

**Training and human capacity development in Australasia, S. and S.E. Asia and sub-Saharan Africa.**

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**ABSTRACT:**

Delivery of tertiary training in Australia and New Zealand is constrained by the university funding and regulatory environment that leads to a less than ideal hybrid of North American style undergraduate training coupled to UK style research-based PhD. Strong industry, research and training sectors, however, provide steady demand for graduates, provide relevant and high-level PhD research opportunities, and supports life-long on-the-job mentoring and learning, leading to high levels of expertise. Training opportunities in Asia and Africa are much more limited, and face a wide range of challenges to delivering high quality and relevant training outcomes. Shortage of career opportunities limits the support available to research training and the development of high levels of expertise through mentoring and experience gained post-qualification. There are opportunities to improve human capacity through establishment of regional platforms in Africa but less clear in Asia.

**Keywords:** tertiary education; mentoring; professional experience

**Introduction**

This paper outlines the current status of training and human capacity to support livestock genetic improvement in Australasia and Africa. Although a substantial amount of information for Africa was gathered through structured processes, much of the information and opinions presented here are based on personal communications plus the personal observations and interpretations of the authors through their various activities in these regions. In this overview we first summarize the situation in Australia and New Zealand, where the situation while not ideal generally supplies the livestock genetic improvement sector with well trained professionals. We next summarise the findings made from a structured process looking at human capacity in Africa. In this process recommendations for action are embedded in the findings. We next provide a brief overview of South and South East Asia, based entirely on personal observations and discussions with a small number of personal contacts experts in several countries.

**Australia and New Zealand**

Livestock genetics and genetic improvement are not offered as specialized degrees at the undergraduate or Masters level in Australia and New Zealand. Several universities offer units in genetics that have some content on livestock genetics and some additionally offer a unit specifically on livestock genetics and genetic improvement as part of a broader degree in agriculture, animal science, veterinary science or other undergraduate degree. Similarly it is

possible to undertake a course work or coursework plus research Masters degree that includes one or two units in livestock genetics. But in no case does this approach the degree of specialization and level of training offered by some European and North American programs. PhD programs in Australia and New Zealand are research only degrees. Students can sit in on coursework units but regulations governing university funding in Australian prohibit PhD students from registering for coursework units. Students can, theoretically, obtain scholarships to undertake a research Masters degree but in practice very few scholarships are available. Coursework Masters degrees are fee-paying degrees for which scholarships are not available. Consequently, few students in Australia and New Zealand opt to follow the North American model or European Bologna model; i.e. to take a specialized Masters degree prior to undertaking a PhD (during which additional coursework specialization is also undertaken in the North American model). The Australian and New Zealand model can be superficially classified as a North American style, relatively unspecialized undergraduate degree followed by a UK-style, highly specialized, research only PhD. This is far from ideal, and provides substantial challenge to students and supervisors to ensure that PhD students obtain the breadth of theoretical expertise they need to undertake high-quality research. Given that livestock genetics is a niche subject, with insufficient demand to support a specialized undergraduate degree, the current university funding and regulation models are likely to inhibit a better system emerging in the foreseeable future.

The situation post-PhD and post-Masters (for the small number who do take livestock genetics units at the Masters level) is much better. The livestock genetics industries in both countries are vibrant, generating a steady demand for graduates in industry. A strong research and development sector also creates a steady demand for graduates. The networks among people working in livestock genetics industries and the research and training sectors are strong. This situation supports post-graduate employees in the livestock genetics sector to receive the strong mentoring and continued experience that are required to become over time experts in their field. The Cooperative Research Centres (CRCs) in livestock (dairy, beef, sheep poultry and pigs) have played a strong role in linking research to industry and supporting Masters and, particularly, PhD training in livestock sciences, including genetics. The CRCs bring their students together across the CRCs for an annual conference and training workshop, and they have active programs to link students to industry and give them industry experience during their degree program. The large majority of their graduates (more than 150) have developed successful careers in livestock industries, research and/or training.

### Sub-Saharan Africa

An assessment of status in sub-Saharan Africa was made based on: a) a workshop with over 200 participants, held at the All Africa Conference on Animal Agriculture, in Addis Ababa, November 2010; b) a subsequent pan-African email discussion involving 676 recipients seeking answers to structured questions plus open discussion. While based on the various discussions and opinions expressed by others, the inferences in this paper reflect the interpretations made by the current authors, based on their personal experience and observations of the situation in Africa. The key finding of the assessment of capacity status in Africa are as follows. An issue discussed at the workshop that came across strongly was the recurrence of internationally funded, and on occasions nationally funded, livestock genetic improvement projects that engaged with and raised the expectations of local communities but then collapsed when funding ran out. There was strong criticism of the leaders of such projects that they gave insufficient thought to how to make the project sustainable once the funding and/or their personal interest ran out. Several past and current projects were cited. This indicates that expertise in *sustainable livestock genetic improvement* in an African context needs to be built both internally and externally to Africa.

