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How tradition constrains progress towards the development of the dairy industries of southern Asia

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With increasing per capita consumption of milk and other dairy products throughout developing countries, virtually every country in southern Asia is seeking to increase its domestic production of raw milk. This task seems easier in certain countries as smallholder dairy (SHD) farmers understand that improved farming practices are the key to increasing per cow and per herd daily milk yields and per farm profitability. The dairy industries in southern Asia can be split up into two types, namely those that have been established for many centuries and those that are relatively new. Examples of established dairy industries can be found in India, Pakistan and Bangladesh whereas newer dairy industries are becoming more prominent in many South East Asian countries such as Indonesia, Malaysia, Vietnam, Philippines and Thailand.

Brief overview of the history of Asia's dairy industries

The origins of the dairy farming sectors of the Indian Sub-Continent lie at least much in the use of cattle for draught power and the economic value of dung for both fertilizer and fuel as for milk production. Any volume of milk gained by milking cows might be a bonus; the value of female cows was more in reproductive capacity for future producers of dung and suppliers of draught power than arising from being producers of high volumes of milk. It may be fair to say that most attempts to develop the long-established dairy industries of the Indian subcontinent are based on trying to upgrade "the traditional way of doing things". In addition, owing to the historic role of dairy products in their diets, raw milk has been eagerly sought after by farmers in the Indian subcontinent such that a cow is hand milked, no matter how small a volume she may produce. In the other countries mentioned above, however, dairy products have not been an integral part of the diet until quite recently. In these South-East Asian countries, with the virtual disappearance of draught animals, cattle are now generally categorised either as dairy or beef. The beef cattle were generally selected from the remaining draught stock in the country. In the Indian subcontinent, however, "dairy" cows and buffaloes are routinely milked to produce as little as 1 or 2 L/cow/day and are still classified as "local" genotype dairy. So we have a situation where "local" dairy cows, with very low milk yields on the whole are very poorly fed and managed, and yet still are considered an integral part of that country's dairy industry.

The problems with tradition on smallholder dairy farms

Even if the local cows were better fed and managed, they may not be genetically capable of producing much more than 10 L/cow/d of milk. This would not be considered a high milk yield for well fed and managed dairy genotypes in South East Asia that have originated from western countries, usually

Friesians. In this case SHD farmers successfully managing these stock would be expected to know how to look after them better than farmers with the "local" dairy cows; peak milk yields of 15 L/cow/d or even more for Friesians are common.

It has often been stated that it is harder to "unlearn" bad habits (be they personal, social or technical, with a good example of the latter being dairy production technology) than it is to learn new habits from a blank sheet of paper. Therefore if "local" dairy cows are very poorly fed and managed, traditional smallholder farmers often believe that this is the normal way of farming such stock. Hence the tradition continues and is rarely questioned by farmers and unfortunately by many governmental and other institutional dairy stakeholders.

In comparison with traditional practices, the Bangladesh Dairy Enhancement Project (BDEP), being implemented by Land O'Lakes International Development and funded by USDA, has introduced a more modern and productive "whole farm management" approach to the smallholder sector. The project has demonstrated how introducing very different farm management practices to replace traditional practices, can boost farm productivity to a significant extent. The experience of BDEP also shows, however, the difficulty in achieving changes away from traditional practices. For example, BDEP can recount examples of farmers building improved cow sheds, but tearing them down before completion and rebuilding traditional brick and concrete "hot boxes" owing to neighbours all saying "the new design will never work". It has taken more than a year of active field work to achieve real momentum among farmers to end many of the traditional practices.

The remainder of this article discusses how the continuous use of traditional practices has adversely impacted on the rate of development of such dairy industries. If such practices ceased to be used and

Figure 1: Only offering drinking water when mixed with concentrates is a very common problem on many small-holder farms in South-East Asia. Photo credit: John Moran

promoted by many government dairy advisers, these industries could be more effectively upgraded.

Feeding and watering practices

The tradition of only offering water through mixing it with concentrates (Figure 1) is far too common in Bangladesh. Cows require fresh drinking water (throughout the day and night) for efficient rumen metabolism as well as to satisfy their basic needs in all tissues, particularly the mammary gland.

Owing to the traditional origins of the dairy sector of South Asia, the feeding of crop residues is the norm. Rice straw and wheat straw form a major part of the "ration" provided to dairy animals through the Indian Sub-continent. These straws, however, have very low nutritive values and they do not enable satisfactory milk production. In high-yielding milking cows, their roles are to ensure there is sufficient dietary fibre for efficient rumen digestion and also to provide the feeling of satiation. But they do not drive good milk production through the direct provision of necessary protein and energy.

Concentrates formulated for milking cows should provide the essential nutrients (energy, protein, macro and micro minerals and vitamins) to supplement the forage based diets so that cows can achieve their target milk yields and fertility parameters. Price is certainly an issue but it should be considered along with the need for the ration to satisfy the cow's nutrient demands for the target milk yields. A further problem is adulteration of the ingredients of such concentrates which necessitate their sampling and chemical analyses in reputable feed analysis laboratories to more accurately formulate the diet.

