

**Review of presentations and discussion and interesting debates summarized from
'International Symposium on Sustainable Animal Production in the
Tropics: Farming in a Changing World',
Guadeloupe 14th-18th November 2010**

Link to the conference webpage proceedings:

<http://journals.cambridge.org/action/displayIssue?jid=ABS&tab=currentissue>
and presentations and posters are available on: <https://colloque.inra.fr.sapt2010>

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About the conference and this report

The conference organized by INRA, BSAS, CIRAD, EAAP and WAAP was held 14th-18th November, and consisted of 3 days conference with presentations (oral and poster), and 1 day of excursion. In total, 145 papers had been submitted and 134 of these were chosen for presentation (66 oral presentation and 12 which were posters also presented orally, and the rest of the presentations as posters), including 394 authors from 67 different countries. This report serves as a travel report after my travel, with summaries and reflections based on my participation. Some issues were very technically related to one scientific area and the below summary does only summarise in brief the overall perspectives given in the presentation.



Day & Theme 1: Facing the major breeding constraints on livestock production in the tropics

Breeding for adaptability or production or both?



The key note presentation (Heather Burrow, Australia) focused primarily on tropic beef cattle breeding, and worked with 4 types: Bos Taurus, Bos Indicus, Tropically adapted Taurine, and Tropically adapted Composites. One major conclusion of this presentation was that breeding could be done parallel for adaptability and production. A number of different characteristics can be bred for with more or less success, e.g. tick count (h^2 range 0.39-0.44) and worm egg counts (h^2 range 0.24-0.57). One interesting discussion (new for me) was the concept of re-ranking e.g. sires with respect to certain characteristics, over different areas. Meaning, that even though a sire seems to carry

certain characteristics in a certain environment, we cannot always find those characteristics work in the same way in a completely different environment.

Heat stress – impacts and how to overcome it

A couple of presentations focused on heat stress and revealed interesting aspects about this issue. The key note presentation given by David Renaudeau pointed to three major key areas, where the problem can be met: Environmental modification, feeding and breeding. Environmental modification is e.g. sprinkling with water, providing shade and wetting the floor. With regard to feeding, the timing of the feeding, water, and various vitamins and minerals will help the animal to overcome heat stress. Regarding breeding, issues like in poultry to reduce the feather coat, and local breeds are definitely better than most exotic breeds. Another study conducted on Trinidad and Tobago, stated that local production generally in the Caribbean area account for about 20% of the total demand, most of the systems are sustainable and there are also commercial. The systems are low input forage based systems often with multipurpose trees, and including adapted animals. Various grass types, including elephant grass chopped for the animals. In this study, the results showed that there is breed effect on rectal temperature. He concluded that even adapted animals still can decline in performance in heat, and improved management must be introduced.

Thought provocation: how do animals fit into the environment and why?

One short presentation given by Dr. Silanikove (on photo on page 3) focused on the abilities and characteristics of animals in relation to their surroundings. It gave examples regarding heat stress but generally gave a lot of illustrations on how centuries' selection and development of 'natural characteristics' (natural for those animals in exactly that environment) influence and can explain their survival and ability to stay healthy in their sometimes extreme environment. One of the exciting examples were how 5 small (20 kg) adapted goats could actually produce much more and get more out of their feed than one big (100 kg) goat which was not adapted to e.g. desert environments. He gave examples of how small ruminants



could store water in the rumen for 3-4 days until they could get water again. It raised issues which are very important in terms of sustainability, and was contrasted to e.g. one of the other presentations, which focused on import of Brazilian Girolando goats to Benin, and where the production seemed to call for heavy medicine use (so far only in a big experimental herd, which also explains the medicine use, since the animals were costly and

nobody dared to not 'cover them in medicine'). A presentation in the afternoon touched the issue also, like bringing Dorper sheep from South Africa to Virgin Islands: although they were adapted to hot climate, they were still not suited for humid heat, so they needed to be bred into the local breeds if used. This combination of presentations in addition to the presentations on heat stress opened an interesting issue of always remembering why the local or adapted breeds were developed like they were, sometimes over centuries.

