SEARCA Regional Professorial Chair Lecture for AY 2014/2015

Organic Livestock Farming and Breeding Towards Food Security of Smallholder Farmers in the Tropics

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According to the IFOAM (2001),

*Organic agriculture* is a production system that sustains the health of soils, ecosystems and people.

- Relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects.
- Combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.
According to IFOAM (2001), FAO/WHO Codex Alimentarius Commission, and USDA National Organic Program:

- "Organic agriculture" implies application of agronomic, biological and mechanical methods of production in place of the use of synthetic chemical inputs.

- Most definitions also incorporate the use of several techniques not exclusive to organic agriculture, as they may be applied in conventional and low-input production systems as well.

Integration of animals in organic farming

As opposed to crops, animals are not just integrated parts of the whole system but they are also sentient (i.e., conscious, living, responsive) creatures.

- This aspect of dealing with sentient beings gives animals a special status on the farm, i.e., animals deserve special moral consideration.

- They are individuals that need to be protected and provided to cover their (basic) needs.

"Organic farming" vs. “traditional farming” vs. “intensive or conventional farming” (Source: Giovannucci, 2005)

Organic Farming is an internationally certifiable farm management system (with controls and traceability).

Traditional Farming is often subsistence-oriented using few or no purchased inputs.

Intensive or Conventional Farming utilizes “Green revolution” methods designed to maximize profit often by extracting maximum output using external purchased inputs.

Intensive/Conventional livestock production

- Designed to increase farm profit, by increasing capital, land or labor efficiency.

- The aims are to reduce labor per animal, increase number of animals per land unit, and maximize output per food unit.

- It implies no direct valuation of the quality of life of the animals but seek to maintain health and well-being only in so far as it is directly related to performance.

Problems in intensive or conventional livestock production

- Productive lifetime as well as fitness and adaptation in high yielding breeds are reduced.

- Housing, feeding and breeding methods lead to system specific health and fertility problems such as detrimental effects of chronic concentrate overfeeding in dairy cows and fattening beef animal (i.e., fatty liver syndrome, liver damage, rumen acidosis, foot diseases, etc.).
- Resulting disease problems are either tolerated or resolved through the routine use of chemical drugs, resulting in problems of residues and resistance.
- The detachment of livestock production from the soil also creates pollution problems due to the open nutrient cycling as well as off-site degradation on regions where feed and fodder are produced.
- High reliance on feedstuffs from elsewhere and problems of disposing livestock wastes in environmentally harmful quantities and concentrations creates imbalances on energy and nutrient level.

**Table 1. Regionalization of livestock production according to agro-ecological zones** (Modified from Uhlig, 1965 and Andreasson, 1972)

<table>
<thead>
<tr>
<th>Humid months</th>
<th>Precipitation (mm/year)</th>
<th>Vegetation belt</th>
<th>Species</th>
<th>Production system</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1000</td>
<td>Humid savannah, tropical rainforest</td>
<td>Buffalo, goat, sheep, pig, poultry, meat, work, milk, hide, eggs</td>
<td>Many mixed livestock keeping</td>
<td>Meat, work, milk, hide, eggs</td>
<td></td>
</tr>
<tr>
<td>1000-1500</td>
<td>Semi-arid savannah, shrub grass savannah</td>
<td>Buffalo, cattle, goat, sheep, pig, poultry, meat, work, milk, hide, eggs</td>
<td>Many mixed livestock keeping</td>
<td>Meat, work, milk, hide, eggs</td>
<td></td>
</tr>
<tr>
<td>1500-2000</td>
<td>3 Semi-arid savannah, shrub grass savannah, semi-desert</td>
<td>Buffalo, cattle, goat, sheep, pig, poultry, meat, work, milk, hide, eggs</td>
<td>Many mixed livestock keeping</td>
<td>Meat, work, milk, hide, eggs</td>
<td></td>
</tr>
<tr>
<td>&gt;2000</td>
<td>4 Semi-arid savannah, desert</td>
<td>Buffalo, cattle, goat, sheep, pig, poultry, meat, work, milk, hide, eggs</td>
<td>Many mixed livestock keeping</td>
<td>Meat, work, milk, hide, eggs</td>
<td></td>
</tr>
<tr>
<td>&lt;1000</td>
<td>Grassland</td>
<td>Buffalo, cattle, goat, sheep, pig, poultry, meat, work, milk, hide, eggs</td>
<td>Many mixed livestock keeping</td>
<td>Meat, work, milk, hide, eggs</td>
<td></td>
</tr>
<tr>
<td>1000-1500</td>
<td>3 Grassland</td>
<td>Buffalo, cattle, goat, sheep, pig, poultry, meat, work, milk, hide, eggs</td>
<td>Many mixed livestock keeping</td>
<td>Meat, work, milk, hide, eggs</td>
<td></td>
</tr>
<tr>
<td>1500-2000</td>
<td>Semi-arid savannah, shrub grass savannah, semi-desert</td>
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<td>Many mixed livestock keeping</td>
<td>Meat, work, milk, hide, eggs</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Regional distribution of land area of livestock production systems** (Modified from Kruska et al., 2003)

