

LOGISTICS - THE KEY TO ADDRESSING FOOD SECURITY IN EMERGING MARKETS



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Logistics - The key to addressing food security in emerging markets

Economic slowdown and climate change is increasing rates of undernutrition in the developing world. Increasing production and improving yields will only partly address this challenge. The huge levels of waste which occur in the supply chain post-harvest must be addressed to truly solve the problem.

The United Nations forecasts that the world's population will rise to 9.1 billion by 2050 and that food production will have to rise by 70 per cent if it is to keep pace with people's needs. What is more, the Food and Agriculture Organisation (FAO) claims that the number of undernourished people in the world has been rising since 2015 and now stands at an estimated 821 million⁽¹⁾. The situation, according to the FAO, is most alarming in Africa where the Prevalence of Undernourishment (PoU) has been increasing right across the continent. Almost one-in-five Africans 'suffer from hunger' with the global figure being one-in-nine.

Asia is somewhat kicking this trend of increasing undernourishment with 11.3% of people projected to be affected in 2018, down from 11.7% in 2015. In 2005, 17.4% of people in the continent were undernourished showing the considerable improvement which has occurred over the past 13 years.

Weak economic performance is the most important factor in undernourishment as unemployment increases and disposable income falls. However, according to a World Economic Forum report, climate change is also playing a role in the reduction of crop yields and calorie intake in what they call 'food insecure' emerging markets. The report found that climate change was reducing rice yields, for example, by 0.3% and wheat yields by 0.9% on average a year⁽²⁾.

Considerable efforts will have to be made if food production is to keep pace with the demands of population growth and the additional headwind of falling yields is to be overcome. An additional hazard is that population growth is largely occurring in developing regions with the most fragile economies, societies and inefficient infrastructure. This means that an increasingly large proportion of the world's population will be located in high-risk areas, where a poor harvest or conflict can result in humanitarian disaster.

However, an improvement in food yields and production, although important, is unlikely to be sufficient on its own. As this paper lays out, one of the main ways in which the impact of economic downturn and changing weather patterns on food security can be mitigated is by improving the presently woeful inefficiency of food supply chains in the post-harvest phase.

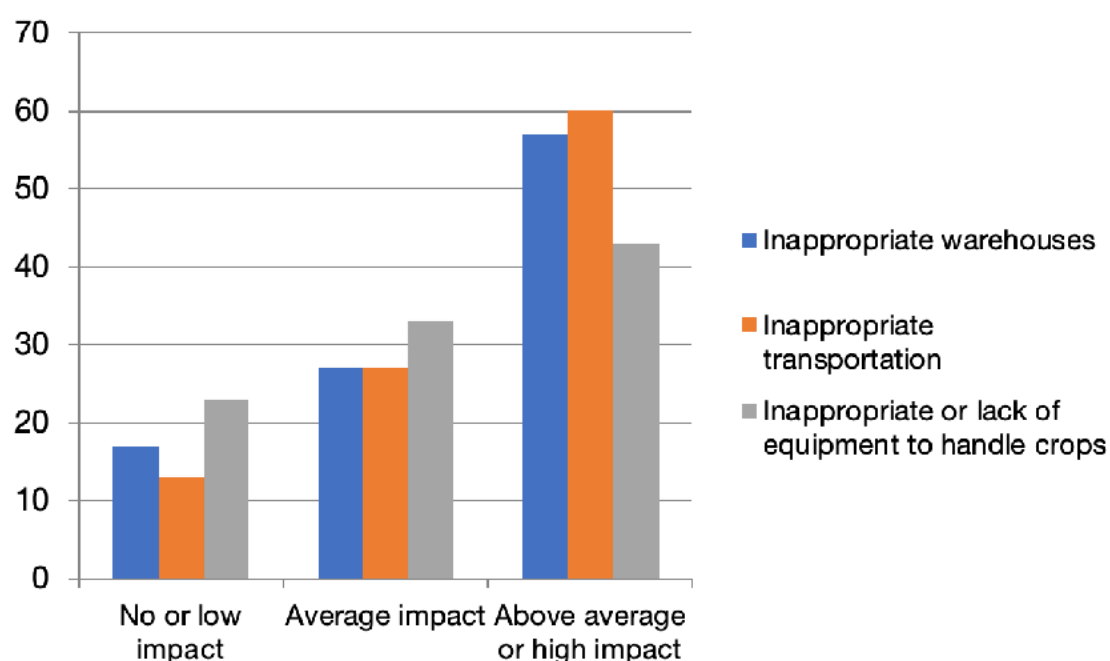
Although empirical evidence is scarce, it is estimated that in the developing world between a third and a half of food is lost post-harvest, between farmer and consumer(3). This occurs through poor handling or biodeterioration by micro-organisms, insects, rodents or birds. Livestock products, fish, fruit and vegetables are most at risk due to poor standards of refrigeration. Most fresh produce is transported in an unpackaged form and is often sold at markets where handling dramatically reduces its shelf life.

