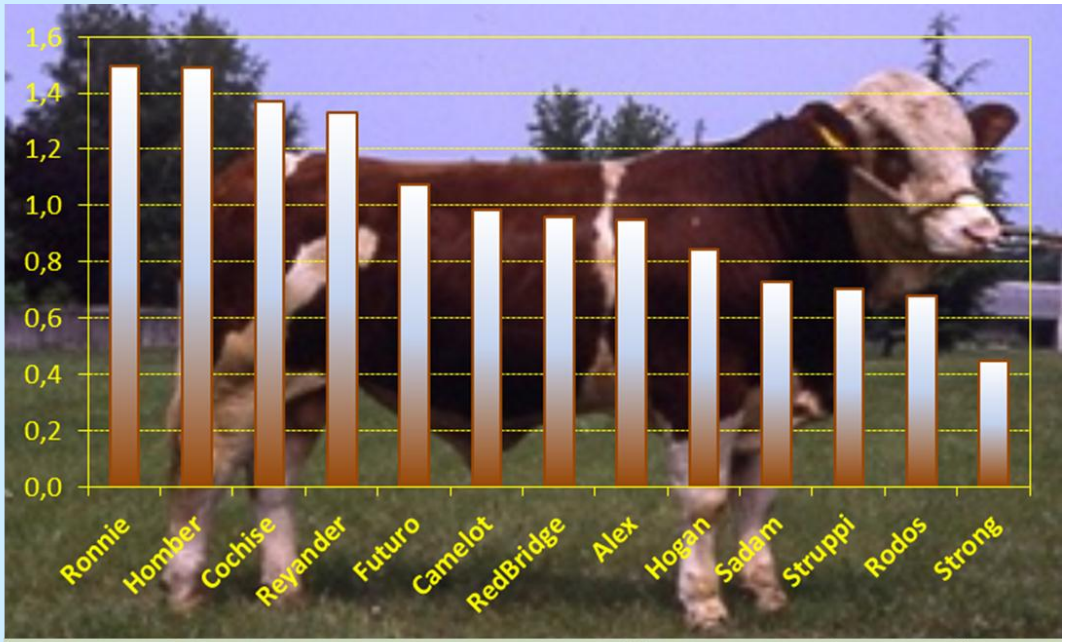
Breeding records of each of the 13 bulls used

Name of Bull/ID	Total doses per bull[1]		Calves sired by bull	
	No	%	No	%
RONNIE IT031000105430	19	3.8	13	5.8
HOMBER IT021000823434	44	8.9	30	13.3
COCHISEIT04UD0211493	40	8.1	25	11.1
REYANDER IT04UD0208061	51	10.3	31	13.7
FUTUROIT04UD0196885	51	10.3	25	11.1
CAMELOT IT007GO023C002	20	4.0	9	4.0
REDBRIDGE IT004UD009B029	41	8.3	18	8.0
ALEX IT04VR0100261	23	4.6	10	4.4
HOGAN IT04UD0206505	44	8.9	17	7.5
SADAM IT093000700839	30	6.1	10	4.4
STRUPPI IT04BZ0133400	56	11.3	18	8.0
RODOS IT021000854994	42	8.5	13	5.8
STRONG IT009GO013B010	34	6.9	7	3.1
Total	495	100.0	226	100.0



Index of relative conception efficiency of sires (% of calves sired by bull / % total doses per bull)

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Artificial insemination at Ndokayo ranch (11/05/2008-15/11/2009)

IS Bull	Cows inseminated		
	nr.	age (years)	BS (score)
ALEX	4	6.4	6.3
CAMELOT	5	6.4	6.0
COCHISE	10	7.4	6.3
FUTURO	8	6.2	6.1
HOGAN	7	5.9	7.3
HOMBER	7	6.7	6.2
RED BRIDGE	6	8.1	6.8
REYANDER	6	7.7	6.4
RODOS	17	6.4	6.9
RONNIE	10	7.8	6.7
SADDAM	9	6.3	7.1
STRONG	4	7.5	7.3
STRUPPI	11	8.0	7.2
Total/ mean	104	7.0	6.7
SD		2.1	1.3
min		3.4	4.0
max		11.9	9.0

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SIMGOUD crosses calves

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A group of F1 SIMGOUD of different age and sex

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A six months young F1 bull behind it a one year old Goudali young bull

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A one year F1 heifer with his dam by the side

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A one year old SIMGOUD heifer