<table>
<thead>
<tr>
<th>Livestock only</th>
<th>Mixed raised</th>
<th>Mixed irrigated</th>
<th>Others*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>World total (1,000 km²)</td>
<td>23,189</td>
<td>19,932</td>
<td>5,124</td>
<td>32,599</td>
</tr>
<tr>
<td>Central and South America (%)</td>
<td>23.60</td>
<td>26.24</td>
<td>7.75</td>
<td>29.53</td>
</tr>
<tr>
<td>East Asia (%)</td>
<td>18.68</td>
<td>12.37</td>
<td>26.86</td>
<td>8.57</td>
</tr>
<tr>
<td>Central Asia (%)</td>
<td>8.95</td>
<td>5.05</td>
<td>8.03</td>
<td>1.79</td>
</tr>
<tr>
<td>South Asia (%)</td>
<td>1.50</td>
<td>8.64</td>
<td>29.69</td>
<td>4.25</td>
</tr>
<tr>
<td>Southeast Asia (%)</td>
<td>0.91</td>
<td>7.69</td>
<td>9.38</td>
<td>8.14</td>
</tr>
<tr>
<td>West Asia and North Africa (%)</td>
<td>7.78</td>
<td>7.83</td>
<td>16.14</td>
<td>24.83</td>
</tr>
<tr>
<td>Sub-Saharan Africa (%)</td>
<td>38.66</td>
<td>32.79</td>
<td>2.35</td>
<td>26.91</td>
</tr>
</tbody>
</table>

* Others = Livestock production systems, i.e. less than 10% of dry matter fed to animals is farm-produced and in which annual average stocking rates are >10 livestock units (LU) per hectare of agricultural land.

In the Philippines, the livestock industry is dominated by backyard or smallholder farms especially for ruminants such as buffaloes (99.6%), goats (98.4%), and cattle (93.2%).

Lower and decreasing percentages of smallholder or backyard farms are noted for pigs (64.9%), chickens (45.4%) and ducks (71.6%).

Source: Bureau of Agricultural Statistics (2014)
I. Introduction

A. Origins of organic farming and definition of terms

B. Principles and standards of organic livestock production

C. Global and local statistics on organic agriculture/livestock production

Four principles of organic farming (IFOAM, 2005)

1. **Principle of Health** - sustain and improve the ecosystem and organisms, i.e., health of soil, organic matter, air, water, plants, animals, humans and our planet and the balance between them.

2. **Principle of Ecology** - based on living ecological systems and cycles, work with them, emulate them and help sustain a high level of biological diversity, i.e., animal welfare standards are highly respected to meet the animals’ species-specific behavioral needs.

3. **Principle of Fairness** - involves building of relationships that ensure fairness with regard to the common environment and life opportunities.

4. **Principle of Care** - should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

Organic livestock standards

- Values may differ according to cultural background, so standards are not universally recognized.

   National and International Standards:
   - International Federation of Organic Agriculture Movements (IFOAM) Standards
   - Codex Alimentarius (FAO/WHO) Standards
   - European Union Standards – Regulation EEC
   - USDA National Organic Program Standards (NOP)
   - Organic Federation of Australia (OFA) Standards
   - Philippine National Standards – Bureau of Agriculture and Fisheries Product Standards (BAFPS), DA

Comparison of national and international standards on organic livestock farming

Commonality:
- Limits on non-organic feed, prohibition of growth promoters, prohibition of drugs in the absence of disease

Areas that need harmonization:
- Housing, grazing areas, withholding periods of drugs, conversion time, age at weaning, nose ringing of piglets, etc.

Some observations:
- IFOAM standards focus more on management, physiological and ethological needs (IFOAM, 2002).
- EU Regulation pays more attention to the animal ethological needs as compared to other international standards (Schmid, 2000).
- EU standards are more detailed than standards from the USA developed within the National Organic Program (NOP) in 2002 or from the Organic Federation of Australia (OFA).
**Codex Alimentarius** is more environmentally oriented and gives the animals a role in closing the nutrient cycle, improving soil fertility through their manure, and controlling weeds through grazing (FAO, 2001).
I. Introduction

A. Origins of organic farming and definition of terms
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Key indicators of organic agriculture in the Philippines and the world
(Source: Willer and Lernoud, 2014)

<table>
<thead>
<tr>
<th></th>
<th>Philippines</th>
<th>World</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic agricultural land, hectares</td>
<td>80,974</td>
<td>37.5 million</td>
</tr>
<tr>
<td>Share of total agricultural land, %</td>
<td>0.70</td>
<td>0.87</td>
</tr>
<tr>
<td>Producers</td>
<td>3,008</td>
<td>1.9 million</td>
</tr>
<tr>
<td>Organic market size</td>
<td>no data</td>
<td>63.8 bn US$</td>
</tr>
<tr>
<td>Per capita consumption</td>
<td>no data</td>
<td>9.08 US$</td>
</tr>
</tbody>
</table>

- Organic livestock and poultry systems across the world are not nearly so developed compared to the production and trade of organic cereal, horticultural and even textile products.

- In the Philippines, organic agriculture is a priority program strategy for addressing rural poverty as an alternative low-input sustainable agricultural strategy to improve land productivity and to protect our environment (Giovanucci, 2005).
- DA has earmarked PhP636.4 million for 2015 to R&D programs related to organic farming.
- However, the domestic organic market tends to be small (i.e. US$6.2 million in 2004, with US$2.5 million coming from domestic production – according to DTI estimates).
- Annual growth rate of organics is approx. 10 to 20%, most of which is related to herbal and food supplement products.

