
Livestock Marketing and Supply Chain Management of Livestock Products*

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I

INTRODUCTION

Some of the most dynamic markets both globally and in South Asia are for livestock and livestock products. This is being driven largely by demand due to growth in purchasing power, but other factors play a role as well. The vast bulk of these markets are domestic, do not cross international boundaries and are driven by local demand. Managing these supply chains requires addressing the complexity of handling and regulating highly perishable products, which at times also present greater human health implications than crop products. Consumer demand is increasingly driving a move towards higher standards, which is being channelled back through increasingly integrated production and supply chains, including greater roles for supermarkets. Regulators in turn are responding to public pressure by increasing scrutiny and standards for food safety. In spite of these consistent trends, livestock product markets in South Asia and typically across developing countries remain largely traditional and unorganised or informal,¹ delivering raw, or minimally processed products to the majority of consumers. Managing these changes requires balancing regulatory interventions with economic forces in ways that are effective both for increased supply of quality products, as well as providing livelihoods and rural development opportunities through these growing markets.

This paper does not attempt to provide a comprehensive overview of livestock markets and trends in India or elsewhere in developing countries, as there are other much more competent sources of that information, many of which are cited here. I do attempt nevertheless to raise some of the key issues that emerge from these trends, point to the challenges and opportunities they raise, and suggest possible strategies for addressing them.

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II

TRENDS IN LIVESTOCK MARKETS AND DEMAND

Livestock Trends Globally

The livestock revolution was first described by Delgado *et al.* (1999) as the extraordinary growth in current and projected demand for livestock products, occurring almost entirely in developing countries, and particularly in Asia. This accelerating demand is mostly due to increased incomes coupled with low current rates of per capita consumption and high income elasticity of demand for nearly all livestock products. Contributing factors are also increased urbanisation and changes in diets, often toward more Western habits that consume more livestock products. As illustrated in Figure 1, developing country demand for meat and milk may grow by 50 per cent to 2050. South Asia, with currently low per capita meat consumption, may grow the fastest, estimated at 4 per cent annually to 2050 (Alexandros and Bruinsma, 2012).



Source: Modified from Alexandros and Bruinsma (2012).

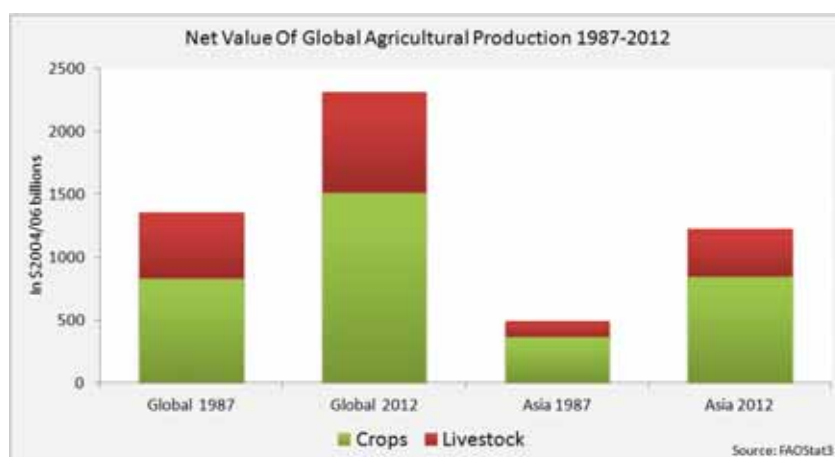
Figure 1. Projected Change in Demand for Food Commodities by Region to 2050.

Where will the supply come from to meet this demand? Livestock products are intrinsically difficult to trade because they are perishable, so require freezing, canning, drying, or processing of some sort to allow adequate shelf life to send to distant markets. In addition, sanitary and phytosanitary measures (SPS) standards imposed by global animal and public health bodies further constrain trade. Feed grains, on the other hand, are much simpler to trade. The result is that livestock production occurs largely close to where demand is located and feed is often imported where needed. Partly as a consequence, only some 10 per cent of global production of meat and milk is generally traded across borders, compared to one-third

for fish, in spite of the fact that global meat trade has grown by 40 per cent in the last 10 years (Delgado, 2014). Given the relatively small role of trade overall, because the demand growth will be largely in developing countries, that is very likely where the production growth will occur as well, and that process is already underway. Although trade often receives high policy attention because of the interest in earning foreign exchange, the bulk of the increased activity in Asia will be in domestic markets.

Developing countries' share of milk production in 1982-84 was only one-third of global production and of meat was only one-fourth. Now they produce two-third of the global meat supply and more than half of the milk, with India of course the world's largest milk producer (Delgado, 2014). That trend will continue. In developing countries milk production is expected to grow by 1.8 per cent annually to 2050 (2.0 per cent in the case of South Asia), compared to only 0.3 per cent for developed countries. Similarly, for aggregate meat the expectation is over 3 per cent annual growth for developing countries, compared to 0.4 per cent for developed countries (Alexandratos and Bruinsma, 2012).

This growth in demand and supply particularly in Asia will have consequences not only for livestock markets and production systems, but is already altering the relative shares of agricultural commodities and value of production. As illustrated in Figure 2, by 2012 not only had the share of value of production in Asia grown to nearly half of the global total, but the share of livestock in value of agricultural production had also increased significantly, both globally and in Asia.



Source: Delgado (2014).