Breeding for resistance

Some presentations focused specifically on breeding for resistance to different diseases, in particular helminth infections (strongylus in small ruminants), and there are many benefits of this, in addition to generally more healthy animals and less use of medicine. Giving an example, $H^2 = 0.3$ for resistance to intestinal parasites. However, it takes time to build into breeding schemes, and it requires some technology and infra structure. Often it does not make sense to talk about resistance, because that is not a evolutionary stable strategy. Many parasites change and other breeding goals influence as well. We talk about tolerance and resilience instead. There is a very big variation, and there is heritability which is quite

high. There is not necessarily an antagonism between resistance and production, but it probably only has a background in very different selection strategies. Integrated disease management controls, were breeding, management, nutrition and other factors may all play a role.

Disease handling using breeding as one of the methodologies

Emerging diseases are groups of diseases which OIE defines as new or recently recognized diseases, and



they have increased over the last couple of decades. They are zoonotic and/or vector borne diseases, and the risk is very much higher in tropical and sub-tropical areas. The population at risk is also the most vulnerable and poor population, and there is a big growth of human population, urbanization, climate change, and a part of a global market which also means global risk. 70% of poor people rely on animal production and there is an increase of 3% per year for animal products in the so-called developing countries. The susceptibility differs over production systems, e.g. zoonotic are more in smallholders with tight human-animal contact and pastoral systems there is large distance mobility. Actors along the chain:

Production => distribution => processing => retail are different, from farmers to governments and traders.

Day & Theme 2: Local feeds, values and strategic use

The day started with a presentation about the scene for animal feed and human food systems. Over the last 40-50 years there has been a sharp increase in meat, milk and eggs, especially in poultry meat and pork (increase 30% over the last 25 years). In Europe it is about 73 kg per capita per year, where it is 124 in America, and 7 now in South Asia and 15 in Africa. The population is growing, and the demand is increasing e.g. with increased urbanization. Higher income gives also high value protein. Most of the feed consumed



Felix Ojeda Garcia from Cuba in conversation with Nissim Silanikove from Israel

by animals is cereal (60%), and 10% by-products of cereals. The soybean consumption is increasing dramatically, and there is a shift to monogastrics, and there are more intensive types of production. Food prices grew much during the late 2000s with the high increase in oil prices, and the price of the transportation has also been increasing. Yield has increased tremendously. High demand for livestock products, but we have a scarcity of resources and supply constraints. We have to explore a range of by-products, and we have to choose how we will produce livestock products. The discussion touched the sustainability of the products we have and a shift towards ruminants and small ruminants which are much more suitable for many systems. We should invest in ecological intensification in our systems. Another point is that feeding concentrate to animals also results in a less nutritional quality of

the human food. In the tropics, ruminants are essential and play an important role, and after all in the complete picture they do not contribute much.

Focus on local feed production

Local feed was in focus. One presentation (Carole Régnier) focused on local forage and high protein feeding of pigs, and had included cocoyam, sweet potatoes, cassava and erythrina leaves. She had so far observed big differences between products which could be related to maturity at harvest and other factors, so in conclusion it can be said that it is not easy. In another presentation (B. Kambashi) looked at the possibilities

in DR Congo to feed forages rather than sources of feed which compete with humans. Unconventional feeds were identified and showed that pigs lived well from forages, because it had a good nutritional and digestible value. Leuceana and Cassia leaves were suggested as a good protein source for village poultry by B. Kambashi. A very 'special approach' was to feed dried earth worm meal to poultry as a finishing diet (J.P. Nguekam), and he had found studies where earth worms were used for monogastrics. However, it demanded some work to breed them and dry them, but this can be done even in the sun. Earth worm can transfer diseases, and it was also discussed if there was a risk of heavy metals.

Pasture and grazing in the tropics



Maryline Boval (on the photo) illustrated how pastures are extremely important in the tropics, and 70% of people who are extreme poor live from their small livestock farms, and 24% of the beef meat is produced on pasture. The intensity of grazing improves the diversification of grasslands (referred to Congolani et al. 2005). Animal production from pastures is a main way of economically utilize vast areas with low or minimum C foot prints (considerable storage - about 100 tonnes/ha C). It is a source of many products, and it reduces evaporation and degradation. Management strategies include stocking rate, fertilization and mixed grazing, and depending of course of climate related factors. When evaluating the grasslands, it is