A survey undertaken by researchers at Loughborough University very clearly shows that inappropriate warehouses

and transportation have a high impact on the level of food losses(4).

Whilst Post-Harvest Food Loss (PHFL) is a major problem for emerging markets and their populations, it also offers a major opportunity. After all, if the logistics can be successfully addressed, a vast amount of additional food can be brought to market with no increase in production output. It could be conjectured that the improvement in rates of undernourishment in Asia over the last decade might be linked directly and indirectly with the considerable increase in logistics efficiency in the region over the same time period.

To what extent do you think the following process related factors influence the level of food losses of your products?



Source: School of Business and Economics, Loughborough University

The investment in logistics infrastructure has not only fuelled economic growth, providing consumers with more money to spend on food, but also reduced the logistics costs of getting the products to market in the first place, subsequently lowering prices.

FRAGMENTED SUPPLY CHAINS UNDERPIN THE PROBLEM

One of the core reasons behind the wastage is the extreme level of fragmentation involved in production and indeed food supply chains as a whole. The industry in developing markets is dominated by micro-farmers owning less than one hectare. They have access to very limited resources in terms of temperature control and for that matter very little understanding of how to sympathetically handle produce. Marketing channels are disorganized and complex involving traders, middlemen and wholesalers, and this leads to enormous inefficiencies. On top of this, transport systems and operations are expensive and undeveloped.

Larger commercial farmers have much more efficient supply chains, but in many cases they produce for export markets. They supply products to a high specification for international retail chains but are untypical of the market as a whole. Poorer farmers producing for a domestic market are unable to invest in

their facilities to anything like the same degree.

However, the success of export-led farmers in markets such as Kenya can be used as an example for wider agriculture. The demands of Western retailers for consistent production levels and standards of quality have increased cooperation amongst farmers. This has increased their resources and allowed them to take more control of the supply chain, initiating the introduction of cold chain systems, for example, alongside their marketing channels.

IMPROVING LOGISTICS TO REDUCE FOOD LOSSES

Upgrading transport infrastructure, superior trucks, better packaging and enhancing the reliability of power supplies (allowing for more refrigerated storage) as well as improving training, would have immediate supply chain benefits. Much can be done to encourage private and government support for these highly-achievable aims. The points below summarize some of the problems and solutions to mitigating Post Harvest Food Losses:

- **Better transport infrastructure**

A robust road network is an essential element in getting product to market, but one which in many parts of Africa is sorely lacking.

This is one of the primary reasons why cost of transport can be five times more expensive in Africa than in some parts of Asia.

One of the key ways to address this problem is to stimulate investment from the private sector. Some of the biggest investors, however, in Asia, Africa and Latin America are Chinese state-owned enterprises, which have been encouraged to invest by the Chinese government. The reason for this is obvious – improved road infrastructure is necessary to efficiently move raw materials from inland locations to ports and Chinese companies are some of the biggest players in the exploitation of natural resources. However, the improved infrastructure will also help food supply chains and further investment from organizations such as FAO, EU, USAID, UNDP and the Asian Development Bank has been encouraged.

Governments in emerging markets have also been encouraged to take a more holistic view of transport. Cost-benefit studies can show that returns on transportation projects far outweigh the investment. These benefits are not only economic, but also society-wide.

• **Improved road transport services**

Distribution of produce in Africa and many countries in Asia is characterized by transportation in open-sided trucks which are used to move goods up to 850 kilometres. As well as the obvious problem of decay in hot conditions, poor handling, overloading of goods without separation,

rutted roads and a lack of ventilation all play a role in the degradation of produce.

Obviously, investment in better trucks would improve the condition of the product at the end of the journey. Improvement of vehicle stock will be a natural consequence of increased GDP and value creation.

One of the most important steps is training. At a management level, some very basic steps can be taken to ensure that transportation professionals optimize transport planning. At an operational level, the way in which goods are loaded and unloaded can also be addressed. Training seminars and the dissemination of information materials can play a role in this.