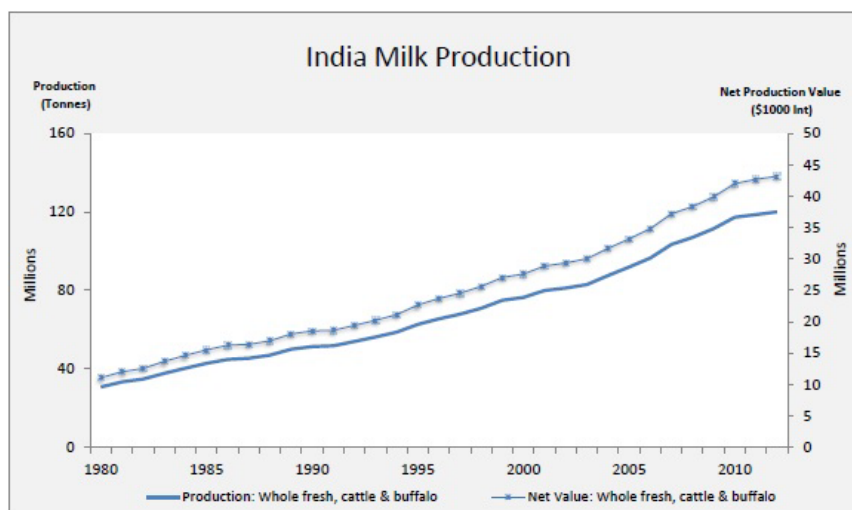
Figure 2. Net Value of Global Agricultural Production 1987-2012.

With all of this expanded demand and production, clearly the performance and structure of markets that link those will be critical to the interests of both consumers and producers, but also to the many actors along the supply chains whose livelihoods may depend on them.

Livestock Trends in India

India has also been experiencing these trends. The share of livestock in the value of agricultural production has increased and was recently estimated at some 27 per cent of agricultural gross domestic product (GDP), and has held steady at 5 per cent of total GDP even while agricultural GDP has declined in share (World Bank, 2011).

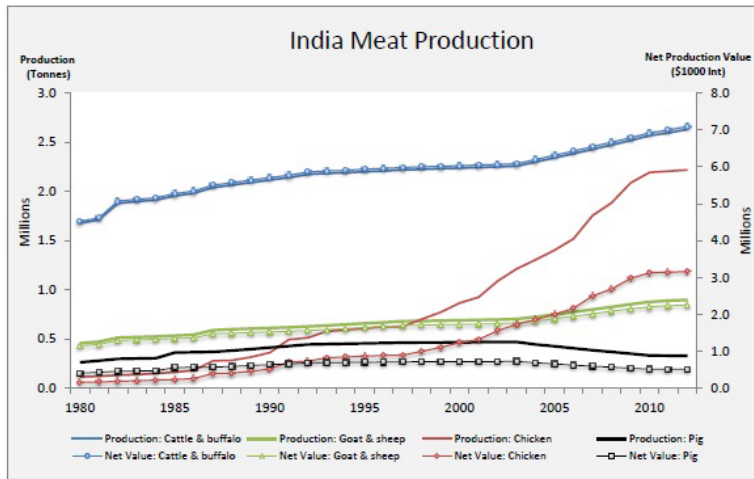
Figures 3 and 4 show trends in the quantity and value of production of milk and meat in India since 1980. They show the quantity and value of milk increasing steadily at an annual rate of some 4 per cent since 1995, although at a lower rate in recent years, with value outpacing quantity reflecting recent real price increases. In the case of meat, the feature that stands out clearly is the strong growth in poultry production. This reflects the rapid growth in the use of improved breeds leading to increased productivity and also increased commercialisation of poultry production. The organised poultry sector is reported to comprise 70 per cent of production (Vetrivel and Chandrakumarmangalam, 2013). Bovine meat production seems also to have increased its rate of growth in recent years, possibly linked to increased exports, and there is also steady growth in small ruminant meat, demand for which is growing as will be discussed below.



Source: Faostat.

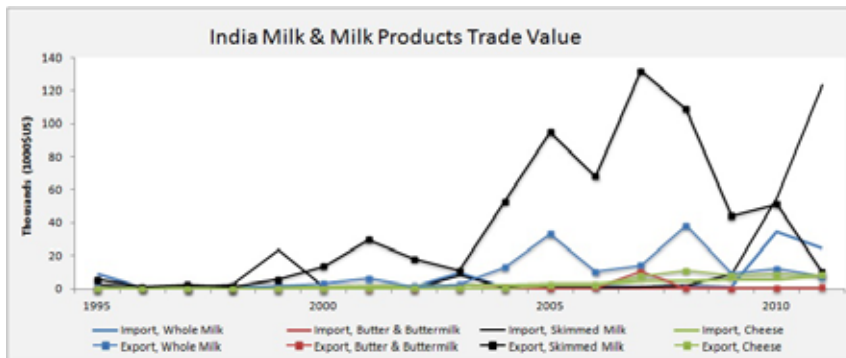
Figure 3. Annual Quantity and Value of Milk Production in India Since 1980.

Figures 5 and 6 show the value of Indian imports and exports of livestock products since 1995. While India is the world largest milk producer, trade in dairy products remains relatively small, although recent years have seen strong growth in demand for dairy products, estimated by some at 6-8 per cent annually. Coupled with some increases in the quota for duty-free milk powder imports, this has produced



Source: FAOStats.

