Evaluating the barriers to effective breeding and husbandry in communal alpaca herds in Pucara, Peru.

Report

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1. Introduction

During the month of December, I was given the opportunity to work with the American NGO The Nunoa Project in the Puno District, and the Llama Pack Project in Urubamba, Southern Peru. The Nunoa Project is affiliated with the Chijnaya Foundation and CONOPA a Peruvian NGO. The aim of the project was to provide veterinary support to subsistence alpaca and llama farmers and local communities in southern Peru.

1.1. Context

Pucara is a small town in the remote region of Puno, southern Peru situated around 2hrs north-west of the Bolivian border.
Alpaca's have been farmed traditionally in the region from before the Inca times and culturally great value is placed upon them. Around 7,000 people live in rural countryside and on farms. In the Pucara region, the main crop is animal fleece (also sheep and llamas) with a much smaller percentage being sold for meat. Nationally 22.7% of the population live under the national poverty line and this figure is higher in rural areas. The under-five mortality rate is quoted by the World Bank as 16.9% in 2015 and the remote location means that access to medicines, veterinary care and trade is often very limited.
The level of poverty that many alpaca farmers and their families face is severe. Even with a medium or large herd many farmers reported struggling to afford food, medical care or education for their families and are also unable to invest in extra nutrition or health care for their herds.
Many farmers struggle commercially as they have poor access to the market and often lack negotiation power.
In this context it is easy to see why many communities in the region lack the resources and education to fully implement herd health plans as well as have autonomy over their livelihoods and futures.

1.2. The Nunoa Project

The Nunoa Project has been working in the area for almost 15 years and has in this time formed partnerships with local governmental organisations (Chijnaya Foundation) and CONOPA a Peruvian NGO.
The Nunoa Project is a charity that offers veterinary support for Peruvian alpaca farmers and provides educational and research opportunities internationally. They run well attended workshops for farmers to help improve husbandry and provide the technical support for farmers to set up elite breeding programmes to improve the genetic potential of their alpaca herds. Ultrasound is used for accurate pregnancy diagnosis and a vaccination programme against coccidiosis has been launched in Jan 2015 for participating communities and farmers. On each farm individual animals are also health checked and medical care is provided accordingly.

2. Methods

Data was collected during informal questionnaires with a translator who translated from Spanish or Quechua the local language to English. Farmers were invited to provide data on different health parameters during routine veterinary visits. Semi-quantitate data on the impact of these diseases was also collected.
Retrospective data collected by The Nunoa Project was used. This included: Body Condition Score, age of animals, herd size, fertility exam for males, pregnancy diagnosis, results of any testing for diseases and health status.
An analysis of cria mortality rate in comparison to 2016 was planned but was not possible due lack of recordings and tagging numbers (see section 6).
Interviews with local Government vets, animal health technicians “technicos”, local charity employees and market vendors all formed a semi-quantitate representation of the situation which I have tried to portray in this report.