In Australia, about 97% of the 12 million hectares of certified organic land is dedicated to arable agriculture.
- Almost 20 percent of the global 37.5 million hectares of certified organic land is dedicated to arable agriculture.
- About 2.3 million hectares are used in the production of green fodder from arable land.
- In Australia, about 97% of the 12 million hectares of certified organic lands are extensive grazing lands.

More organic livestock production statistics ...
- Animal products especially milk and dairy products, make up a high share of all organic products sold in many countries in Northern Europe. Organic dairy products achieve market shares of about 5% of all dairy products sold and even higher at 10% in Switzerland.
- Meat and meat products are very successful, with market shares of around 10% in Belgium, the Netherlands, Finland, and France.
- Organic eggs have market shares of up to 20% in Switzerland, and around 10% in most of the countries for which data was available. (Source: Organic Data Network survey)

- Local organic products are marketed mainly in weekend organic markets, direct selling, and to a lesser extent in independent organic stores and mainstream supermarkets.
- Organic products usually carry an average of 20-30% price premium over conventional products.
- Most important organic product exports include banana, coconut, mango, muscovado sugar, herbal and food supplements (Giovanucci, 2005).

- In Argentina, 3.3 million hectares of certified organic lands (or 3.6 million ha) are permanent grassland/ grazing areas.
- In both Australia and Argentina, the extensive nature of livestock systems is the most suitable management option in dry land conditions and large farms are typical.
- In contrast to these huge organic animal production properties, smallholdings characterize organic arable lands (with few exceptions).
- In Europe, out of all organic livestock, cattle and sheep are the most important species, with nearly 3% of the total EU livestock population.

- Organic pigs represented lower proportions, with less than 1% of the total EU livestock in most of the EU member states (Röhner-Thielen, 2010 as cited by Mayer et al., 2014).

- Tropical countries are now producing and exporting organic agricultural products in ever-increasing quantities, but represent only a negligible portion of their total livestock production.

  ➔ due to limited export prospects for organic livestock products because of quality controls (so-called "trade barriers") and self-sufficiency in importing countries (Harris et al., 2003).

- In the Philippines, there is yet no aggregate study on the scope of organic livestock production.

II. Regulations and standards for organic livestock farming

A. Design and management of free-range/outdoor systems

B. Source/origin of adapted breeds and breeding methods

C. Feeds and feeding strategies

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E. Organic certification issues

The ethological needs of the organically farmed animals should be respected in order to allow the expression of their natural behavior (Braghieri and Napolitano, 2009), i.e. animals must be able to express their natural, species-specific behavior which implies loose housing systems and going outdoors, or giving them access to an outdoor run or pasturing them.

Extensive rearing system therefore requires:

1. Access to pasture and proper housing design, wherein animals are provided sufficient space.

Box 1. R&D topics related to free range/outdoor systems in organic livestock farming

1. Provide access to free range/outdoor areas.
2. Set desired stocking rate to maintain a good vegetation cover, adjusted to the animals’ excretion rate (i.e. kg N in manure per ha), e.g., 100 m² per outdoor pig kept from 20 kg to 100 kg live weight; and 360 m² or 180 m² per sow
3. Reduce nitrogen (and phosphorus) losses due to nitrate leaching, ammonium volatilization, and denitrification.
4. Reduce building costs using locally available materials.

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Animal sources/origin
- Organic animals should be born and raised under continuous organic management from the last third of gestation or at hatching.
- When organic animals are not available in sufficient number, "non-organic" animals may be brought onto a holding for breeding purposes.
- Cloned farm animals and their descendants as well as use of their products and imports of such animals and products are not allowed due to the negative effects on animal welfare and ethical concerns.

Choice of adapted breeds
- Livestock breeds must be able to adapt to local natural conditions, thus ensuring diversity.
- Organic livestock production requires the use of a number of breeds.
- Different types of forage-based livestock farms may require breeds with different characteristics.
- Some breeds may be developed to be adapted to a broad range of environments.

Breeding (reproduction) methods
- Animals must be able to reproduce independently (IFOAM website, 2000), i.e. animals should reproduce naturally to express their natural, species-specific behavior.
- Breeding (reproduction) methods to conserve adapted local breeds or their genetic improvement should not depend on high-end artificial breeding technologies.
- Reproduction technologies with the exception of artificial insemination (AI) are not allowed in the organic system, as they are detrimental to the welfare and integrity of animals and the naturalness of the biological system.

The use of AI in organic farming is allowed indefinitely.
- AI prevents the spread of transmittable venereal diseases when exchanging bulls or mating cows with the neighbor's breeding bull (Den Daas and Van Wagendonk, 1993 as cited by Nauta et al., 2001).
- Bulls are potentially lethal animals and keeping them on the farm requires special skills and practical knowledge.
- Farmers need not keep as much young stock in order to have a good choice of animals in on-farm breeding (Nauta et al., 2001).