The size of the mailing list and the number of people signing up as having interest in livestock genetics, coupled with the fact that we know that many professionals in countries such as Kenya and Nigeria did not participate in the e-discussions, indicates that there are many hundreds of professionals with formal qualifications or other experience in livestock genetics in Africa. For example, the Nigeria government expertise register lists 72 experts in livestock genetics, the vast majority of whom have Masters degrees and 31 of whom have PhD. This compares to 2 active Nigerian participants in the email discussion group. While the total number of livestock geneticists remains low in comparison to developed country levels, it suggests that lack of trained personnel is not the fundamental cause of the very limited activity in and impact of livestock genetics. In other words simply training more post-graduates in livestock genetics (necessary as that is) will not in itself solve the problem.

Post-graduate training opportunities in animal breeding/genetics in Africa are very limited. Only a few universities have post graduate programs, and these universities have less than optimum capacity (expertise and facilities) to deliver high quality MSc or PhD training. There is need and potential to innovative regional graduate programs that harness collective capacities of multiple universities. Such an initiative could be linked to advanced research institutes/universities in the developed world.

In the universities offering post-graduate training in livestock genetics, there has been limited enrolment. Genetics/breeding is considered to be a hard subject, and is suffering disproportionate lack of interest within the general decline in student enrolment in agriculture. There is need to make the field more attractive, at least in part by bringing in

new and appropriate technologies and new, more exciting, teaching and learning approaches.

Over the past 5 to 10 years, very few MSc and PhD fellows graduating from local universities have entered industry. The cause is a combination of the two problems above and a lack of industry positions for career development. There is a generation gap emerging which will further reduce the ability to develop the next generation of well qualified personnel in this area.

Many of the good graduates in livestock genetics (whether trained at home or abroad) have moved rapidly into administrative positions with limited opportunity to contribute technically in their areas of expertise. In general there is a major problem that the incentives to the individual once they are employed do not encourage them to develop a strong career in research or in application of livestock genetic improvement.

Many of those who train abroad do not return, or return only to leave again, or stay to do something else – not directly related to their training. Very few of the African diaspora are involved in collaborative projects back in their countries or otherwise in Africa. The diaspora have significant potential, and could be tapped into as part of a regional capacity development initiative. The diaspora could become directly involved in mentoring and capacity development and/or act as catalysts to get their institutions more broadly engaged in such support.

Cross-institution collaboration, within and between countries in livestock genetics is extremely limited. There remain a number of barriers and disincentives to developing strong collaborations within and between countries. In contrast to this, sub-Saharan Africa has a continent-wide level of cohesion and shared vision, facilitated by use of a limited number of shared languages, which is not seen in other regions, such as Asia. A number of well functioning pan-African institutions and mechanisms for collaboration have arisen in recent decades. This indicates that there are good opportunities to establish regional or pan-African institutions and collaborations to promote more effective training and delivery in livestock genetic improvement.

Some training and research programs in universities and national agricultural research institutes (NARIs) have remained very traditional, largely ignoring emerging technologies, while others have embraced new technologies with little thought to practical relevance in their own contexts. Similarly returning nationals who have trained overseas bring back thinking and approaches suitable for developed countries that are not necessarily suitable for their home country, and they do not find institutional contexts that can guide and nurture what they have to fit better and become valuable to the local livestock context. There is need for more innovation-based training than the traditional pedagogic approaches.

A fundamental difference between successful livestock genetic professionals (researchers, industry, extension, etc)

in the developed world versus Africa is that after receiving their MSc or PhD, the former generally receive strong mentoring and continuous 'learning-through-doing', while there is limited or no opportunity to gain deep experience and high-level mentoring for most African graduates of livestock genetics training. A well thought through platform for building capacity in Africa is needed. Such a platform will need to include processes that provide strong ongoing mentoring and opportunity to gain deep experience through professional practice, whether in research or application of genetic improvement. This life-long-learning, mentoring and coaching will need to pay particular attention to adapting knowledge and technologies to finding solutions that are sustainable in the local contexts. The mentoring scheme should include mentors from outside the region, including the African diaspora. But given that many problems result from poorly considered advice of external experts, many of the external mentors and coaches will need coaching themselves on how to adapt knowledge to meet the needs of Africa.