3. Livestock Systems

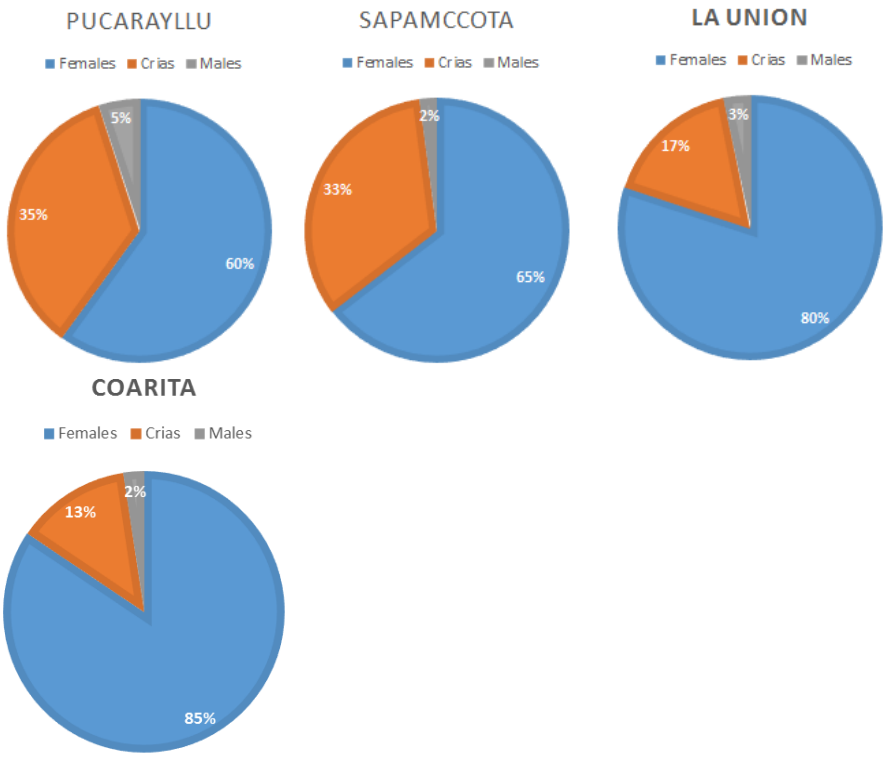
We worked with five communities, La Union, Sapamccota, Pucarayllu, Alto Pucarayllu and Coarita. In all cases, the communities had approached The Nunoa Project and requested technical advice and assistance.

3.1. Management Systems

a) Herd Structure

In the UK, the total number of alpacas has increased since 1992 with an average herd size of 1-5 alpaca being the most common demographic (*Davis, et al,* 1998, D'Alterio, *et al, 2006).* In the Pucara region, up to 500 animals are kept in one herd farmers herd with approximately 200 females breeding each year, however accumulated community herds can be much larger. However, herd size and structure can vary significantly between communities and farmers (see Fig. 1), with some keeping as little as 20 alpacas. Often community structure and demographic changes as a result of local politics and new leadership - this can also lead to changes in herd ownership and structure.

Fig. 1. Different alpaca herd structures in community farms, Pucara, Peru.



Generally, animals are herded in a cohort of many different animals including alpacas, llamas, horses, donkeys, brown Swiss cows and sheep (Fig. 2). The equids and cows tend to be tethered whilst the camelids and sheep are herded pastorally throughout the day and corralled at night.

Fig 2. Typical landscape showing variety of animals herded together including sheep, alpacas, llamas, donkeys, cows and horses.

In some herd breeding males are kept and in others male animals are slaughtered for meat. Most families will slaughter 2-3 alpacas/year to supplement their diets as one of their few sources of meat. Other farmers will castrate “tui” males (two-year-old animals) and keep them with the main herd.

Fig 3. Information on herd structure and husbandry in a variety of farms participating directly in the Nunoa Project scheme.

Community	Alpaca Association President	Number of producers in community	Total community animals	Breeding females	Crias	Male: Female breeding ratio
Sapamccota	Benito Arela Morales	10	1200	1100	~400	1:45
La Union	Alberto Diodoro Yianki Orcoapasa	20	2000 (Huacayas: 1800 Suis: 200)	1600	~330	1:25
Pucarayllu	Timoteo Babel	25	1000	600	350	1:10 - 1:50
Alto Pucarayllu	Braulio Ccama Morales	-	1500	1400	-	-
Coarita	Buenaventuro Mamani	14	2000 (15 Suris)	1000	250	11:320

b) Husbandry

During the rainy season animals are grazed on higher pasture for mating and births. In the dry season herds are moved to the lower pastures (if available and /or not flooded).

Generally, availability of adequate grazing pastures is good and animals can roam over a significant area, especially in shared community herds where resources such as land are shared.