Box 2. R&D topics related to adapted breeds and breeding methods in organic livestock farming
1. Characterize and conserve local breeds (indigenous/native genetic resources) suitable for organic production systems.
2. Identify and continuously monitor unique attributes of local breeds (e.g., genetic disease resistance and heat tolerance; nutritional values of animal food products) to justify their conservation.
3. Determine if animals which have been bred for conventional production are capable of optimum performance in organic conditions (i.e. genotype x environment interaction).
4. Validate the traits selected in conventional breeding to be relevant or comparable to organic farming (i.e. revise breeding objectives).
5. Decide to use only one breeding stock (as in conventional farming) or use certain breeding lines just in organic farming.
Organic Livestock Farming and Breeding Towards Food Security of Smallholder Farmers in the Tropics

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Minimum requirements for feed and feeding strategies in organic livestock production (Source: Zollitsch et al., 2004)

1. Pasture-based feeding, i.e. higher forage-to-concentrate ratio.
2. Use of organically produced feed ingredients.
3. Ban of synthetic amino acids, antibiotics, growth promoters or any other substances intended to stimulate growth or production as feed additives.
4. Minimize risk of GMO contamination of protein sources.

Box 3. R&D topics related to feed and feeding strategies in organic livestock farming

4. Find feed sources with higher energy to amino acid ratio needed for animals reared outdoors (for non-ruminants), i.e. energy requirements are higher for animals reared outdoors.
5. Find protein sources that would compensate synthetic amino acids that are excluded in organic feed diets.
6. Formulate high-density diets in organic livestock production (especially pigs and chickens) to reduce the gap between increased nutrient requirement and limited feed intake capacity for fibrous, bulky feed.

II. Regulations and standards for organic livestock farming

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The welfare of an animal is usually determined by its capacity to avoid suffering and sustain fitness, while animal abuse should not be tolerated. Animals should be given some "freedoms" (Farm Animal Welfare Council, 2010), namely:
1. Freedom from hunger and thirst
2. Freedom from discomfort
3. Freedom from pain, injury or disease
4. Freedom from fear and distress
Animal welfare issues are generally related to health problems and their control/treatment involving veterinary medicine and even mutilations.

Veterinary medicine
- Major animal health issues pertain to control or treatment program against parasitic infection and use of phytotherapeutic and homeopathic products from medicinal plants.
- The use of prophylactic antibiotics is prohibited. All antibiotics are discouraged except in medical emergencies and may only be used for curative purposes when an animal is so ill that its welfare is at stake.

Mutilations
- Animals may not be mutilated because mutilation compromises animals' welfare and integrity.
- Horns, tails and beaks should remain intact, but steps should be taken to prevent animals injuring each other (Hierden, 1997; Bestman, 2001 as cited by Nauta et al., 2001).
- Exceptions for mutilations (e.g., castrations, tail docking, dehorning, and ringing) should only be given when suffering can be minimized and anesthetics used where appropriate.

Box 4. R&D topics related to animal health and welfare in organic livestock farming
1. Develop new animal welfare standards for agricultural practice.
2. Develop practical and objective measures of animal welfare in relation to health, productivity, stress physiology, immunology, and normal/abnormal behavior.
3. Discover biological control of parasites (i.e. plant-derived anthelmintics).
4. Due to organic prohibitions on certain veterinary drugs, new health care protocols must be developed for each species, including research on alternative and complementary methods of disease prevention, effective non-chemical parasiticides, and preventive health care practices.
5. Develop and evaluate a Hazard Analysis and Critical Control Points (HACCP) - based management and surveillance system in organic herds/flocks to prevent diseases and welfare problems by monitoring and controlling the risk factors.

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Organic certification is an essential element for any country wishing to either export or develop its internal market.

- It guarantees not only the quality of the product but also the quality of the production, handling, processing and marketing continuum under organic management, i.e., production methods are certified to be safe and sound, as well as environmentally friendly.

- The organic label is a process claim rather than a product claim.

- It should not be interpreted to mean that the foods produced are healthier, safer or entirely natural.

- It simply means that the products follow the defined standards of production and handling.

- The organic standard does not exempt producers and processors from compliance with the general requirements of statutory regulations, such as food safety regulations, pesticide registration, general food and nutrition labeling rules, etc.

Labels or tags associated with OLF:

- “additive-free”  “antibiotic-free”  “bio/ bio-organic”,
- “cage-free”  “cruelty-free”  “chemical-free”  “country-fresh”
- “earthly”  “ecological”  “eco-friendly”  “environment-friendly”
- “free-range”  “GMO-free”  “grass-fed”  “green”  “healthy”
- “homegrown”  “indigenous”  “old-fashioned”  “native”
- “natural”  “naturally pure”  “non-synthetic”
- “not artificial or man-made”  “pasture-based”  “pesticide-free”
- “pollution-free”  “probiotic”  “produced by nature”
- “rural”  “true to nature”  “unadulterated”

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<table>
<thead>
<tr>
<th>Region</th>
<th>Province</th>
<th>Municipality</th>
<th>Name of Enterprise</th>
<th>Type of Animal Raised</th>
<th>Name of Certifying Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALABARZON</td>
<td>Cavite</td>
<td>Davao Del Sur</td>
<td>Absaroka Inc</td>
<td>Baboy damo</td>
<td>OCCP</td>
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<tr>
<td></td>
<td>Occidental Negros</td>
<td>Iloilo City</td>
<td>Fresh Start General Merchandising</td>
<td>Baboy damo</td>
<td>NICERT (NIC 1336)</td>
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<td>Negros</td>
<td>Sta. Rosa</td>
<td>Panusugan Ocampo</td>
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III. Organic livestock breeding strategies for smallholder farms

A. Animal genetic resources in organic farming

B. Conservation of adapted local breeds in organic livestock farming

C. Genetic improvement programs in organic livestock farming
Animal genetic resources in organic farming

1. Imported high-yielding livestock breeds and hybrid lines
2. Local (indigenous) livestock breeds

Imported high-yielding livestock breeds and hybrid lines (i.e. conventional breeding stock) . . .

