Boosting technology uptake

Some ideas for improving small-scale mango farming in Kenya

Key messages

• The design and promotion of preharvest, harvest and post-harvest technologies needs to be based on a good understanding of the value chain and the motivations and constraints of the actors within it.

• Some of the technologies currently being marketed to small-scale mango farmers in Kenya are designed for processes carried out by other actors in the value chain.

• Many small-scale mango farmers have limited access to markets for higher-quality fruits.

• Small-scale mango farmers face numerous constraints and disincentives for investment in new post-harvest technologies.

Increasing the uptake of preharvest, harvest and post-harvest technologies is often seen as a way to reduce losses and increase incomes in small-scale agriculture. Private-sector actors, development initiatives or governmental institutions identify a set of desirable technologies, that can increase smallholder livelihoods, and try, through a combination of marketing, subsidies and agricultural extension service, to persuade farmers to invest in them. However, there is a risk that such initiatives set too much store by the technologies, and do not sufficiently take into account the users’ motivations, preferences and constraints in relation to technologies, or the realities of the value chain.

In 2016–17, a team of researchers from SEI’s Initiative on Behaviour and Choice, Expedition Mondial, Jomo Kenyatta University and UN Women set out to better understand the “socio-ecological system” of small-scale mango farming in Kenya, with support from the Rockefeller Foundation’s YieldWise Food Loss initiative. The aim was to show how a service-design approach could help to improve the development and uptake of technologies.

This brief summarizes key insights from the study, and how they could be taken into account in intervention design. A full write-up of the study can be found in the report Increasing Access to Post Harvest Technologies to Women Farmers (SEI and Expedition Mondial 2017).

Mango farming in Kenya

Agriculture is the most important provider of livelihoods in Kenya, with more than 75% of the population depending on the sector for food and income. Mango is an important food and cash crop, whose production increased six-fold to between 2000 and 2014. However, a significant proportion (>25%) of the crop is currently lost before, during and shortly after harvesting, due to, for example, pests, inadequate on-farm storage and small-scale farmers not having direct access to markets for their produce.
On-farm technologies can reduce losses and improve incomes – including by producing higher-quality fruits, processing the mangoes (into more durable and/or higher-value products), and by allowing them to be stored for longer periods without deterioration. However, uptake of these technologies is generally low, particularly among more marginalized groups, including female-led households.

**Study design**

The study design built on insights from the field of service design. A branch of “Design Thinking”, service design is an interdisciplinary approach that focuses on making services useful, efficient, effective and desirable to the user (Stickdorn and Schneider 2012). Service design methods may be applied to inform the design of a new service or system, or to improve the functioning of an existing service or system from the perspective of the user.

Service design research includes four key steps: interactions (interviews), insights (thematic analysis and identifying emerging patterns), ideation (fine tuning analysis and refining themes) and triggers (the use of visual aids such as pictures, prototype products or games to encourage or trigger the respondent to elaborate on their experiences).

To gather the data, we used qualitative methods, starting with a broad picture and gradually narrowing the scope. To get a fuller understanding of the farmers and their contexts, the team carried out several different types of research, from participatory observation to field workshops. Periodically, we presented our evolving analysis to farmers and other stakeholders for their feedback. We mapped different value chains and user journeys to better understand the roles of, and relationships between, different actors, and how the system functions as a whole (Figure 1). In total the study included 206 participant interactions – observations, interviews and field workshops.

Throughout the field research we compiled our data in a “user journey map” – a visualization of the journey of a mango farmer through a typical growing and harvesting season in Kenya, in terms of activities, main driving forces and thresholds during the preharvest, harvest and post-harvest phases. The user journey map provides a visual overview of the user’s main needs and aspirations, and identifies the social, economic and contextual factors that influence their behaviour. Box 1 describes the various components of our study design.