3.2 Production Systems

Animals are shorn by hand and marked by leaving wool “tendrils” in specific places to indicate the time shorn. Fibre is harvested all year round in relation to need and a farmer can expect to harvest 5-6 pounds of fleece per animal every two years. At primary level fibre is sold on weight alone and each pound of fleece is currently quoted to be around 8 soles (Dec 2015). Currently, there is no differentiation in price from leg and neck fibre. There is a myriad of information available to commercial alpaca breeder in North America and Europe, however, this level of scientific detail is not relevant in the Peruvian market given the realities many farmers face.
The meat price at market per animal is approximately 100 soles, although this is seen as a last resort by farmers and animals are generally kept in the breeding herd for wool production unless there is a very severe health problem. There is currently no official hide market, although cured cria hides are often sold by women at local markets. Quinoa and potatoes are the only crops that can be farmed at this altitude (over 13,000 ft), but livestock farmers tend not to have commercial plots.

4. Production Challenges

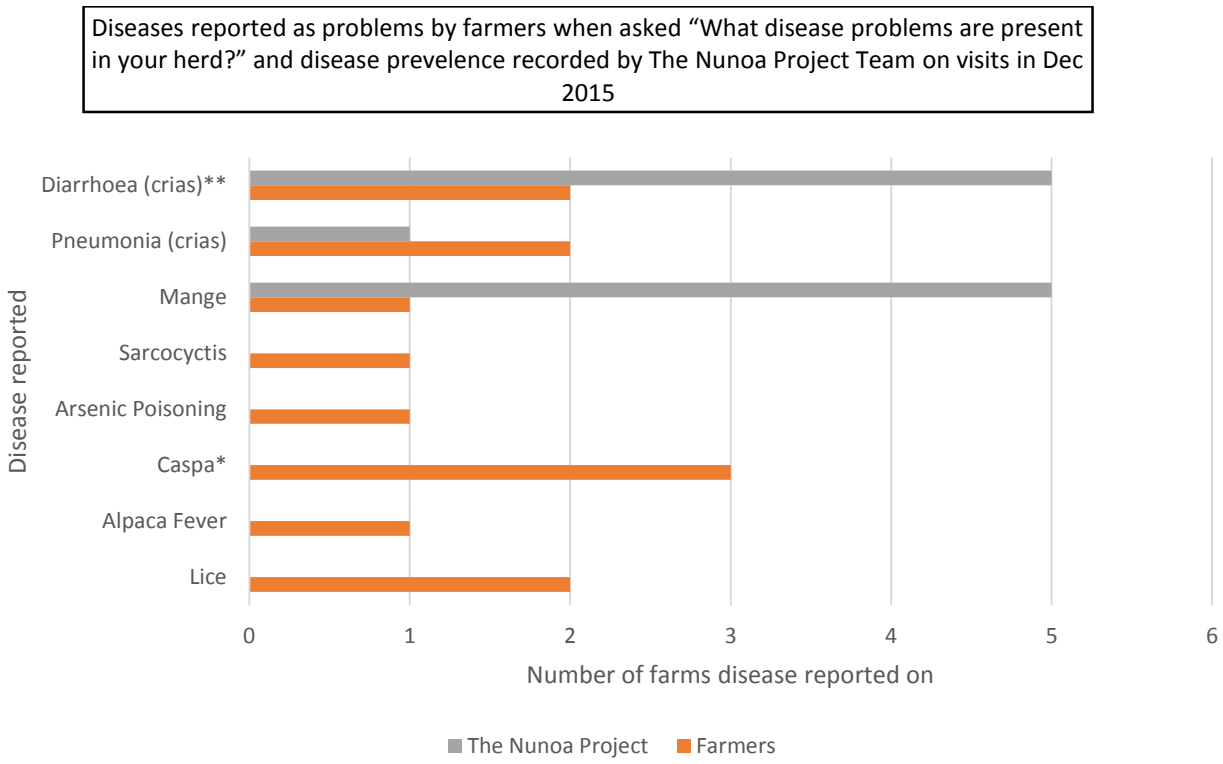
4.1. Diseases

a) Reported Diseases

Farmers in different communities had varying levels of knowledge about disease processes and illness in their herd. A limiting factor to knowledge of disease processes was lack of education on common herd health problems as well as no easy way to identify animals and keep recordings (see 3.2). Because most farmers have not been able to record disease incidence most answers on disease incidence are therefore estimates. The consequences of this could lead to under-reporting of certain diseases or alternatively, the problem could be situational when collecting the data, for example, due to translation problems or social pressure when in large groups.