- There are ethical concerns on the use of high yielding conventional breeding stock that may lead to the loss of diversity in livestock breeds.

- Conventional breeding animals have a very high genetic predisposition for production and therefore need high quality feed and concentrates – not always provided on organic farms.

This can lead to health and fertility problems and more intensive veterinary management (Nauta et al., 2001).

Conventional breeding stock sometimes lack characteristics which are desirable in organic systems, putting animal welfare at stake.

Modern pig breeds have very little body hair and a short snout, which makes them less capable of copeing with sun and heat in an outside run. They also have relatively little body hair and a short snout, which makes them less capable of coping with sun and heat in an outside run.

Holstein cows have long, dangerously formed horns which are undesirable in organic systems and organic livestock farming (Van Putten, 2000).

In hens, negative pecking behavior and cannibalism occur (Bestman, 2000; Kjaer and Sørensen, 1997).

Consequently, animals are mutilated to prevent the onset of such undesirable behavior/characteristics in conventional agriculture.

### Table 4. Livestock genotypes used in conventional production systems and organic livestock farming

<table>
<thead>
<tr>
<th>Farm species</th>
<th>Conventional production systems</th>
<th>Organic production systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Purebreds</td>
<td>Local (indigenous) breeds</td>
</tr>
<tr>
<td></td>
<td>Synthentic breeds</td>
<td>Traditional breeds (may include crossbreeds or composite breeds that contain genetic material from local breeds)</td>
</tr>
<tr>
<td></td>
<td>Rotational crosses</td>
<td></td>
</tr>
<tr>
<td>Buffaloes, sheep and goats</td>
<td>Purebreds</td>
<td>Local (indigenous) breeds</td>
</tr>
<tr>
<td>Pigs</td>
<td>2- or 4-bred crosses</td>
<td>2-bred crosses (i.e. exotic or local breed)</td>
</tr>
<tr>
<td></td>
<td>Purnbreeds</td>
<td>Local (indigenous) breeds</td>
</tr>
<tr>
<td>Chickens</td>
<td>Commercial hybrid breeders</td>
<td>3- or 4-bred crosses (Local (indigenous) breeds)</td>
</tr>
</tbody>
</table>

### Main Genetic Companies in Global Livestock Breeding

(Source: Gunu, 2007)

**Mother Company**

- KOEPON HOLDING (NL)
- PIG BREEDERS (PIGTURE GROUP)
- GENUS (pig)
- ABS (Global animal genetics)
- SEMEX (CAN)
- DANSEK (DK)
- HUBBARD (USA)
- ALTA Genetics (CAN)
- COMB-WITNESS
- AVIAGEN (AVIAGEN world leader in beef and turkey)
- Lohmann (huhn)
- TBW (Tierzucht Gruppe)
- MILLMAR Poultry Company (WILLMAR Poultry Company)
- PIGS Online
- TOPIGS
- POULTRY BREEDERS CO-OPERATIVE
- HYBRO
- GENETICS B.V.
- PIGS World Market Leader in Pig Genetics
- UNIPORK (pig)
- JSR Genetics (pig)
- PIUG (pig)
- WESJOHANN
- HENDRIX
- HYBRO

**Subsidiary**

- KOEPON HOLDING (NL)
- TOPIGS
- POULTRY BREEDERS CO-OPERATIVE
- HYBRO
- GENETICS B.V.
- UNIPORK (pig)
- JSR Genetics (pig)
- WESJOHANN
- HENDRIX
- HYBRO

**Table 4. Livestock genotypes used in conventional production systems and organic livestock farming**

<table>
<thead>
<tr>
<th>Farm species</th>
<th>Conventional production systems</th>
<th>Organic production systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Purebreds</td>
<td>Local (indigenous) breeds</td>
</tr>
<tr>
<td></td>
<td>Synthentic breeds</td>
<td>Traditional breeds (may include crossbreeds or composite breeds that contain genetic material from local breeds)</td>
</tr>
<tr>
<td></td>
<td>Rotational crosses</td>
<td></td>
</tr>
<tr>
<td>Buffaloes, sheep and goats</td>
<td>Purebreds</td>
<td>Local (indigenous) breeds</td>
</tr>
<tr>
<td>Pigs</td>
<td>2- or 4-bred crosses</td>
<td>2-bred crosses (i.e. exotic or local breed)</td>
</tr>
<tr>
<td></td>
<td>Purnbreeds</td>
<td>Local (indigenous) breeds</td>
</tr>
<tr>
<td>Chickens</td>
<td>Commercial hybrid breeders</td>
<td>3- or 4-bred crosses (Local (indigenous) breeds)</td>
</tr>
</tbody>
</table>

**Main Genetic Companies in Global Livestock Breeding**

(Source: Gunu, 2007)

**Mother Company**

- KOEPON HOLDING (NL)
- PIG BREEDERS (PIGTURE GROUP)
- GENUS (pig)
- ABS (Global animal genetics)
- SEMEX (CAN)
- DANSEK (DK)
- HUBBARD (USA)
- ALTA Genetics (CAN)
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- JSR Genetics (pig)
- WESJOHANN
- HENDRIX
- HYBRO
Many livestock breeds or strains developed for intensive or conventional farms still have limited suitability in organic production and may not be optimally adapted to an organic, low-input farming system (Weigel et al., 2001).