Improving the availability and quality of specialized transport assets is also important. Although refrigerated containers are in use in many emerging markets, they are certainly not universally available.

• **Better packaging**

There is an acute lack of packaging technology in emerging markets and this includes labelling. Packaging is important not only to protect the products in transit, but also once they have been purchased by the consumer. In many countries, such as India, most vegetables are transported loose.

The problem is most acute in the perishable fruit and vegetable sector. The use of (very cheap) low density polyethylene film, combined with

temperature controlled storage (13–14 degrees Celsius) could extend the shelf life of bananas, for example, from 5–7 days up to 45 days. Even at a very basic level, the use of corrugated fibre board (CFB) and moulded trays or partitions, instead of timber, significantly reduces bruising.

The use of CFB boxes would be a first step towards unitization of shipments on pallets, and the introduction of forklift trucks would be a major step in reducing product damage.

In terms of labelling, there is a lack of regulatory systems that provide supply chain partners and consumers with essential data about the product. This can be addressed by governmental initiatives and regional coordination.

- **Improved storage and training**

Warehousing and storage infrastructure throughout the food supply chain in emerging markets is often weak or non-existent. This includes on the farms themselves as well as at each supply chain node right up to end delivery to the processor, market or port. Temperature-controlled facilities are often in short supply and sanitation is poor. In addition, there is also a lack of training and awareness related to temperature requirements or packaging restrictions for mixed loading. For example, ripening climacteric fruit (bananas, avocados, tomatoes for instance) should not be transported with leafy or succulent vegetables which will be harmed by ethylene emissions.

This latter point can be addressed by improved training as well as research and dissemination of best practice.

With regards to the provision of staging/storing facilities, it has been suggested that individual government support for clustering of warehouses could bring significant benefits. This could include incentives or tax breaks for warehousing zones which would then lead to private sector investment, the development of support services, a trained workforce and shared expertise.

Refrigerated warehousing is hugely problematic. The process is energy intensive and relies on a continuity of energy supply, which in many emerging markets cannot be relied upon. However, the impact on the food chain is considerable. Shelf life of produce properly cooled can be extended from three days at room temperature to 90 days in the right conditions.

- **Better cooperation**

One area in which there could be immediate improvements for little investment is in cooperation between supply chain partners. Better coordination among supply chain partners is a key factor in the reduction of PHFL, along with better infrastructure and better skills, training and information sharing. However, whilst many supply chains remain so fragmented and complex, this, in practice, will prove difficult to achieve.

CASE STUDY: CASSAVA IN NIGERIA

Cassava, is a versatile root vegetable which is grown widely across sub-Saharan Africa similar in shape to sweet potatoes. It has an extensive root system which makes it more resilient to drought conditions. Consequently, it may prove an important crop in climate change adaption strategies for agriculture across the region. One research project found that whilst maize and sugar cane yields had declined, cassava yields had actually risen over the period analysed (1974-2008) taking into account mean changes in climate⁽⁵⁾.

Whilst its natural resilience makes cassava an obvious choice for farmers in terms of yields, its perishable nature once harvested means that a highly efficient supply chain is required if high levels of wastage are to be avoided. Unfortunately, in many parts of Africa such supply chains do not exist, as evidenced by the situation in Nigeria.

Cassava is a staple crop in Nigeria used for the production of flour for bread, starch, syrup, dried chips and even ethanol. It is produced by many thousands of smallholders with an average farm size of just 2 hectares and also processed by small businesses. The crop accounts for 40-50% of the calorie intake of the population in large parts of Nigeria.

Whilst suited to the Nigerian climate, once harvested cassava tubers can deteriorate very quickly (within 72 hours) due to fermentation. The valuable part of the product is its starch content, which makes up only 15-20% of its weight. Its low value to weight ratio means that lower transport costs can have a high impact on the profitability of the overall supply chain.

One way of lowering transport costs is by reducing the distance between harvesting and processing. Demonstrating the complexity of the supply chain decisions involved in the process, smallholders presently have an option of sending their cassava to local processors where they will get low prices due to the resulting lower quality end product (flour known as 'garri'), or longer distances to more sophisticated factories which produce High Quality Cassava Flour (HQCF). This results in better prices but will cost the farmer more and in many cases this has resulted in a headwind to supply chain restructuring.



According to the German Federal Ministry for Economic Cooperation and Development, cassava wastage in the garri supply chain runs at about 35% whereas in the HQFC supply chain it is only 20%(6). This is due to a number of factors, partly as a result of poor storage and transport practices in the fragmented garri supply chain and partly due to the more robust nature of the HQCF final product (lower levels of moisture compared with garri).