All forages should be chopped to 2 to 3 cm lengths prior to feeding, to reduce wastage and improve digestibility. This is often not practiced on traditional farms.

A common feature on many Bangladesh traditional dairy farms is the feeding of boiled rice as the only concentrate feed. Rice may have sufficient dietary energy but it is very low in protein and many minerals. Feeding this together with rice straw is hardly a suitable diet for milking cows – it impairs milk yields and results in severe fertility issues over time.

The cow's appetite drives her mammary gland and this is primarily determined by rumen retention time which depends on the quality of the feed entering the rumen and its rate of breakdown to convert it into microbial protein (which is digested in the abomasum). Therefore to achieve high intakes (hence milk yields and then profit margins), feed quality must be optimised. The forages grown on most Asian soils benefit from applications of inorganic fertilisers which supply minerals such as nitrogen, phosphorous and potassium as well as pH stabilisers such as limestone, whereas many traditional dairy farmers only use organic soil additives such as cow manure and shed effluent. A series of fertiliser strips where different fertiliser applications are compared, either visually or better still, following chemical analyses, to determine the optimum fertiliser regime for that particular crop on that particular soil.

A year round supply of quality forages is essential for maintaining profitable feed nutrient intakes and in many areas of Asia (subjected to regular flooding or drought), and this can only be achieved using forage conservation. Because of the lack of sufficient rain-free days during harvesting (to make hay), this generally means having to learn to make silage. Developing the skills for good silage making will reap dividends in ensuring reduced annual variations in the forage contribution to the diet.

Young stock management

All too often, traditional dairy farmers accept the fact that not all newborn calves live to become weaned heifers. True, milk fed calves are very susceptible to invasion by the many tropical pathogens and respiratory issues such as pneumonia, however there is no reason to accept calf mortalities as normal. There are several improved practices that can virtually guarantee calves will survive and thrive to become useful members of the milking cow team. These include:

A specific place in the shed for calving cows down is logical because this can be more easily disinfected, provided with rubber mats and fans to improve the calving down environment.

Effective colostrum feeding management is essential for calf health. The concentration of immunoglobulins in the colostrum (which can be easily tested) and the timeliness of its administration to the new born calf (within 30 to 60 minutes of birth) should be an integral part of the birth process on many well managed tropical dairy farms.

Weaning can naturally occur as early as 6 weeks in calves with good rumen development. This is encouraged by offering quality calf concentrates that have been specially formulated for their needs and include high carbohydrate feeds, such as maize meal, sufficient protein (up to 16 to 18%) and rumen buffers. A small quantity of roughage should also be offered to stimulate saliva production as a natural rumen buffer. With better calf rearing practices, including ensuring early rumen development, and calf milk replacer becoming available (at lower cost versus the milk presently being consumed by calves), the day of calves still drinking from their dam at 6 to 9 months of age should be in the past.

Key performance indices are the best way to monitor the farmers' ability to rear calves, and feed and manage mature dairy cattle. Therefore these should be readily available to all farmers, big or small. The age at first calving provides an excellent assessment of the farmer's skills in calf and heifer rearing and it should be in the range of 24 to 28 months. For farmers following traditional practices, the typical range is 30 to 36 months of age, representing significant economic loss.

Housing and cow comfort

Ensuring good ventilation is nearly just as important as regular bathing of cows and providing shade, when designing cow sheds. In Bangladesh, we have seen some very poor dairy cow housing. Cows are tied up in brick "hot boxes" with only cement floors (Figure 2), no open windows, a very low roof and minimal sunlight; the air temperature and humidity is such that this housing exposes the cows to very severe heat stress (measure as the Temperature Humidity Index).

Cows are more heat susceptible than humans in that they feel hot at lower temperatures and humidities than do humans. They have a large fermentation vat (the rumen) continually generating heat as well as a

Figure 2: This cow has a deformed skeleton resulting from years of living in a tie stall. Photo credit: John Moran

mammary gland that synthesises up to 4 times as much milk protein than a feedlot steer generates muscle protein in its entire body. To maintain the appetite required to produce milk, milking cows must be "happy": heat stress must be addressed, cows want to comfortably lie down for 12 hours or more each day. They want to be able to move around and feel secure in their living quarters.

Cows should be offered a soft place on which to lie. For cows excluded from open land, which is the norm in Asia, thick (sponge) rubber mats or sand beds are ideal (as shown in Figure 3). Another major problem with housed stock is the common practice of tying cows, often using tie stalls often with only short pieces of rope attached to the stall. Cows like to interact with their herd mates, lick themselves and "stretch their legs" during each day, which they cannot do when tied in a restricted manner. Stock in loose housing can be just as easy to manage as cows tied in small sheds, and indeed this is the experience of the farmers working with BDEP.