Figure 4. Annual Quantity and Value of Meat Production in India Since 1980.



Source: FAOStats.

Figure 5. Annual Value of Dairy Products Imported and Exported Since 1995.



Source: FAOStats.

Figure 6. Annual Value of Meat and Live Animal Exports and Imports Since 1995.

higher powder imports. However, offtake of buffalo meat mostly from the dairy industry, along with low local demand, has contributed to India becoming since 2012 the world's largest bovine meat exporter.

When one looks at prices for livestock commodities in India, the value trend seems to be towards ruminant products. Monogastric production has been demonstrated to be generally more efficient at scale, using concentrate feeds. Ruminant production, particularly when it depends on grazing, exhibits fewer economies of scale in production. As a consequence, the relative price of poultry has been in decline for some time, as production has been commercialising. In contrast, prices for goat and sheep meat have been increasing, possibly also related to the fact that they are often regarded as superior product in many countries. In India between 1963 and 2009 for example, the ratio of mutton to poultry prices has more than tripled from 0.7 to 2.9,² and the same trend can be seen in other developing countries, including in Africa. This reflects the fact that mutton production generally cannot meet demand. (Kumar *et al.*, 2010), and has implication for market organisation and performance as will be discussed.

Role of Smallholders in Production

Although this paper is focused on market issues, the livestock production context is clearly an important determinant of options for improving market performance and organisation. Some have described “two worlds” of livestock in India, differentiated mostly by state or region. In states such as Haryana and Gujarat production is increasingly commercialised and market-driven and soar “leading” zones, compared to other states sometimes described as “lagging”, such as Odisha, which is described as subsistence and livelihood oriented, and where livestock represents only 20 per cent of agricultural GDP (World Bank, 2011). In some states strong differences maybe be seen more locally within states based on differences in market access, irrigation, soils and climate, etc. Realistically, different scales and types of producers may exist side by side, based on producer-specific differences in access to land, resources and capital, and in management capacity.

To understand the factors determining the sometimes complex structure of production, we can consider two alternative models of livestock production that can be seen in various forms across India and other developing countries (Staal *et al.*, 2008).

One is the “household model” of production, which in economic theory follows the objective of maximisation of utility. For that reason, household livestock producers seek multiple benefits that improve their utility, not just profit. These include using livestock assets as financing and insurance mechanisms, manure for soil fertility, animal traction, among many others. As a consequence, these non-market “returns”, to the extent that they can be measured, can in some cases add up to 40 per cent additional return to the livestock-related activities in the household.

(Ouma *et al.*, 2003). In addition, household producers may have the advantage of under-utilised family labour, and communal resources for feed.

In contrast, a generally large scale commercial 'enterprise model' of production in theory follows the sole objective of maximisation of profit, and generally derives no other benefits. This model of production generally substitutes capital for labour, in the form of mechanisation, and uses that to exploit economies of scale. A disadvantage may be that labour and feeds must generally be purchased or produced at full market cost. Livestock assets may have limited value for financing or insurance, and manure may require additional costs for disposal.

Other features of the two worlds that these competing sets of producers live in are that while smallholder producers typically face greater market constraints, are often unsubsidised and sometimes more highly taxed, exhibit nutrient deficits among families, land and animals, and typically have little voice in policy and investment debates, in contrast the large commercial producers may capture market volume premiums, targeted subsidies or tax advantages, exhibit nutrient overloads, and generally have a loud voice in policy debates compared to their market share (Staal *et al.*, 2008).

In spite of this, smallholders are competitive. The evidence suggests that the key driver of the enterprise model, which is economies of scale, is closely tied to the opportunity costs of labour. More specifically, there is evidence that there are limited economies of scale at the production level when the local opportunity costs of labour are low, including some studies from India (Delgado *et al.*, 2003). A simple example might be an urban dairy producer in an Indian city with 100 buffaloes who chooses to hire multiple labourers to milk and tend the animals rather than milking machines. Partly as a consequence, in many cases smallholder producers are able to compete effectively against larger commercial producers and demonstrate similar unit costs of production, for example in dairy in several countries including India (Sharma *et al.*, 2003), and in pig production in Vietnam (Lapar *et al.*, 2012). The economies of scale are stronger in monogastrics such as pigs and poultry because even smallholders generally have to buy some feed at market prices. At the market level it should be noted that the raw or traditional products that poor consumers often demand also provide a buffer to competition from imports, because they cannot easily be substituted by imported products, which are nearly always processed (Tisdell *et al.*, 2010)

The competitiveness of smallholder livestock producers is closely linked to their household model of production, contrary to the usual assumption that greater scale is inevitably linked to greater competitiveness. Consider a case when livestock product prices fall in the market for exogenous reasons – while the profit-dependent commercial producer may be forced to suspend production, a household producer may continue to participate in the market because of the other benefits being generated.

For these reasons, smallholders continue to dominate livestock production in many developing countries, including India, and particularly in the case of ruminants. Smallholder farmers are estimated to produce the large majority of the small ruminants and 70 per cent of the milk in India (Kumar *et al.*, 2014a), an even higher proportion of the milk in Kenya, and up to 90 per cent of the pork in Vietnam, now a middle income country (FAO, 2011). In contrast the Indian poultry sector has been rapidly commercialising and broiler production is estimated to be 70 per cent in the organised sector (Bhilegaonkar and Agarwal, 2008).