Use of higher-yielding breeds implies an economic risk, especially for resource-poor smallholder farmers, owing to these breeds’ higher input requirements such as require regular, prophylactic veterinary treatments and high-energy concentrated feeds (Bondoc, 2014).

Organic Livestock Farming and Breeding Towards Food Security of Smallholder Farmers in the Tropics

2. Adapted local (indigenous) and traditional livestock breeds

Despite the rapid industrialization of the livestock sector, many local breeds are kept by smallholder farmers and still predominates domestic animal production in many developing countries (Gura, 2008).

They are commonly regarded as local (or native) to a specific area and are raised using traditional production techniques by most village households. No structured animal breeding program exists to improve their genetic traits.

Organic Livestock Farming and Breeding Towards Food Security of Smallholder Farmers in the Tropics

Local breeds are not impediments to development.

Local breeds are socially and culturally acceptable.

They symbolize our natural (i.e. food, agricultural and cultural) heritage.

They matter as the bedrock of identity as well as life of any society and nation, especially in organic farming which also shows profound cultural sensitivity and historical-mindedness.

Organic Livestock Farming and Breeding Towards Food Security of Smallholder Farmers in the Tropics

Nowadays, more local or native breeds seem to be used (or are expected) in organic farms than in conventional farms.

Many local breeds which utilize lower quality feed are not only more resilient to climatic stress, but are more resistant to local parasites and diseases, and hence ensure healthy and stress-free animals (Yarwood and Evans, 2002 as cited by Van Diepen et al., 2007); the need for allopathic medicines and antibiotics is much lower (Chander et al., 2011).

Local breeds are and should therefore be preferred to save them.

Organic Livestock Farming and Breeding Towards Food Security of Smallholder Farmers in the Tropics

This gives better recognition of organic production, especially for multifunctional farms, which do not need high production performance but have strong connections with consumers and society (Nauta et al., 2009).

Local breeds are the basis of livelihoods and therefore can help achieve local food security objectives.

- Their development through science and technology-driven undertakings should not only be aimed towards technical excellence but must at all times, be ethical.

Organic Livestock Farming and Breeding Towards Food Security of Smallholder Farmers in the Tropics
Animal genetic resources in organic farming

Diversity of breeds

Genetic improvement programs in organic farming

This includes the maintenance of adapted local livestock by breeding cooperatives, government breeding organizations, and breeding companies especially in Europe and North America, which are now used in industrial livestock production.

However, the potential for genetic improvement has so far only been exploited to a very limited degree (Philpsson et al., 2011).

Furthermore, the adapted local breeds are easily irrevocably lost especially when they are considered to be commercially non-competitive.

Thus, maintenance of local breeds in organic livestock farming is of great importance for the maintenance of genetic diversity.

III. Organic livestock breeding strategies for smallholder farms

A. Animal genetic resources in organic farming

B. Conservation of adapted local breeds in organic livestock farming

C. Genetic improvement programs in organic livestock farming
2. Managing breed diversity
- Several actions should be undertaken to maintain breed diversity as a part of the national strategies for livestock production.
  e.g., Establish a **genetic pool of breeding stock** from which to select desirable traits in close collaboration with some breed associations and producers.

- Some basic considerations to promote the use of local breeds in organic livestock farms are as follows (e.g., Andresen, 2000; Nauta et al., 2001; Van Diepen et al., 2007; Bondoc, 2014):
  1. **Choice of adapted breed.** Local breeds must be better adapted to the local production and marketing systems and should be well-suited to free-range systems.
  2. **Continuous exposure to local conditions.** Local breeds must be continuously exposed to local conditions to maintain their unique adaptive traits.
  3. **Closed herds and flocks.** Local breeds must be maintained in closed herds and flocks.

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III. Organic livestock breeding strategies for smallholder farms
A. Animal genetic resources in organic farming
B. Conservation of adapted local breeds in organic livestock farming
C. Genetic improvement programs in organic livestock farming

- Breeding should be **based on the principle of naturalness** and should preferably take place within the organic chain, separately from the conventional sector (Nauta et al., 2005a), i.e. breeding is only organic if the breeding animals and their families are kept and housed in organic conditions.

- The main breeding strategies for improving adapted breeds in organic livestock production are **selection within a breed and crossbreeding**.

- The breeding strategies not only need to ensure farm profitability, but also to safeguard animal health and welfare, **focus on conserving genetic diversity** and promote human health in line with the principles and standards of organic livestock farming.