important to look at the live weight gain. Since digestibility and intake is not correlated at all, so various sward characteristics influence intake and digestibility of the ward, and the productivity is a function of digestible intake. She concluded that tropical pastures have great potential for productivity and have a lot of other functions. Both intake and digestibility needs to be measured, and there are potential for innovative strategies and need for meta-analysis. Dixon presented issues of measuring feed intake using NIRS, which is useful when grazing hundreds of hectares, and can prevent N-deficiency. Benvenuti et al. explored the use of pasture in an experiment in Argentina, and concluded that steers heavily grazed preferred species and pastures should be used 60-70% in order to also eat less preferred species. The animals can get enough up till the utilization level of 74% of the pasture.

Alternative feed strategies

Livestock farming faces many challenges, and solutions to some of them could be to reconnect livestock to the land (referring to Naylor et al. 2005) and to relate livestock to urban developments. Focus on trees, grasslands and legumes, food wastes, by-products, crop residues and new technologies. A Cuban example (Felix Ojeda Garcia) pointed to the potential to alternative types of silage, e.g. including citrus bi-products and trees which are used in the feeding widely over Cuba. Joseph Sikosana (on the photo at the left) spoke



about how to implement the use of local and indigenous trees and plants as feed for goats, which had been found very difficult on-farm and much more easy in an experimental farm. He concluded that wild fruit is an easy and useful source of feed, and pods are very valuable as food additives and to improve poor forages. Tannins can be inactivated by wood ash, and a Mexican team (Esquivel-Mimenza et al.) had made experiments also confirming the potential of foliages and pods. Hadja Sanon gave a presentation from Burkina Faso, where about 85% can be covered more or less from natural pasture, and 11% by crom residues, and the rest from other sources. In this study, mango peels and seed kernels were introduced into animal feeding. In the country in 2008,

71.000 tons of mango were produced, and the waste constitute about 35-40% of the weight, and they are hand peeled. It normally ends up as compost, but here, the possibilities for commercialization were investigated.

A sustainable system based on energy recirculation and natural energy and rain harvest

Lylian Rodriquez (lylianr@utafoundation.org) gave a presentation on behalf of Thomas R. Preston about a multi-criteria evaluation of biomass resources for farming. It was based on sun energy and food as well as fuel sovereignty, and recycling of all waste. It was a whole model of recirculation, including sun energy and rain harvesting (1000 cubic meters per year), which has stopped them from taking water from the stream. They are members of an organisation 'El Comun', which has more than 30 farmer organizations. Cocoyam is the protein source for the pigs and silage is made from it, and there are plenty of sugar cane; they fix N and are used as juice to feed to pigs which replace soybeans. They also produce 'wild' sun flower which has very high potential as feed source. Goats are very good at separating plants so that they eat the nutritious leaves and leave the stems for biomass for the energy production, where 1.2 kg fibre will give 1 kW of energy. They get the by-product which is bio-char, and that gives a negative carbon-foot-print, since the bio-char is going back to the soil, and it has shown to have a tremendous effect on the growth e.g. on the maize, and generally a very good root development and improved water capture capacity. Calculations showed a very well balanced energy circulation, and they can also produce 15.000 US\$ of energy just from this farm. The only weakness, she could think of was the labour and that it needed training. The role of the animals in the agro-forestry system is important. The pigs are very important for the gas production, but the farm also has other animals such as rabbits, guinea pigs, poultry, horses etc. Animals contribute to reach equilibrium with the energy used and produced in the farm.

Day & Theme 3: Sustainable and integrated livestock systems in the tropics

In an integrated system it is also important to include the human aspects

The farmer will always try to reach some goals and will always have to interact with an environment with opportunities and constraints (for tropical livestock systems referring to Dedieu et al., 2010). Giselle Alexandre took the starting point in 4 case studies. The first case studies were in Neo-tropical areas (South-America incl. Carribeans). Domestication of animals include like fish, paca and semi-intensive pig farming. The second case was the UTA farm which was also introduced on the day before. This is also an example of a highly integrated system with goats, cattle, sows, bee hives, rabbits, fish and hen. It is very important to be 'living the system', and be aware that they provide the solution of some of the world crisis. In Guadeloupe, a multi-ethnic background makes the goat very important for the hindu ceremonies, and it is also used in the national dish 'Colombo' which is a curry dish. Goat skin is used for drums which are very important for e.g. carnivals. Haitian NGO called VETERIMED created in 1991 to contribute to national development in the rural sector. About 700.000 farmers are poor but deliver 90% of the animal products for the population. In other words, we have to do with systems that represent diversity and multifunctionality. There are no farm that cannot make a 'whole system'. Non-productive characteristics also should be taken into account. A question is how to measure the success? Criteria are also environmental variables as well as profitability. Sanitation is quite controlled e.g. in the Colombian case, like the pig manure goes through a bio-processor, and the goat manure goes into the compost.