Diarrhoea and "sarna" or sarcoptic mange are the most commonly reported diseases by farmers (Fig.. Mange was mostly mild to moderate but occasionally was severe. Severely affected animals were advised to be taken out of the breeding herd until recovered (See Fig.) Skin scrapes were performed on affected animals but were all inconclusive, possibly due to the chronic and highly keratinised nature of the lesions. Farmers treated mange with Ivermectin if available, but treatment had limited success. Animals received topical treatment with petroleum jelly when identified.
Enterotoxaemia, on the other hand, had significant impact on mortality and caused severe production losses.

Fig 4. Graph to show the diseases reported as problems by farmers when asked "What disease problems are present in your herd?" and diseases recorded by The Nunoa Project Team in 2015.



** Caspa is a scaling of the skin that severely affect fibre quality. It has been associated with a mineral excess in selenium (Rosiado et al, 2012)*
*** reported as "diarrhoea" by farmers but clinical description consistent with enterotoxaemia, reported to occur in outbreaks and generally affect crias at around 2-3 months' old*

b) Other Diseases

Other diseases reported or observed on farms included late term abortions of unknown cause, liver fluke in wet areas and suspected trombiculosis. Some of the factors influencing disease rate on farms may include the lack of accurate recording to identify and treat/remove from herd as well as limited of no access to medications, nutritional supplements or preventative health schemes.
Manage was found on five farms, although the number of animals and the severity varied significantly between herds from very mild to severe. Skin scrapes for were taken from the most severely affected animals but were inconclusive. Infestation with *Sarcoptes scabiei* was suspected based on the location and type of lesions (Bornstein, 2010, see Fig 5). Estimates on prevalence of sarcoptic mange in Andean alapacas has been estimated at 20-40% (Leguia,1991) which seems high in comparison to out findings, although we did not look for very mild or subclinical infections. The most common ectoparasite in South American Camelids living in the UK however, appears to be *Chorioptes* mites (D'Alterio *et al*, 2005b)

Fig. 5. Alpaca male with suspected sarcoptic mange to the ventrum, axilla and perineum. Subsequently treated with petroleum jelly, applied liberally and regularly as therapy.

Additionally, occasional phenotypic abnormalities were seen presumably due to the high rate of inbreeding

Fig 6: Alpaca displaying evidence of Polydactylylism, a probable result of inbreeding.