**Findings**

**Value chain actors**

We found that besides farmers and end-buyers (such as retailers or mango-processing companies) there were three other key actors or roles in the value chain: harvesters, brokers and farmers organizations (see Figure 1). While harvesters – potential users of some of the technologies – might be the farmer or their hired labourers, they were often labourers hired by a broker.

The role of brokers – middlemen who purchase mangoes at the farm gate or other collection point and sell them on to end-buyers – was particularly important from the point of view of technology promotion, as will be discussed below. Farmers organizations, where they existed, could help their members to invest in technologies or to negotiate with brokers and buyers. They also often acted as collection points for members’ harvests.

Given the overlapping roles played by the different value chain actors, farmers may not always be the only potential users of technologies. For example, brokers might well invest in improved harvesting technologies if they carry out the harvesting of fruits themselves, and they see that technologies could increase their incomes. Similarly, it might make more sense for farmers to invest jointly in larger-scale technologies through a farmers organization.
Farmers’ motivations and constraints

While farmers commonly used pre-harvest technologies – particularly fruit fly traps and fertilizers – improved harvesting tools and post-harvest technologies had low adoption rates in both study locations. The post-harvest technologies being marketed to farmers included those for storage (e.g. crates and cold storage) and processing technologies that could prolong the shelf-life of the mangoes and produce higher-value products (e.g. mango pulp, concentrate, juice or flavoured yoghurt). Several reasons emerged for this low adoption.

Farmers tended to sell to the processing market – via brokers – because it offered better financial returns than selling on local markets. In addition, farmers had very limited access to the export market, which would give the highest value for the fruit. This was due to poor infrastructure and lack of resources to invest in higher-quality production. A clear message from the field research was that the farmers thus tended to prioritize quantity of mangoes over quality; technologies aiming to improve the quality of fruit or process it into higher-value products were therefore less attractive.

A common theme in discussions with the farmers was also their distrust of brokers. Many farmers complained that brokers used unfair tactics to reduce the prices paid for mangoes. They felt they had little negotiating power with the brokers since they depend on the brokers for transport and storage. This left farmers feeling hopeless and more unwilling to invest in technologies.

More generally, the farmers had limited economic resources for making larger purchases such as trucks to transport mangoes, storage or cooling facilities, which further reduced their market access. Most of their income was spent on school fees, food, fuel and other household expenses.

Another reason for low adoption of the technologies was that, for the vast majority of the farmers, mango production was not the primary source of income. Most farmers raised a range of crops. Thus, investments in technologies specific to mangoes had to compete with investments for other...
crops. The adoption of the studied technologies would presumably be higher on larger farms specialized only in mango production.

Finally, the study highlighted the fact that any new technology is in competition with more established, familiar technologies and practices, which need to first be properly understood if they are to be improved on. For example, we found that farmers rarely used new harvesting tools that could significantly reduce damage to mangoes during picking. Farmers explained that the traditional harvesting methods – such as shaking the trees, using wooden poles, climbing trees to “drop and catch” – were quicker and did not require any investment. As they were selling to the processing market, damaged fruit was not a major concern. For technologies to be successful, they must be based on a thorough understanding of the users’ behaviour, everyday choices and context.

**Recommendations**

The findings of the study suggest some recommendations for development actors seeking to boost technology uptake and incomes in predominantly smallholder value chains.

- In designing technologies and promotion initiatives, always carry out thorough research on the whole value chain, to understand how the system works and the roles, motivations and constraints of the actors involved. This will help in selecting and targeting technologies to the right users, in devising effective marketing strategies, and in identifying the most effective entry points.

- Consider supporting and working with farmers organizations such as cooperatives, to help farmers negotiate commodity prices, raise capital and access market and technology information. It may also be more efficient and feasible for farmers to invest jointly in some post-harvest technologies through farmers organizations – for example vehicles, storage facilities and value-adding processing technologies.

- Taking a service design approach, efforts to boost uptake of technologies that can improve the quality of harvested fruits should be complemented with efforts to ensure that farmers access the appropriate (usually export) markets, for example by providing refrigerated transport services.

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**References**