Unorganised or Informal Markets

Given the dominance of smallholders in large parts of the livestock sub-sector, market structures and mechanisms must be suited to facilitating their role in supplying the increasing demand. They may be less able to overcome infrastructure constraints, which are formidable in many rural areas, thus requiring public investment. New ICT based tools can reduce information costs somewhat, and different forms of collective action can reduce transaction costs, as will be discussed. Transport and capital costs are however more difficult to overcome.

Any discussion of agricultural markets in the context of developing countries and smallholder producers must address the reality of informal or traditional markets as defined previously. Informal agricultural markets are only part of a larger reality of economic evolution. The informal economy overall is reportedly half of India's GDP and employs 90 per cent of its workers, among the highest proportions in the world. Agriculture comprises a third of India's informal GDP and the majority of it handled by either informal or micro-level enterprises, done by commercial companies (Credit Suisse, 2013).³

The level of formally processed livestock products in India is very low. It is estimated that only 6 per cent of meat (including beef and pork) is formally processed (South Asia PPLPP small ruminant report, FAO, 2009), and the organised share in the dairy market is estimated to have grown to only 25 per cent recent years, in spite of efforts in co-operative development (Kumar *et al.*, 2014b). In Vietnam only some 3 per cent of pork is sold in supermarkets. Similar shares can be found across developing countries, and even in middle income countries such as in Latin America some 25-50 per cent of dairy products often go through traditional channels.

Traditional markets tend to supply low cost fresh produce particularly to poor consumers, and also generally provide a greater proportion of market outlets for smallholder producers, who often are less able to link effectively to formal markets, outside of such cases as the successful village co-operative societies. It should be noted that traditional markets generally generate more employment, because of the labour-intensive nature of their enterprises, which of course is also the basis for their low costs. For example, traditional milk markets in Africa and South Asia were found to employ between 1 and 5 full time people per 100 litres of milk handled daily, at

above the minimum wage, far higher than in the case of modern processed milk markets which substitute capital for labour (Omore *et al.*, 2004).

Consumption Drivers Shaping Markets

The phenomenon of informal or unorganised markets for livestock products, and for any other product for that matter, is driven by a significant gap between buyer demand for characteristics of market products, and the standards in the formal market for those characteristics, generally imposed by regulatory authorities. This is most easily illustrated in the example of demand for food safety, which can be treated as a commodity associated with various products, since the supply of food safety incurs additional and measurable costs. However, demand and response to other standards can be equally applied.

Figure 7 below provides a conceptual mapping of the level of food safety against consumer purchasing power. The diagonal line represents the relationship that one typically finds of increased demand for higher levels of safety with increased consumer purchasing power. In spite of often expressing a desire for safe food, resource-poor consumers tend to opt for cheaper food stuffs offered by traditional markets, some of which may be less safe. Regulators however set standards based on public health evidence and Codex Alimentarius guidelines which do not take into account actual consumer demand for food safety.

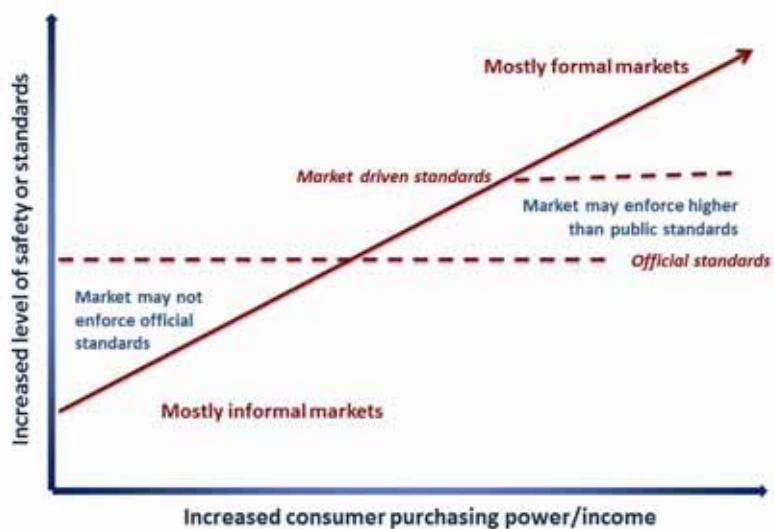


Figure 7. Conceptual Relationship between Level of Safety or Standards and Consumer Purchasing Power

The official regulatory standards are represented by the dotted horizontal line. When demand for safety is above that line, as towards the right side of the graph, then informal markets largely disappear. When demand is below that line, as towards the left side, then the market will generally not enforce the standards and instead may supply largely informally.

Of interest is the situation when consumers demand higher standards than officials consider necessary based on their technical experts. In this case the market may very well provide products with those higher standards. Some public and veterinary health officials regard these higher market-driven private standards with suspicion, because they are not expert-driven and may regard them as unnecessary and imposing costs. Once consumers decide they want higher standards and are willing to pay for them, regardless of how evidence-based that desire may or may not be, they will occur in the market.

On the other side, experience has shown that when demand for standards is low among consumers, informal markets will flourish. Some governments have tried to enforce standards using policing and fines, which can impose additional costs and inconvenience on market actors, but experience has shown that those efforts are generally ineffective and market forces will determine the characteristics of products supplied.

Note that the same case can be demonstrated for other product characteristics, such as product quality, standardised product forms, etc. For our discussion here, the lesson from this is that until purchasing power increases and consumer preferences and willingness to pay for higher standards change, markets will in part avoid official standards to supply lower cost products.