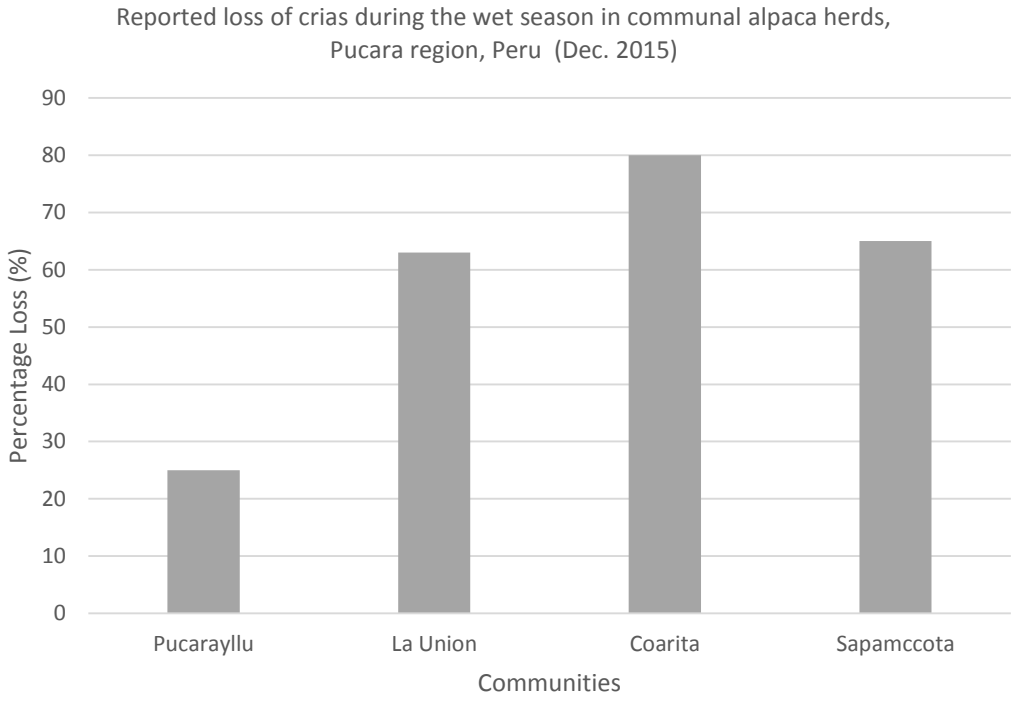
4.2. Enterotoxaemia in Crias

An important economic loss to Peruvian farmers is cria mortality, a parameter that farmers have expressed uncertainty over how to improve. Conversely, in the UK, cria mortality is often over-

reported compared to other farmed animals (Wright et al, 1998). This is thought to be due to the perceived status of alpacas as companion animals in many UK units. In Pucara, however, limited recordings of mortality are made, going some way to explain the discrepancy between observed and reported disease. Additionally, there is little knowledge on distinguishing disease types and/or deaths may be too acute for symptoms to present.

Cria mortality rates vary between herds and can clearly have a very significant impact on herd size and profit in the long term. Some herds experience up to 80% cria loss every year.

Fig. 7. A graph to show percentage loss of ciras reported by different farmers during the wet season.



The majority of ciras die in the wet season of enterotoxaemia and/or pneumonia. It is suspected that a complicating factor in enterotoxaemia is the coccidia Eimeria macusaniensis which has been identified as a protozoan associated with enterotoxaemic deaths in neonatal alpacas (Rosadio et al, 2012). Enterotoxaemia is one of the leading causes of cria mortality in this region, described as “white diarrhoea” by the farmers.

5. Intervention Strategies

The programme focusses on two main interventions that work within the structure and limitations of the farms and the main concern of the farmers - firstly to reduce enterotoxemic deaths in crias and secondarily to improve breeding potential in the herd. Currently farmers get paid by the pound for fibre and therefore by improving the quantity of fibre produced it is hoped to lead directly to increased profits.

5.1 Vaccination Programmes

A vaccination programme for participating farmers was launched in the Pucara area in January 2015.

The aim is to replicate a decrease in cria mortality rates as achieved in nearby town of Nunoa (Purdy, S, 2014). To achieve this, veterinary technicians are trained to administer vaccines. These are men who have volunteered from the community or family. The scheme is voluntary and farmers pay for the vaccine themselves using a community rotary fund. Before vaccination, pregnancy is confirmed manually or via ultrasound.

Fig. 8. Project Presentation in Pucarayllu.

Unfortunately, at this time, the change in mortality due to the vaccination programme cannot be evaluated due to a lack of records. The data presented here is qualitative or farmer estimated data. Participating farmers were offered the opportunity to tag animals with The Nunoa Project providing the ear tags. It is hoped that this will enable farmers to analyse trends in the future and thereby have more autonomy in their herd health and breeding success.

Fig 9. Myself and other members of The Nunoa Project team ear-tagging and teaching farmers and technicians how to body condition score their alpacas.

5.2. Elite Breeding Herds

Setting up of elite breeding programmes led to a substantial improvement in cria birth rates - from 30-50% to 80-90% - a figure sustained until last verified by the Nunoa project technicians via ultrasound (Purdy, 2014). Animals were pasture bred with loaned superior machos and turned out with 20 to 25 females for 70 to 90 days. This demonstrates the high fertility of alpacas given enough time and a suitable female to male ratio (around 1:30).
Unfortunately, there is no published data on the correct breeding and fertility of alpacas to compare these figures to directly and very little on alpaca fertility in general.