Other aspects of herd management

It goes without saying that heat detection is considerably easier when the cow can move around in a yard rather than being tied. Yet on traditional farms in Bangladesh and elsewhere in South Asia, many cows are routinely tied for 24 hours a day, seven days a week.

Disease management requires following a protocol of vaccinations and routine anthelmintics, and regular observations for symptoms of ill health which must be followed by diagnosis and treatment. In traditional farms, too often the farmer waits for a problem to arise and then pays a high cost for treatment, rather than vaccinating and de-worming routinely using reputable medications.

Paying strict attention to shed cleanliness is essential in a housed dairy herd. It is not that traditional farmers pay less attention to it, but "farm layout" on traditional farms makes it harder to maintain cleanliness. In addition, on traditional farms cows are rarely if ever provided with rubber mats or sand beds, and the forage is often fed unchopped, all factors resulting in shed cleanliness being harder to achieve.

In some countries, there is a degree of preference for genotypes perceived to be "hardy, disease resistant and heat tolerant". That such genotypes may not be high milk producers does not stop recommendations for their use. But in many heat stressed countries of the world, including in the Gulf and in South-East Asia, and on large scale farms in Pakistan, Friesians are proving to be very high yielding just as in more temperate climates. Great results are achieved by using the right genotype with modern management practices adapted for the condition. Where less productive genotypes are being recommended, this could be perceived to be as an alternative to the hard work of introducing modern management practices, especially to traditional dairy sectors. Thus it appears that genotype choice, when sourcing semen for artificial insemination, may be used as an alternative to enhancing farmers' skills and work practices capacity. In smallholder sectors in which cows are producing two litres milk per day or less, the first step towards improved dairy farming must be in the field of whole farm management, especially including much better nutrition than is the norm on traditional farms relying on rice and wheat straw. Once improved management is in place, there is less need to consider traits sometimes thought to be of high value, namely genetic resistance to the heat and the many diseases of the tropics. Conversely, all breeds, including the tropical breeds, suffer from poor farm management. Better farm management allows the selection of efficient dairy genotypes such as Friesians. The dairy feedlots in low land Vietnam and Thailand routinely use high grade Friesian semen because of the excellent management on farm. This even includes tunnel ventilation through the shed to minimise heat stress.

Support infrastructure

In southern Asia, milk may be destined either for the informal or the formal market. The informal market may be anywhere that consumers want to purchase it, while the formal market is normally via a milk collection centre. With milk being such a perishable commodity, food safety issues are of utmost importance; hence virtually every professional dairy stakeholder would prefer the informal market to be

Figure 3: Vietnamese crossbred (zebu x Friesian) dairy cow. Stall is clean, clear, has good ventilation and is shaded. The cow can lie down on a rubber mat. Photo credit: Gilles Tran

phased out either through legislation or emerging consumer preference for processed milk as economic development builds. Consumer preference, however, also has developed over a long period of time, and has its own traditions. Changing these traditional preferences is a challenge to the formal dairy processors of South Asia.

In far too many places in the Indian subcontinent, the SHD industry supports a "middle man" who takes the milk from the farm to the market place, generally via the informal market, although in certain places he can sell it to milk collection centres. Not only does the farmer receive less money for his milk, the milk can be adulterated to increase its volume, thus increasing food safety concerns when handling such a perishable animal product as raw milk. Further, when milk is sold to a "middle man", the farmer is not paid on milk fat content, certainly not in any reliable manner. This significantly reduces the incentive for the farmer to improve his farm management practices. In Bangladesh, the "middle man" can even milk the cows for the farmer. His milking hygiene is often questionable and mastitis can be spread through milking herds.

Conclusions

Many of the above improved practices have been developed recently meaning that dairy farmers need to be flexible and modify their farming systems when necessary and possible. Clearly there is little role for maintaining the traditions of the past when profit margins are becoming smaller due to the increasing costs of farm inputs. Although there is nothing wrong with many traditions among human society, in something as biologically complex as tropical dairy farming, advances can be very rapid and farmers and their advisers need to be more aware of "better" ways of carrying out these practices. Sure, farmers should try them out and maybe even modify them to their situation. But they cannot be ignored without significant opportunity cost in terms of productivity

and profitability. Improving dairy farm practices is not simply a matter of adding a few changes to the underlying traditional foundation; rather, a breaking down of traditional practices is necessary. This is vital if the sector is to progress for the betterment of smallholder farmers and consumers. The profitable management of dairy cows in the lowland tropics such as in Vietnam, where dairy feedlots with herd averages of 20 to 25 L/cow/d and daily peak production considerably higher, indicates that much of the tradition of herds producing less than 5 L/cow/d has been replaced successfully with more modern practices. We have a challenge to ensure that such models are spread much more widely than is the case at present in traditional dairying sectors such as in Bangladesh and other countries in the Indian subcontinent.

Further reading

For many more best management practices, readers are directed to a recent CSIRO book by one of the authors (John Moran): “Blueprints for tropical dairy farming. Increasing domestic milk production in developing countries”. Each chapter is freely downloadable from the website www.profitabledairysystems.com.au.