The same principles are driving the other trends at play as well, importantly the phenomenon known as supermarketisation, or the increasing market share of large food retailers, many of which are linked to vertically integrated supply chains. As occurred in developed countries earlier, consumer interest in large retailers is driven by the convenience of being able to buy a wide range of products in a single location, sometimes at lower prices, and to perceptions of higher product quality. As the middle class grows as a share of the population, purchases from modern retail markets will increase (Tschirley *et al.*, 2014). The key issue for smallholders is the rate at which modern retail outlets will grow, and the extent to which smallholder farmers may be excluded from these firms' preferred supplier networks by an inability to comply with quality or volume standards (Tschirley, 2007). The threat to smallholders emanates from the fact that markets increasingly prefer concentrated production, and consistent high volume and standards.

Reardon and Minton describe a "quiet revolution" in Indian food supply chains, with modern retail sales growing at 49 per cent annually (2011), driven almost entirely by the private sector. However, the growth is from a small base, as the modern retail sector in India recently only comprised 7 per cent of the overall food market. There is however also evidence from studies elsewhere which suggests that

fresh foods may be less affected, or at least more gradually affected, by the supermarket revolution. For example, Ayieko *et al.*, (2006) among other studies, show that in Kenya, livestock products are among those least likely to be purchased in supermarkets, compared to staples and other dry or processed goods. Similar results are found for fresh vegetables. Tschirley *et al.*, (2004) show that supermarket chains in Kenya held less than 2 per cent of the national urban fresh produce market, and that nearly all fresh produce purchases in these supermarkets were made by consumers in the top 20 per cent of the income distribution. They calculate that, to reach a 10 per cent market share in 10 years, supermarket sales of fresh produce would have to grow 22 per cent per year in real terms. Similarly, in Vietnam, pork is still mostly sold in the wet market, where consumers perceive fresh un-refrigerated meat as higher quality. As Tschirley *et al.* have projected for East and Southern Africa (2014), traditional marketing systems will continue to play large roles, if not dominate livestock markets, for years to come even with robust economic growth and the expansion of the middle class.

Linking Farmers to Markets

Given the above dynamics of the continued evolution of market channels driven by consumer preferences and purchasing power, the structure and functions within the markets need to be able to meet the challenges imposed by change in order to meet the multiple objectives of supplying urban consumers and fostering rural development. While co-operatives have traditionally played an important role in some livestock product markets, alternative organisational models are continually being explored that may more closely fit the needs of the new market and production circumstances.

Collectives and Producer Companies

In spite of the recognised success stories such as Operation Flood and the Anand model, co-operatives have had a mixed record in livestock supply chains, and have been most prominent in dairy, although other examples are available in poultry etc. Kenya has also had a long tradition of successful dairy co-operatives, although their role peaked in the 1980s (Owango *et al.*, 1998) and now private companies play a larger role, and of course dairy co-operatives are common in middle income and developed countries.

Building on the successes of Operation Flood, dairy co-operatives in India have grown in importance. In India the formal share of the domestic dairy market is some 25 per cent, about half of which is handled by dairy co-operatives, and is significantly up from the 5-7 per cent share of some years ago, the other half by the private sector (Kumar *et al.*, 2014a,b) Dairy co-operatives have expanded significantly in numbers across India in the recent decades, from some 13,000 in 1980-81 to over 140,000 in

2010, although concentrated in certain states as described above in the “leading” zones. Interestingly, the average size and number of members of village-level dairy co-operative societies has changed very little over time (Kumar *et al.*, 2014a,b). This may suggest that given the fact that producers still mainly keep only a few animals, the optimal size for the collective companies is determined by its ability to collect adequate milk from a given zone to be economic and avoid long collection routes, while at the same time not grow so large as to potentially lose the ability for direct member participation in governance processes. This balance of economic density of production and economies of scale against the centripetal forces that can fracture such organisations may be a delicate one and may very much depend on the type of product, frequency of offtake, and market requirements.

Some of the issues challenging co-operatives, and not just in India, have been interference by politically-connected individuals, investment in enterprises such as processing which ultimately exceed the groups’ management capacities, mis-allocation of resources, and excessive governmental regulation that stifles innovation. In both India and Kenya, competition from the private sector also grew as restrictions to private operators were relaxed beginning the early 1990s.

Given the limitations of the co-operative model, other forms of market organisation have been and continue to be explored, particularly with a view towards more business-oriented models that can operate in a professionally-managed manner, innovate and adapt to dynamic market requirements, and also be less dependent on sometime unreliable public services.

The concept of a producer company was introduced through legislation in India in 2002, and has been described as a hybrid between a private limited company and a co-operative, and aims towards greater levels of efficiency and developing opportunities to move further along the value chain (Venkattakumar and Sontakki, 2012). They also may allow greater access to financial capital, and operate strictly on the basis of one person one vote. Some hundreds have been established for handling a range of commodities, some targeting market niches such as organic products, and some are large, with thousands of members. Although co-operatives can opt for conversion under the law, there is little evidence of that occurring on a significant scale, and states vary in their attitude towards promotion of this model in terms of creating awareness or providing incentives (Venkattakumar and Sontakki, 2012). It remains to be seen regarding the extent to which this model of market organisation may play a significant role.