Selection criteria used by The Nunoa Project veterinary team included body condition score (BCS), fibre quality, fibre quantity, leg covering, absence of disease on physical exam, size, age (using teeth), Suri or Huacaya and general structure and conformation. Pregnancy status was also confirmed via Ultrasound. All animals in the elite breeding herd were tagged, separated and recorded.

Criteria used by farmers also included the absence of “sarca” a cloudy blue colouration to the cornea that is perceived to negatively influence the health status of the animal although a “Blue Eyed White” pattern can be recognised as a coat pattern by alpaca breeders. Brown patches on the face or body where also undesirable and selected against.

Fig. 10. Unilateral “Sarca” in Peruvian alpaca. Often presented bilaterally as well.

5.3. Teaching and Education

The use of participatory intervention and education schemes is an important part of increasing the self-reliance and sustainability of the programme. Most “teaching” was informal discussions with the farmers based on their particular concerns Practical skills were taught such as handling methods, body condition scoring and fertility checks of males. Training meetings are also organised (see Fig. 8).

6. Barriers to Production and Intervention Strategies

Farmers reported three main barriers to production

1. Record Keeping

Inadequate record keeping is a barrier to perceiving and intervening in specific problems affecting one farm. After ear tagging and with regular veterinary contact it is hoped that eventually farms will be able to record pregnancy, birth rates, abortion rates, cria mortality, age, BCS and shearing frequency for each animal with the aim to adjust herd grazing, vaccination protocol, shearing and breeding herd accordingly. This is a very achievable aim. Currently, a limiting factor in fully initiating this is lack of literacy and interpretative skills in many families. Initially, farmers will be supported with regular visits from a vet with whom they have built a good working relationship. Animal technicians who have been specifically trained will also play a crucial role in recording data and making changes to breeding practices in the coming years.

2. Incomplete separation of breeding herds.

One of the difficulties faced by farmers is a shortage of fencing availability which can implicate the effectiveness of breeding protocols as separation of elite herds becomes difficult - three out of five community farmers reported that it was challenging to separate the herds or were unable to do so. For some farmers, it is therefore difficult to achieve complete genetic separation and start a selective breeding programme. Production systems are extensive and low input – having a further herd to manage separately can be challenging, especially for smaller family owned herds where labour is in short supply.

3. Transport/Communication links

The remote and rural location of many farms means that farmers often have limited access to new breeding stock from other farms and medicines or nutritional supplements and fencing equipment at market. Practicalities such as transporting vaccines to remote locations, storing them effectively are all technical challenges which require initial input from the regional veterinary managers. Communicating effectively to all members of the community can also be challenging – most have mobile phones but are not always contactable. Decisions making processes can therefore be slow to action.

4. Others

Other barriers include a cultural reluctance to culling as a management method. Farms operate on a year-by-year basis and so culling animals as a long-term investment in genetic potential when so many other variables play a part in profit margins does not present as a very feasible option.
Also, changes to leadership and politics in different communities can potentially jeopardise the longevity of any initiative. Leadership is democratic and changes every 4 years but can potentially disrupt the stability of a project. Finally, the lack of access to veterinary facilities and a lack of education and literacy in the communities can be barriers to change. For example, not knowing about modern medicine can lead to superstitions such as the idea that to start a vaccination programme can cause macho deaths - a concern held by one community when initial approached with the proposal. In some communities there is also concern and uncertainty around the idea of booster vaccinations and reports of illness after vaccination leading to difficulties in establishing a regular vaccination protocol.

7. Conclusion

Changing cultural perceptions and farming practices is a long and continuous process. However, the communities who have approached us are involved, engaged and dedicated to doing the best they can for their animals and their businesses now and into the future. Through building relationships with farmers and communities, there is excellent scope for overcoming barriers and developing effective breeding and husbandry protocols for community alpaca herds. Particularly if the focus is on providing sustainable technologies for the provision of basic services (veterinary, energy sources, schools, safe water etc) that work within the cultural and geographical framework of the region as well there being continues emphasis on building strong market access for farmers, which hopefully will start to break down some of the barriers outlined above.

8. Acknowledgements

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