Domestication and heritage breeds

William Mollineau presented a study of the agoutis, which is n edible rodent and the meat is a delicacy in Trinidad and Tobago and 4 x price of pork. This is a case of animal domestication (Gilmore 1963; Mason

1984), which was driven by the demand for meat. During many years the animal has been hunted. One criteria of domestication is that the animal is forcefully kept and that there is a dependency. It should also breed in captivity, and in the research station there is an average litter size of 1.96. In conclusion, the agouti is on the verge of domestication. The Moka cattle was also discussed by Michel Naves in the Reunion Island. This breed is a zebu type introduced from Bali, Madagascar and India; today 600-1500 heads (from 35.000 heads before). Moka is normally used in extensive rangeland production and with no food supplement nor management (e.g. there are bulls in the herds, and no other reproductive management). It is a resistant breed and it is tolerant to live weight changes over the season. They have mapped the genetic pattern and have compared it with cattle in the Amsterdam Island, Guadeloupe Creole and Charolais, and also found that this breed is close to e.g. African zebu and taurin. In conclusion, there is no doubt that it will be a loss for the future to lose genetic material.

The Haitian 'Let agogo' program

In Haiti there is a great potential for developing milk production, since they import for 40 mill Euro – the next biggest post after rice. Therefore the VETRIMED NGO has introduced the 'Let agogo' program, and they want to increase milk production and work with smallholder dairy farmers. They focus on water and hygiene, as well as veterinary care and technical training. They are also establishing micro transformation units (22 up to now) where farmers sell their milk, and they supply schools with milk. In the beginning, they did not have any support from the Government, but through the school programs now they start to help. They also face big problems like drought and the production level is not easy to reach especially not equally over the whole year, and the appropriate packaging is also a problem of resources.

Mixed livestock-crop systems

Mario Herrero from ILRI lined up the scenery for the world livestock sector. Things are changing, and it creates changes in production systems in the developing world. E.g. in West Africa, over the past 40 years the farming has changed from pastoral systems to mixed crop-livestock systems. Urbanisation and increased demand for livestock products (Rosegrant, 2009) will change the way we produce food in. Water scarcity is threatening, and the climate change (Thornton et al., 2006). A framework for analyzing the system can be the Millenium Assessment, MEA 2005. Some of the conclusions are derived from different scenarios (Herrero et al., 2010, Science). The current models of 'highly efficient models' for farming and they are not always so efficient; depends on how one calculates. All animal species will increase in numbers. One of the later speakers (Valerie Angeon) spoke of territorisation of food production. In the afternoon session, Katrien Descheemaeker presented a study from Ethiopia about the water productivity (Peten et al. 2007 and Deschemaeker et al., 2010). In the drought season are there great limitations for feed production and therefore high mortality. Energy for walking takes 2-3 times more than energy needed for milk production; they walk around 9 km per day. One solution could be water harvesting in the homesteads.

Mixed farming systems require mixed farming research

We have richness in animal resources and feed, and we have adapted species and breeds. In the tropics there are so many sources of feed and food. Also the residues can be used, and we do not use the resources that we have. The research sector must be involved in this, and they must develop methods which we can use under these circumstances. Eliel González-Garcia raised these issues and called for research approaches, e.g. through working with working with on-farm-development, and accept e.g. pilot-studies as research. We need to convince



the professional community – e.g. to take the potentials in mixed farming systems serious. We need integral and multidisciplinary approaches. Researchers also need to be as ‘multiple’ as there are particular circumstances to work under. Farmers must be integrated in these approaches, and really use multi- and interdisciplinary research. Experimental fields can be converted into ‘pilot systems’. All approaches much emphasize the farmer leadership. The presentation of a current project continued to address this: a project across Cuba, Guadeloupe and Martinique, presented by Yann Alexandrine. In Cuba it was a 32 farm study and assessment of on-farm biodiversity. 122 species of plants were identified (human and animal nutrition, medicine use etc). The conclusions (e.g. that goats are most well integrated in systems of other orientation) of this is that the results are also useful for other farmers and researchers.