Contract Farming

Another form of market organisation which is often cited as a means to more effectively link smallholder producers to modern supply chains is through contract farming. The aim is to reduce risks and uncertainty among both producers and buyers. Producer risk is reduced by potential access to a reliable market outlet, even

if prices are not included in the terms, as well as access to inputs and sometimes services. Buyers have greater assurance of volume and timing of supply, and through provision of inputs, increased quality control such as breed of animal in the case of livestock. Catastrophic risk due to animal disease for example, may be shifted from the integrated producer/buyer, to the contract grower.

The experience of contract farming in the livestock industry is mixed, and depends significantly on the animal species and product. By far the most success can be seen in the poultry broiler supply chain. In India contract farming has become the dominant model in this part of the poultry industry (World Bank, 2011). This is mirrored in the experiences of Vietnam, Philippines and Thailand (Costales and Catelo, 2009). The reasons for this can be seen in the market demands of a batch-driven production system which requires a large buyer at a precise point in time when broilers reach market size, as well as relatively low barriers to participation by producers in terms of investment.

However, in the similar batch production systems found in pigs, contract farming is less common. Even in Southeast Asia with its large and developed pork industry, still supplied mostly by small producers, contract farming is not the norm, and more informal arrangements are relied on (Costales and Catelo, 2009). Lapar *et al.* (2012) show that contract farming in the case of pig production in Vietnam is unavailable to small producers because of the significant barriers to entry due to the large investment requirements to achieve the needed scale and biosecurity safeguards. Actors who participate successfully tend to be commercial investors rather than agricultural producers.

In the case of dairy, while there may often be contracts between commercial buyers and groups of producers, such as co-operatives, direct contracts between buyers and individual producers are uncommon (Tiongco *et al.*, 2006) some of which has to do with the small volume of individual farm production, but other reasons are described below. Large scale producers may enter into agreements with dairy processors, and but these may often be informal.

Importantly, there is evidence across a number of countries and commodities of high levels of non-compliance with contracts, by producer or buyer, either due to exogenous shocks or deliberately when other preferred options occur (Barrett *et al.*, 2011), and regardless of whether contracts were written or oral. As a result, a high degree of annual exit from contract participation can be observed.

The key differentiating feature of successful contact farming in livestock appears to be batch production and offtake versus daily production and offtake. Dairy producers too easily find alternatives for some portion of their daily milk output, and so informal markets offering higher prices can sometime absorb a significant share of output, with only the remainder being supplied to the formal contract buyer, particularly when seasonal shortages occur. This unreliability of supply deters contractual buyers, and also significantly reduces their incentives to invest in services such as extension, genetics and animal health. For similar reasons, egg production is

less commonly under contract. Given these constraints, contract farming may only remain an important mechanism in livestock supply chains in broiler production for the foreseeable future, until changes in factor values such as wages drive up the scale of production in a wider range of livestock enterprises.

Hubs and Clusters

Another approach to both market organisation and access to services is the “hub” or “cluster”, related approaches that try to make use of a mix of private and public sector actors. While the contract farming model relies heavily on one formal actor, the buyer, these approaches exploit the presence of a number of actors in a dynamic process that can evolve over time to change with needs of producers and the market. They also build on the geographical proximity of multiple producers in the same manner as village co-operative societies.

The hub approach may be best illustrated in some dairy development efforts in East Africa. The model builds a set of services and functions around a core investment, a milk cooling tank to collect and send on milk supplied by some hundreds of local smallholder producers. The investment is owned and managed by a “dairy farmer’s business organisation” (DFBO), along the model of a producer company, but whose membership may be limited to shareholders. A dairy co-operative may operate alongside the DFBO, with more open membership, and whose members constitute the suppliers. Buyers, either processors or local traders, deal directly with the DFBO. A key feature of the model is to use the density of economic activity around the hub to attract private and public service providers, such as private veterinarians and AI suppliers. Private milk processors can use the DFBO’s and co-operatives to convene training in clean milk supply and improved productivity to increase supply. Another key feature is, where feasible, to allow individual farmers to charge the cost of private services against their milk income through the DFBO. (Baltenweck, 2014). The approach avoids reliance on either one large formal buyer or on public extension services, but requires a significant degree of management expertise and oversight, and so some third party capacity building to become established.

A similar approach is promoted by UNIDO, and again focuses on the geographical clustering of enterprises that can play complementary roles in the production and marketing of some given commodity, and the approach is applied to non-agricultural goods as well. The overall geographical cluster may thus include producers, processors, suppliers of equipment or technical service and buyers along the value chain (UNIDO, 2009). In India, BAIF’s variation of the cluster approach is a more local level community development model, targeting 12-15 villages in one locale, that still relies significantly on public or NGO service provision. BAIF’s approach is also less commodity-focused and aims to achieve multiple outcomes within the target communities such improved water supply and health (BAIF, n.d).

Both the hub and cluster approaches are aimed at facilitating the establishment of sustainable “business development services” (BDS). BDS are market-driven services that are provided on a payment basis and to some extent replace or complement publically provided services. They may be provided by private actors or by NGOs, and may range from farm level services to training in production techniques to best business practices. This approach is based on the recognition of the fact that public services such as extension or animal health are too often of poor quality and reliability and also that as producers increasingly commercialise, they may be willing to pay to services that once were assumed to be publically provided. The fact that services are paid for creates demand and a market for those services, and optimally, competition among suppliers and improved quality. Given that this generally in the model of service provision in industrialised livestock industries, some evolution in this direction where feasible in developing country livestock markets is desirable.