- **Protected geographical indications and designations of origin.** Local breeds must be linked with local marketing to account for special quality of livestock products and to protect their geographical indications and designations of origin:
  - **Protected Designation of Origin (PDO):** produced and processed up to finish product stage in a defined area whose name the product bears.
  - **Protected Geographical Indications (PGI):** produced in a geographical region whose name it bears, e.g., “Siquijor roast beef”, “Black Tiaong native bacon”
  - **Traditional Specialty Guaranteed (TSG):** highlights traditional character, either in the composition or means of production.
Organizational structure.
- Smallholder livestock farmers must form into breeding groups or cooperatives and follow a common breeding objective.
- A farm-specific breeding program operated by a community-based organization for the genetic improvement of livestock or CBOGIL (Kahi et al., 2005; Valle Zárate and Markemann, 2010) is recommended.
- It is less dependent on conventional institutional structures, ensures more diversity within breeds, and encourages the use of local breeds.

Breeding objectives and selection criteria.
- Unlike the limited number of traits in intensive or conventional livestock production, the breeding objectives in organic livestock farming may consider a broader range of attributes.
- Measures of animal performance in the selection criteria may shift from feed conversion to functional efficiency and traits related to fitness (e.g., Andresen, 2000; Nauta et al., 2001).

Breeding objectives in organic livestock production:
- Quantity of meat, milk or eggs
- Quality of products
- Lifetime performance and longevity
  - Disease resistance
  - Hardiness or robustness
  - Vitality
    - Feed intake capacity
    - Ability to utilize broad fodder spectrum
    - Ability to digest rations w/ higher forage percentage
      - Fertility
      - Mothering ability
      - Walking ability

Selection within breeds.
- The breeding organizations should help individual smallholder farmers to select and mate (sires) or animals from their own herds with the best breeding values, depending on his own individual ideas and fancies and breeding goals.
- A local selection program for improved disease resistance may be especially important for local breeds showing resistance or tolerance to certain infections.

Selection of local cattle breeds

Selection of local pig breeds
- Iberian pigs (Spain)
- Mangalitza (Hungary)
- Cinta Senese (Italy)
2. Crossbreeding systems

- Crossbreeding may be applied in organic livestock farming wherein the productivity of the crossbred offspring can increase due to hybrid vigor or heterosis.

Crossbreeding in pigs.

- Crossbreeding in organic pigs allows the use of a maternal breed with good mothering ability, good fertility, calm temperament, good lifetime performance and a paternal breed with high growth potential and good carcass performance.
- The production animals, which will not be used for breeding, are usually of the F2 generation and result from a three- or four-way cross.
- Many organic swine farms now commonly rely on commercial hybrids with large proportions of exotic breeds (e.g., Duroc and Berkshire) and local pigmented breeds.

Crossbreeding in chickens.

Crossing chicken breeds for broiler production.

- Slow-growing strains suitable for organic production systems have been developed by some poultry breeding companies (e.g., SASSO and Hubbard, France; Aviagen, Great Britain, and Cobb-Vantress, USA).
- Organic production traits include slow growing, good social and ranging behavior, robust, and lower requirements on feed quality.
- Unlike conventional broilers, which are ready for slaughter 6 weeks after hatching, organic broilers are fattened for 81 days. On average, these birds grow to 2 kg in eight weeks (Nauta et al., 2001).

- Conventional layer production commonly involves the development of lines from the Single Comb White Leghorn for white egg production and a cross of Rhode Island Reds and Barred Plymouth Rocks for brown egg production.
- However, there is limited suitability of conventional strains selected for high egg production in a cage-housing system to be used in organic production, especially now that laying batteries are phased out and disallowed because they compromise the hens’ welfare.
- In the Philippines, crossbreeding of native chickens strains such as the “Paraokan” and “Banaba” with the commercial SASSO range chickens under an organic management system have resulted in:

**Improved performance of the F1 crossbreds** particularly for ranging ability and production traits such as body weight at ten weeks old, feed consumption, and feed conversion ratio (Escobin et al., 2005).

**Crossbreeding in smallholder farms.**
- Crossbreeding programs used in large commercial farms may not be suitable for smallholder farmers because of limitations on herd size especially the number of replacement purebred females and number of desirable males of different breeds.
- More purebred sires will also be required for natural mating services due to the low usage rate and success rate of AI in the village herds.
- Nonetheless, crossbreeding may be practiced in smallholder farms and may involve: (1) upgrading, i.e. improvement of local breeds using exotic breeds and (2) composite breed formation (Bondoc, 2008).

- More purebred sires will also be required for natural mating services due to the low usage rate and success rate of AI in the village herds.

**3. Genotype x environment interaction**
- As of yet, there has been no scientific research to determine if traits selected in conventional breeding can still be relevant to and comparable in organic agriculture, especially in resource-limited smallholder farms.
- The hypothesis is that these differences do exist, especially with respect to functional characteristics such as fertility, disease resistance and behavior, and when differences between the two types of production are greater (Nauta et al., 2001).

- To avoid GxE effects, a farm-specific breeding program should require each organic farmer to select the best animals which are optimally adapted to the specific conditions of the breeder farm or station such as farm type, soil type, housing system, diet and medical regime (Nauta, 2009).
- The systems approach is recommended to decide what animals within breeds, what breeds and crossbreeding programs should be used by smallholder farmers (i.e. decision-maker) in organic livestock production.

**IV. Organic livestock farming contributing to food security of smallholder farmers**

- High-quality organically produced foods from livestock and poultry are purchased at higher prices mainly for health and product safety reasons and wider benefits such as protecting the environment and animals.