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Calves growth

Scale for calves weight recording

LIVE - Linking Institutions for Veterinary Education

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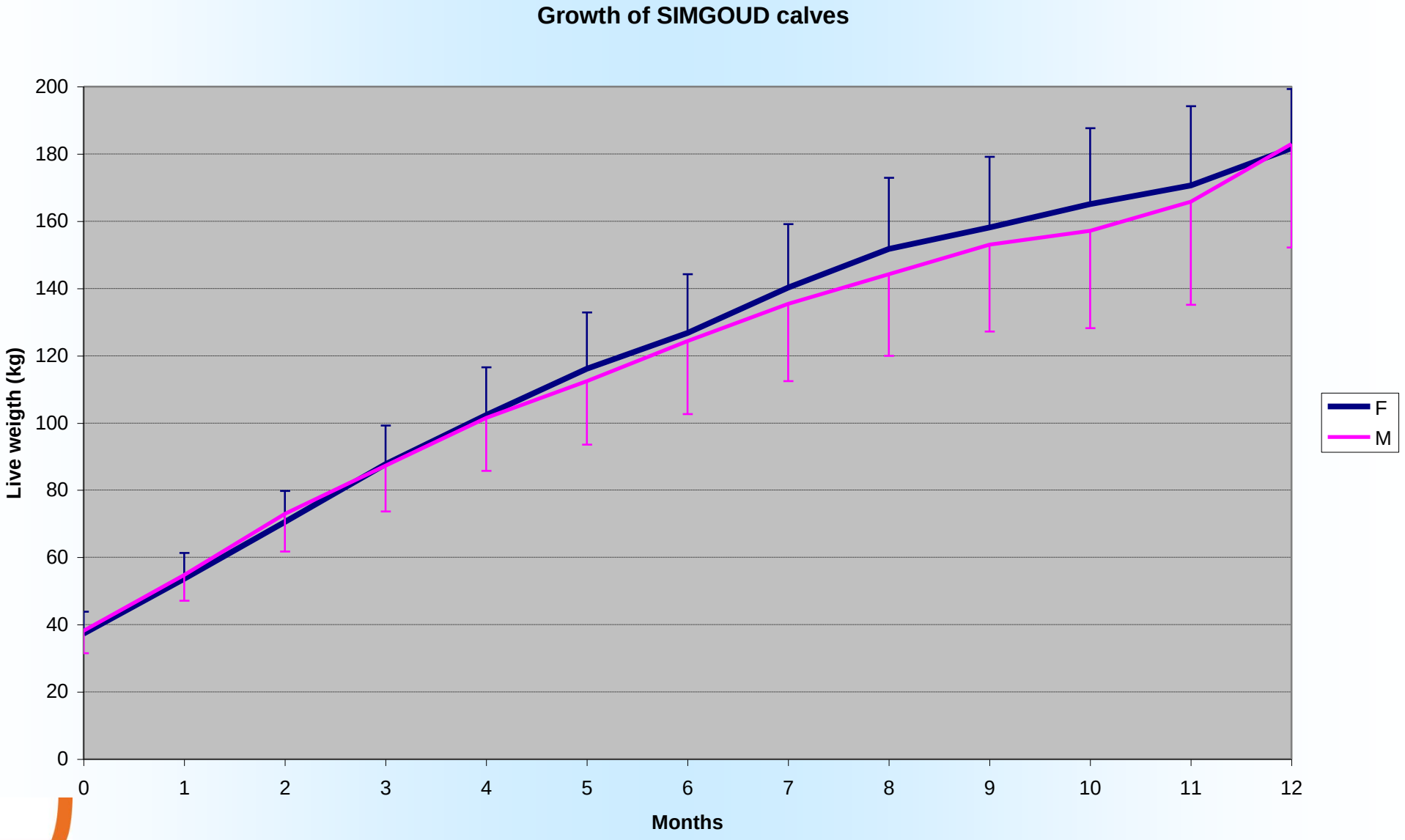