One way of overcoming some of the problems related to the perishable nature of the product and its supply chain complexity, would be to create centralized collection points where consignments of cassava from small farmers can be consolidated. This would also allow the storage of the product in conditions which would prolong its life (i.e. even such basic initiatives as creating areas of shade). At the collection point, other packaging methods could be utilized such as bagging or packing the cassava in straw. Consolidation could also result in the faster and more cost-efficient movement of product to processing plants in larger, more frequent trucks. To support these downstream transport movements, investment is needed in road and rail infrastructure by government and also, in terms of rail wagons, by the private sector.

It is self-evident that if processing plants could be moved closer to the farmers, then transport costs would fall. As well as this, by adding value higher up the supply chain, investment could be made more readily in storage and downstream distribution facilities. Additionally, processing at a location close to harvesting would stabilise the product. The cassava market has a history of volatility as farmers often overproduce the crop in response to a previous year's spike in prices. Gluts lead to high levels of wastage, a situation which could be mitigated by processing the cassava into chips which then have a longer life.

However, perhaps in terms of return on investment one of the best ways to reduce losses of cassava is to educate farmers in the best ways to store and ship the product.

Cassava is already very important to farmers and consumers in Nigeria, and indeed throughout much of the rest of Africa. The resilience of the plant makes it an obvious choice as a food source in times of drought. However, its perishable nature and the fragmented supply base means that efficient supply chain organization and good transport and logistics will be essential to reducing post harvest food losses. With undernourishment in the region on the rise, a situation likely to be exacerbated by climate change, the issues highlighted above must be addressed to increase levels of food security.



CONCLUSION

Undernourishment is a problem facing a significant proportion of the world's population. Whilst economic development has helped to improve the situation in some parts of the world, climate change is proving to be a significant challenge to improving food security and a renewed focus on supply chain efficiency is required.

The priority given to increasing farming productivity, whilst ignoring the inefficiency of the overall supply chain has clear parallels with the now discredited industrial production strategies of the 1970s. What manufacturer these days would be happy with up to half its products being unusable by the time they arrived at the customer?

By focusing on reducing waste in the supply chain, rather than purely on production efficiencies or yields, more food will arrive where it is most needed

and at a lower cost to the consumer. This will not only increase farmer income, but also help to alleviate poverty and hunger. As Dr M L Choudhury, former Horticulture Commissioner in the Indian Ministry of Agriculture commented, 'It is unfortunate that in India, policy makers and planners set targets for increased production without making any effort to reduce postharvest losses.'

It is clear that whilst there is no doubt that advances in food technology and farm productivity will help mitigate the effects of the world's rising population, these gains will be negated by climate change-driven falling yields unless more is done to improve the efficiency of supply chains.

Improving food logistics in emerging markets does not just have humanitarian implications. It would decrease the need for additional areas to be cultivated which would reduce the environmental impact of agriculture. It would also reduce the level of farming intensity, meaning fewer pesticides and chemical fertilisers are required.

Production levels are already sufficient to feed the world's population for many years to come. The real challenge is getting these products from farm-to-table with the minimum of waste.

Footnotes

1. The State of Food Security and Nutrition in the World, Food and Agriculture Organization of the United Nations, Geneva, Switzerland
2. World hunger is on the rise - and climate change is to blame, WEF, Geneva.
3. Enabling Trade: From Farm to Fork, WEF/Bain & Co, Geneva
4. Despoudi, S, Papaioannou, G and Dani, S (2012) Supply chain collaboration (SCC) to reduce postharvest food losses (PHFL). In 17th Logistics Research Network –Annual Conference, Cranfield University, UK, pp 1–8
5. Ray DK, West PC, Clark M, Gerber JS, Prishchepov AV, Chatterjee S (2019) Climate change has likely already affected global food production
6. WEF/Bain & Co (n 3)



ABOUT THE AUTHOR

Professor John Manners-Bell has been writing about supply chain and logistics issues in emerging markets for the past two decades. As Chair of the Logistics and Supply Chain Global Agenda Council of the World Economic Forum, he initiated a project examining Post Harvest Food Losses, presenting the findings at the WEF/Grow Africa Cape Town conference. He has travelled extensively throughout the emerging world, including countries in Latin America, Africa, Middle East, India and China. He has written books on Logistics in Emerging Markets, Supply Ethics, Supply Chain Risk, and Innovation and Disruption.

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