In developed countries very few PhD graduates would, immediately after graduation, be considered competent to design and then operate complex genetic improvement or genetic evaluation programs. This expertise is gained through further experience and mentoring. The low opportunities for gaining further experience and on-going mentoring in Africa means that only in a few countries is there likely to be the human capacity to design and then operate genetic improvement programs that are optimized to be sustainable and to meet local needs. In addition to gaining experience and mentoring there will likely be the need for external assistance in design and operation of genetic improvement procedures (e.g. database development and estimating genetic evaluations) and transfer of that capacity to the point where countries (or regions) have the internal capacity to operate independently.

Infrastructure capacity appeared to be quite widespread but generally of poor quality and most often little used. The active participants in the discussions came from a limited subset of countries in Africa and we feel that the relatively low level of infrastructure identified in the discussions is in fact an overestimation of what is available in most African countries.

Only those countries with large and active livestock genetics programs are likely to be able to support the physical and human capacity for livestock genetic improvement. It will be important when attempting to build the capacity for livestock genetics to maximize opportunities to share capacity across countries and regions.

#### **South and South East Asia**

Correspondence with colleagues in several countries in South East Asia revealed a similar tertiary training structure to that in Australia and New Zealand, with a small number of universities offering some coursework in livestock genetics and genetic improvement as part of broader

agriculture or veterinary undergraduate or Masters degrees. Opportunities to undertake a PhD in livestock genetics appears to be very limited. A substantial proportion of PhD holders obtained their PhDs in North America, Europe or Australia. Overall, the extent of training in livestock genetics at all three tertiary education levels is at a very much lower level of activity per capita than in Australia and New Zealand.

In contrast to Australia and New Zealand the level of industry activity and supporting research activity in livestock genetic improvement is very limited. This means that industry and research career opportunities are limited and those that do find career opportunity receive much lower levels of mentoring and on-the-job learning to help them attain the highest levels of professional expertise. This also produces a vicious cycle whereby those teaching livestock genetics typically do not have the advantage of leading extensive research programs and are not well connected to industry needs and latest developments. Students consequently do not have the advantage possessed by Australian and New Zealand students, who are (generally) assured of having access to the latest thinking and results and receive training in methods and issues of current relevance to industry. At the PhD level, students in S.E. Asia generally lack access to well financed research programs and/or large-scale data bases that are the engine of much of livestock genetics research and development.

In India, the situation appears to be broadly similar to S.E. Asia. A particular problem expressed by several colleagues in India is that during the past twenty years or more, most of the tertiary training and research in livestock genetics has been focused on laboratory-based genetics. The claim is that this has produced a generation of livestock geneticists who are not well equipped to design and manage, or undertake research into livestock genetic improvement programs. India is a large country with a very large human population, a large and rapidly developing economy, continued central importance of the agriculture sector, and a large diversity of livestock breeds and systems. The opportunity for livestock genetic improvement to make large contributions to economic development and food security in India are particularly large. Thus, if the claimed shortage of trained specialists in livestock genetic improvement is correct, it is likely to be a bottleneck that will restrict the extent to which livestock genetic improvement will contribute to economic development.

The level of detail gathered here on the situation in S. and S.E Asia is too low and its accuracy too uncertain to be able to draw firm conclusions about capacity needs and possible solutions. But superficially it looks as if the situation and needs in many countries are similar to those in much of Africa. Language, cultural and political diversity will, however, be serious obstacles to developing regional solutions in Asia that are similar to those that have been suggested as having potential in Africa.

### **Conclusion**

The economic and regulatory frameworks within which Universities work in Australia and New Zealand hinders emergence of a more effective tertiary training system for livestock genetics. Nevertheless the system as a whole provides strong support to the development and maintenance of the human capacity required for a successful livestock genetics industry along with strong research and training sectors.

The situation in much of Asia and Africa is a “chicken and egg” conundrum. Poorly developed livestock genetic improvement industry and research sectors provide limited career opportunities for graduates trained in livestock genetics and also limits the quality and breadth of training available to students interested in livestock genetics. The shortage of well trained professionals is one limitation (among many others) to the emergence of a better developed livestock genetic improvement sector. In Africa there appears to be opportunity to build regional and/or pan-African collaboration to enhance the capacity for training in and delivery of livestock genetic improvement. Regional solutions are likely to prove more challenging in Asia.