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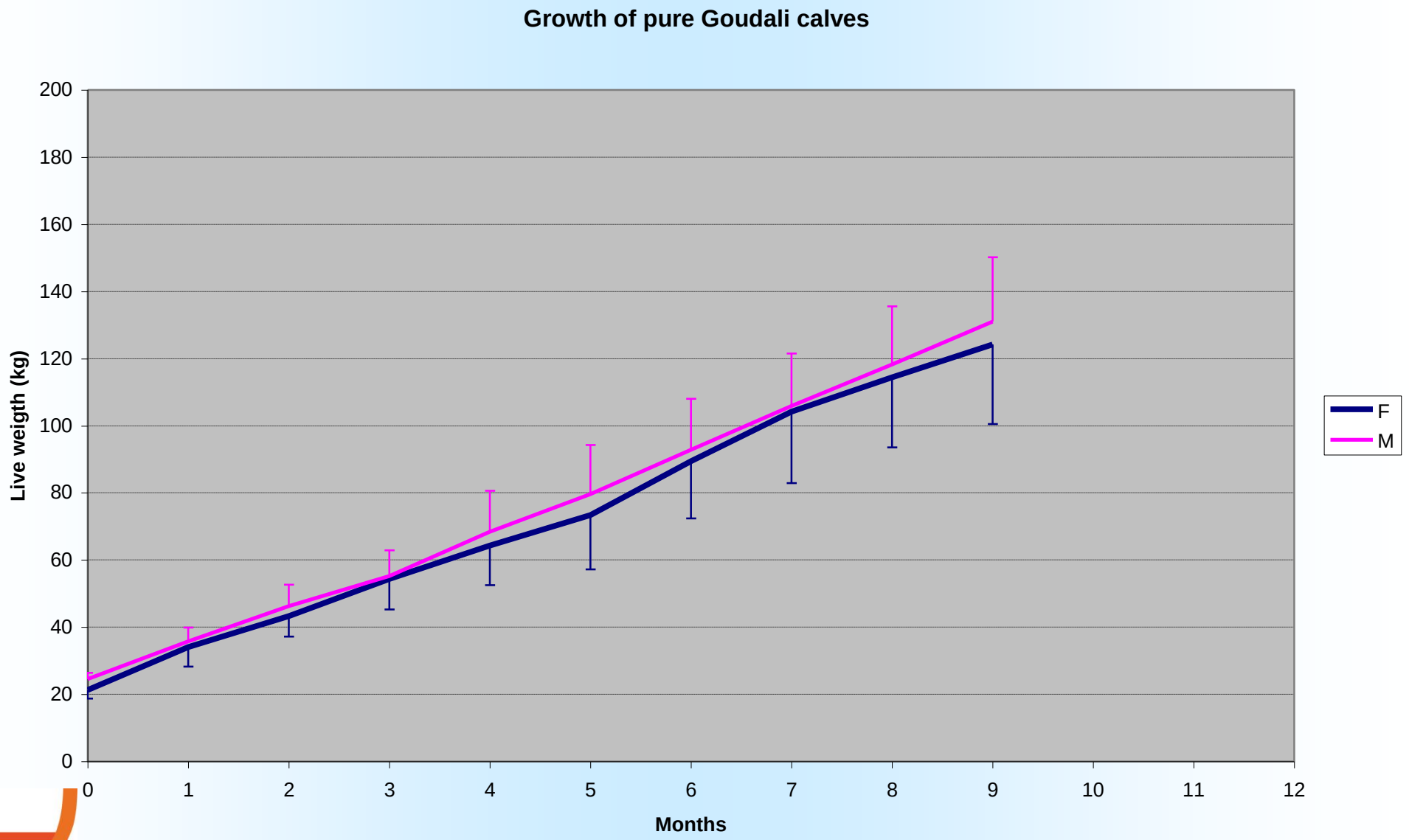

Perspectives

- By the end of the first phase of crossing about 400 F1 SIMGOUD of both sexes are expected to be calved.
- These shall be selected and composed into the second phase breeding groups to obtain the F2 crossings with different levels of Goudali /IS blood:
  - 75% IS blood (by inseminating the F1 females with IS semen)
  - 50% IS blood (F1 females x F1 males from different parents),
  - 25% IS blood (F1 females x Goudali males and
  - Goudali females x F1 males) and
  - 0% IS blood (control pure Goudali group).
- The new facilities of the ranch will permit a regular weight monitoring of the animals.
- The rate of growth alongside the morphological, reproductive, and health records will allow a comparative evaluation of the performance of the crosses
- to evaluate whether:
  - the cross is better in performance than local breed
  - that level of performance is acceptable and economically viable

Breeding strategy

- The intention of the comparison among different classes of cross-breeds and purebreds is to build up a picture of the relative importance of:
  - **additive genetic effects** and
  - **heterosis effects**
- This knowledge provides guidance on whether **proportion of crossed animals have to be maintained in herd or population**
- It is a trade-off between the proportion of crosses in the population and the yield of the crosses
- **Stratification** is possible when purebred (the indigenous one) and the crosses can occupy different environmental niches. In this case there is a natural place for both breeds: the former may perform adequately for small-holders while the second may be more relevant for larger units supplying a city population