Innovation Platforms

In recent years, increased attention has been given to strengthening local actor capacity to develop or adapt market solutions that meet the specific local needs, rather than try to impose one-size-fits all models. The mixed history of success of co-operatives is one illustration of the fact that appropriate models for one setting may not be optimal for another. This emphasis on “innovation capacity” also recognises the need to foster local ownership of the process to enhance sustainability (Hall and de Leuw, 2009). The operational approach has been to use “innovation platforms” as a means to create new linkages between a wider range of market actors than may be currently occurring. Such a platform is typically made up of producers, private and public service providers, market agents, regulators and researchers or technical experts. They hold periodic meetings, facilitated by trained innovations experts, to discuss the needs and interests of each set of actors, and to identify potential new solutions that offer mutual benefits, including new market arrangements. They are typically not intended to be self-sustaining organisations, but rather to operate for a time to catalyse other more durable organisational models, such as the hubs or clusters described above. Originally applied mainly to helping farmers explore technical options for production, they have also been applied to tackle the development of markets and services. In Rajasthan the innovation platform approach was used to improve the performance of services for smallholder goat producers, including market linkages (Swaans *et al.*, 2014, and [http: imgoat.org](http://imgoat.org)). Given the significant investment in facilitation and monitoring required to establish innovation platforms, the jury remains out as to whether the returns to investment justify the use of this approach.

Organisational Issues in Extensive or Dispersed Livestock Systems

Some livestock products markets are particularly resistant to forms of collective action, often because of the structure of production. Small ruminants for example may be raised as complementary outputs in mixed crop-livestock systems, although specialist producers may be found in dryer areas. The generally atomised, irregular and infrequent off take of production, in addition to distances, imposes market and organisational constraints. Research suggests that in those cases, local village markets offer the best bargaining power in spot markets for producers, although in an unregulated environment. Closer to large urban markets for small ruminants, established power structures, brokers and intermediaries control the market conditions (Mehta, 2011). Attempts to introduce transparency in such markets such as use of weighing scales for live animal sales, have been resisted by market intermediaries in the Rajasthan example mentioned above.

Intermediaries and retailers are often accused of extracting above-normal profits at the expense of producers in such, but the evidence for that may be mixed. The generally poor market power of producers in these unregulated but highly structured markets can be assumed to favour the large actors. Organisational options in such markets are more limited compared to those in which producers can exert greater control through large scale collective production or sale, such as in more intensive dairy. Collective action selling in the highly atomised setting of a non-batch produced product like small ruminants, that are also viewed as asset accumulation by producers, is always vulnerable to side sales for convenience and cash shortage, and subject to individual relations with traders, sometimes based on years of interdependence.

The issue is the low density of economic livestock activity in small ruminant production systems, compounded in many cases with remoteness, poor infrastructure, and long-standing traditional relationships between buyers and brokers. In addition, seasonality and climate variability present major constraints to the predictable supply of animals that large buyers want, further constraining market development (Hamza *et al.*, 2014). Given the growing importance of small ruminants in Indian and other development country demand scenarios, tackling these market challenges should be a priority.

Food Safety in Livestock Product Markets

Zoonotic diseases, those which affect both people and animals, account for a significant proportion of incidence of human infectious disease globally. The top 13 most important zoonoses cause 2.2 million human deaths and 2.4 billion cases of illness annually and also have nutritional impacts. In low-income countries the correlation between rates of protein malnutrition and incidence of endemic zoonotic diseases is 99 per cent (Grace *et al.*, 2012). India has been identified as a hot spot for

threats from zoonotic diseases for people. When analysis was conducted of the interface of the three key factors of (a) poverty, (b) rapidly changing livestock systems and (c) the prevalence of zoonotic disease, India emerged as the country at greatest risk globally (Grace *et al.*, 2012). In many cases these diseases can be transmitted through livestock products, for example through pathogens for salmonella in meat and brucellosis in milk, in addition to other pathogens that cause gastrointestinal disease including diarrhoea in children. It is difficult to obtain systematic data on livestock product related threats to food safety in India, but case studies show e-coli and campylobacter contamination in some meat products at up to 50 per cent among other pathogens (Bhilegaonkar and Agarwal, 2008). In addition, aflatoxins may occur in milk from animals fed contaminated feed, such as groundnut cake in some cases (Thakur *et al.*, 2014) with potentially poisonous and carcinogenic effects in people.

The growth in the modern organised livestock market share is of course central to mitigating these risks over time, given that the actors involved, whether private or cooperative, typically apply modern HACCP⁴ protocols and the food safety standards as prescribed by the Food Safety and Standards Act (2006). This paper will not try to prescribe steps to be taken in the organised sector, which are generally well understood and proven. However, as has been discussed, the bulk of livestock products in India as well as many other developing countries is handled by the informal or unorganised market, where hygiene practices are rudimentary, and the actors by definition generally operate in an unregulated environment as regards food standards. How can food safety and other standards be addressed in such cases?