- The increase in demand for organic products is a response to societal needs that sees the current factory-farm methods are responsible for public health threats, ecological problems concerning air and water pollution, and loss of livestock genetic diversity.
There is also a growing international scientific consensus that genetically modified products and the corresponding “genetic modification” process may raise any risks over conventional breeding approaches.

Organic livestock farming contributing to food security of smallholder farmers

A. Consumer demand for organic livestock and poultry products

B. Prospects of organic livestock farming for smallholder farmers

C. Impacts of organic livestock farming on food security of smallholder farmers

D. Constraints faced by smallholder organic livestock producers

E. Recommendations

Smallholder farmers could become important suppliers of organic foods, since organic practices tend to suit the conditions under which their livestock and poultry animals are raised (Chander et al., 2011).

Smallholder farmers in resource-constrained countries are closer to organic farming systems, though largely by default, since they traditionally use few external inputs, such as allopathic medicines and antibiotics, and follow grazing-based extensive or semi-intensive production systems.

Smallholder livestock keepers have developed a vast veterinary knowledge and this is somewhat easier for small farmers to understand (Gura, 2008).

Organic livestock farming can also be used as a tool for poverty alleviation in rural areas with active and equitable participation of small farmers in farmers’ associations.

Organic livestock farming uses small farmers’ traditional knowledge of the natural environment and of the unique relationships between various crops or animals and the environment.

Organic livestock farming promotes technologies and best practices that allow smallholder farmers to earn more and protect the environment by reducing the global warming gases that livestock emit (Gerber et al., 2013).

- Improve the breeding and health of animals;
- Better access to affordable improved animals;
- Use better quality feeds and better grazing management to reduce methane emissions;
- Recover and recycle nutrients and energy contained in manure; and
- Use less energy along the livestock production chain.

With indigenous feed ingredients generated from integrated crop-animal systems, there will be no shortage of organic feed that relies on imported cereals and oil meals.

Farmers who adopt a holistic understanding of organics and are focused on local benefits such as improved soils, fewer toxic chemicals, and self-reliance in inputs rather than just on the premium price for the livestock are likely to better withstand setbacks, reduced premiums, and difficult periods especially during the conversion stages (Giovannucci, 2009).
IV. Organic livestock farming contributing to food security of smallholder farmers

A. Consumer demand for organic livestock and poultry products

B. Prospects of organic livestock farming for smallholder farmers

C. Impacts of organic livestock farming on food security of smallholder farmers

D. Constraints faced by smallholder organic livestock producers

E. Recommendations

- Food security exists when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life (USAID 1992; FAO 1996).

Four “pillars” of food security (Source: FAO, 2011)

- Food availability (i.e. food supply).
- Food access (i.e. ability of people to obtain food when it is available).
- Food stability (i.e. ensuring adequate food at all times).
- Food utilization including food safety and nutritional well being.

Organic livestock farming can be practiced by smallholder farmers to:

1. Increase production and productivity to increase consumption of sufficient calories (i.e. prevent undernourishment) and to consume animal-derived food of adequate quality (i.e. avoid malnutrition).
2. Generate income and employment,
3. Promote fair trade/marketing practices,
4. Provide adequate food at all times, and
5. Ensure food safety and nutritional well-being.

Constraints to smallholder organic livestock production

<table>
<thead>
<tr>
<th>Constraints to smallholder organic livestock production</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited amount of truly scientific research on organic technologies, especially under small-scale farming conditions</td>
<td>Promote education, research and development activities on organic livestock farming at the smallholder farmer level</td>
</tr>
</tbody>
</table>

Promoting traditional products, creating new products, improving their quality and developing markets may also be a good strategy to conserve traditional livestock breeds – e.g., European quality labels such as PDO, PGI and TSG

Smallholder farmers should be organized to meet the demands for certification, quality, and consistency of increasingly mainstream distribution channels.
3. Difficult access to adapted animal breeds

Provide access to adapted animal breeds

- A national breeding program for organic livestock farming, with a National Organic Livestock Database (NOLD) should be pursued through the joint efforts of smallholder farmers’ breeding organizations, UPLB and several SCUs to be led and coordinated by various line agencies of the Dept. of Agriculture, i.e. PCC - for water buffaloes, NDA - for dairy cattle, and BAI - for beef cattle, horses, goats, pigs, chickens, and ducks.

4. High cost of certification

Reduce cost of organic certification for smallholder farmers

- Smallholder livestock farmers must organize in order to facilitate Internal Control Systems and apply for group certification.
- Participatory Guarantee System (PGS) - locally-focused quality assurance systems which certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks, and knowledge exchange.
- Bilateral country-to-country or multilateral recognition and equivalence arrangements may be sought through the Common Objectives and Requirements of Organic Standards (COROS).

- The Philippines is the leading country in terms of producers involved in PGS (10,620) out of over 49,000 small operators currently involved in PGS worldwide (Willer and Lenourd, 2014).
- As of 2014, a total of 109 farmers organizations are using the MASIPAG Farmers’ Guarantee System (MFGS) as a way to guarantee their products, albeit mostly crop-based organic products (Dr. Charito P. Medina, 2015 personal communication).

Thank You!!!
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