Integrated tree crop animal systems

Dr. Devendra from Malaysia (at the left on the photo below talking with Gary Garcia from Trinidad) talked about crop-animal systems, and touched the issues of the search for efficiency. The backbone of production



is the mixed systems, and they produce most of the animal products we consume e.g. in South Asia. He mentioned two categories of systems of animals + annual cropping and other systems combining animals and perennial cropping. He talked about the oil palm production environment. There are many beneficial interactions between the animals and the surroundings, from shade to exchange of resources in terms of feed and manure. We need a coherent and clear policy on integration, increased awareness, inter-agency collaboration &

involvement of major stakeholders and stimulate incentives and create a framework for choosing the animals involved.

Grazing is not always easy

Javier Mata gave a key note lecture on grazing. Grazing especially done by small ruminants is a reason for degradation and desertification. He talked about equilibrated and non-equilibrated situations inspired by Bermejo (2005), and a lot of factors have to be taken into account, e.g. the different eco-systems response to the same action. Vegetation changes are the basis of methodologies, e.g. indicators like floristic composition, vegetal cover and others (Fuhlendorf et al. 2001) and a long term monitoring. The problems are global but the solutions have to be local. One of the demonstrations which were part of the research was a small fenced-in grassland, where the grass grew, and around it, it was completely destroyed. Regarding the social aspects they carried out PRA. They also made a group visualization of the information (Cornwall et al. 1994), and making sociograms, and finally ranking and voting what to do.

Tropical grassland and GHG emissions

It is now 14% and have increased 70% over the past decades. Carbon sequestration (IPCC 2007 and FAO 2010) represents 90% of the mitigation potential in the agricultural sector. 25% of the world's ruminant stock is in the tropics, and they contribute to deforestation because of expanded pastures and feed crops. In a forest like Amazonas, 30% of the carbon is under ground. Carbon is also in the biomass in the forests, up to 300 ton/ha. The dynamics whether soil can continue to sequester carbon depends on the pasture management. Many questions are asked regarding the storage of carbon. Soil carbon stock can be increased from 65 t/ha to 100 t/ha in tropical situations, so that until 1 t C/ha/year, by increasing inputs (e.g. increase biomass) and reduce loss (e.g. avoid cutting grass).

Knowledge systems and learning

The presentation by Javier Mata above emphasized the learning and farmer ownership. Valerie Angeon had studied farmers' perception and reactions related to local breeds in the West Indies. The French West Indian man gazes himself as a stranger and has externalized himself and taken European values, which can be called the creolization. They recommend that economic success stories should be built on basis of local products, which will improve the accordance of the discourses and actions. In addition, local markets should be secured, and to use, institutionalize and diffuse the term 'creole'.

Day 4: Excursion

The excursion on the fourth day went to the research station connected to INRA on the east island, where we were introduced to the activities on the station, among others a trial with feeding of goats for reduction of parasites. After this we went to two inter-connected integrated farms. The farms were integrated in the sense that there was multiple produce production on them, e.g. different animal species and plants, but there seemed to be much left to work on in terms of creating optimum synergy between the different enterprises and parts of the farms.



The INRA research station where one of the trials were to test parasite treatments in terms of feeding.



Life seen from the perspective of a buck at the breeding station. There was not much 'sustainability' in relation to e.g. animal welfare and naturalness as well as humaneness.



One of the creole breeds of cattle. At the right an illustration of the huge amount of chalk on the east island, where on the west island, there is the opposite problem: acidity, so chalk is brought there.



At the left castor trees, and at the right the goat herd belonging to one of the farms.



The two farmers explaining the farming systems at their farms.



In terms of animal welfare and access to natural behavior and human care, there seems to be some room left for improvement (left). Pigs were kept in the far back (bottom of photo at the right) and without wishing to offend anybody, the general impression was that the farm could have been more well maintained.