Engaging Constructively with Informal Markets

One approach to tackling this that has been demonstrated in East Africa and in Assam is through working directly with informal market actors to increase both their capacity for improved hygiene and food safety, as well as their incentives for doing so. In most settings, informal market actors are regarded as exploitative middle men providing no real service, and creating threats to health. As such, they are typically ignored by market development projects, which prefer to work with groups of producers, collectives of some kind, and with modern private sector market players. In some cases these markets are sanctioned under certain conditions such as raw meat markets under license, but in others regulators and policy makers either ignore informal market actors, or actively block their activities, in some cases confiscating equipment, imposing fines and even threatening arrest. These actions drive informal actors to further hide their activities and to invest less in any modern hygienic equipment that may be at risk of confiscation. In both East Africa and Assam the approach used is a “training and certification” strategy which also brings in regulators. In all settings, studies found that as expected informal milk market actors had no formal training in hygiene or generally in business practices, and felt shunned

and ignored by development agencies. The approach had three components (1) accreditation of trainers generally in a local NGO or business development services (BDS) provider, (2) training of market actors by the BDS provider in handling, hygiene, processing and business skills and (3) close communication with the local regulatory agency to provide some sort of certification or recognition of the trained market actors (Omore and Baker, 2011). By providing traders with increased capacity and regulatory incentives, an environment for improved performance can be created. Outcomes included improved profits to traders, better prices for producers, and improved food safety (Kaitibie *et al.*, 2010; Lapar *et al.*, 2014).

A similar approach can be used for a wide range of traditional product markets. The concept is one of bridging the gap between the inadequate traditional standards on one hand, and sometimes the costly standards of the modern market. It is an evolutionary process that recognises as in Figure 7 that until consumer demand and willingness to pay for higher food safety and quality standards rises, informal markets will supply lower cost products with lower standards, regardless of policing or enforcement. Engaging constructively to improve capacity and incentives in the informal market offers an intermediate and evolutionary path to higher standards over time.

Not Discussed in this Paper

There are number of issues which are not adequately addressed in this paper due to limitations to scope and length. These include the potential for new ICT tools such as smartphone apps to provide better market information; policies and incentives to increase private sector investment in market and product development, facilitate public-private-partnerships, and to reduce transactions costs and bureaucratic obstacles; the management of formal organised product supply chains; the increased role of trade for potentially driving greater market participation by smallholders; and the use of livestock auctions, which have a mixed history in developing countries but in the long run are likely to be needed as part of the market structure.

An important area of livestock market development not addressed in the paper is the potential for greater demand for indigenous breeds of animals and related products, some of which command high price premia. Examples are local breeds of chicken for which there is demand among some consumers for reasons of traditional tastes. As purchasing power increases, coupled with increasing interest in local and/or organic products, demand for such products may increase, possibly requiring innovative branding and certification mechanisms, and creating unique market niches which may be relatively immune to competition from imports.

III

KEY LESSONS AND CONCLUSIONS

All projections indicate clearly that demand for livestock products will increase in developing countries for at least some decades to come, particularly in Asia, and including India. If Indian consumer choices shift towards greater meat consumption, the growth in demand in India for those products could be particularly significant, given the size of the population. Some key issues and potential strategies are as follows:

- Smallholders will likely continue to supply the bulk of ruminant livestock products for the foreseeable future, even as the role of larger commercial producers will grow in importance. Most of monogastric production, particularly of broilers, is likely to continue to scale up, given the economies of scale. However, smallholders continue to be competitive in many settings. The two worlds of livestock production will thus continue. The implication is that market systems to manage the supply of livestock products both domestically and for export will need to continue to evolve to suit the needs of small scale suppliers, even while adapting to changing market demands.
- Continued innovation is needed for better linking smallholders to markets. While co-operatives will continue to play an important role in some livestock product markets, more flexible and business-oriented models for co-ordinating and assembling product will be needed. In some settings, the use of hubs, clusters and innovation platforms that take a business development services approach should continue to be explored, to foster greater private sector provision of services. Extensive production systems, such as those commonly supplying the growing demand for small ruminant meat, may need particularly innovative organisational models to cope with the relatively large unit transactions costs of sourcing animals from dispersed areas of low economic density, and also with the strong market power of buyers in those settings. These are topics that should receive strong research attention from market and institutional economists, who can exploit the fact that there exists a rich range of market development experimentation in India among NGOs and others.
- In spite of supermarketisation, unorganised or traditional markets are likely to continue. The trend towards larger role for supermarkets is building on a small base. As has been demonstrated, until consumers are willing to pay for higher standards or reduce their desire for traditional forms of products, the unorganised markets will continue to be important, and will resist attempts to enforce standards.

- An evolutionary approach is needed to “bridge the gap” between unorganised and organised supply chains. Improving standards and performance in unorganised markets may need to be done incrementally over time. The mostly small scale actors who form the bulk of suppliers in unorganised markets are often ignored by development efforts, and have few incentives to improving practices. Capacity building among such actors, linked to certification, BDS, and a more supportive regulatory environment can bring about changes in market practices that improve the safety and quality of livestock products, and generally improve market performance.

NOTES

1. The terms informal, traditional or unorganised are used interchangeably to describe markets that generally employ few if any modern processing practices or standards, and that supply live, raw or minimally/traditionally processed products. These commonly-used terms are sometimes inaccurate, since such markets often comply with local municipal business or tax requirements and so may not be entirely informal, and they may often be quite well organised.
2. Agricultural Prices in India published by Ministry of Agriculture, Government of India.
3. In this case “informal” was defined as all economic enterprises besides formally registered corporations, so possibly wider than some other more restrictive definitions.
4. Hazard analysis and critical control points (HACCP).

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