

Integrated delivery systems of improved livestock and fish genetics

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Key messages

- Integrated delivery systems are required for farmer uptake and adoption of improved livestock and fish genetics; for sustainability, delivery systems should be designed in parallel with product development.
- For optimal delivery, the process of product selection, multiplication, and dissemination must be supported by an enabling policy environment, investment partnerships, end-user engagement, stakeholder integration, and knowledge feedback.
- Improved livestock genetics delivery systems can deliver more than just genetics to smallholder farmers; genetic interventions can be packaged or bundled with other relevant interventions to facilitate optimal far system productivity.

In most developing countries, significant advances have been made to improve livestock and fish genetic technologies, knowledge, and germplasm. Yet, weak public and private sector service delivery constrains translation of genetic improvements into productivity gains for smallholder farmers, hindered primarily by the absence of enabling policy environments, poor collaboration with investor institutions, poor targeting of end users, poor actor integration, and limited or insufficient knowledge feedback. Going forward, it is critical that improved livestock and fish genetic products are developed in parallel in integrated delivery systems. This co-creation of products and delivery systems will enhance farmer access and uptake of improved livestock and fish genetics.

Integrated delivery systems are networks that aim to improve access to adequate services, products, and information for male and female value chain actors needed to improve livestock productivity and returns. Livestock services delivery systems are the integrated arrangement of technologies, institutions, and policies aimed at efficient and gender responsive delivery of livestock services e.g., improved genetic material, feeds, health and extension.

Box 1: Critical success factors

Enabling policy environment: An environment where laws and executive orders enable the development and delivery of products and services without undue or unclear restrictions.

Public-private investment partnership: Relation among public and private entities in which the private partner has made an 'investment' in terms of funds, risk, or management responsibility and the public partner 'invests' assets or information

Targeting end users: Engaging populations targeted to use genetic products during the development and delivery phases, especially regarding their preferences and demands.

Integration of key actors: Facilitating systematic engagement of relevant stakeholders.

Knowledge feedback: A structure that supports the timely flow of critical knowledge and information between actors.

Figure 1. Livestock and fish critical success factors for integrated genetic product development and delivery.

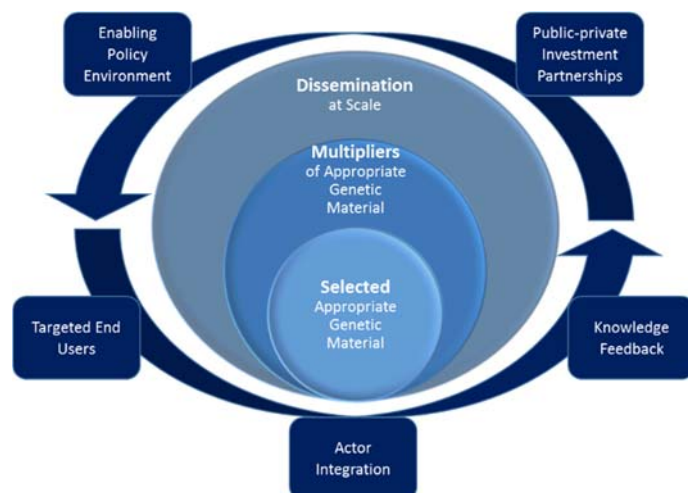


Figure 1 illustrates the livestock and fish critical success factors of effective delivery systems. The central graphic demonstrates effective livestock and fish product development from selection of appropriate genetic material to dissemination for a diverse set of end users.

The outer circle represents the critical success factors of 1) enabling policy environments; 2) public-private investment partnerships; 3) targeted end users; 4) actor integration; and 5) Knowledge feedback that influence and drive the process of product selection, multiplication, and dissemination. It is also important to note the internal process of product development and the external critical success factors are occurring and influencing in-parallel.

Integrated delivery systems

Historically, products have been developed and only after completion have the partners, systems, and end users been considered and engaged. This sequential approach has resulted in the development of a number of products that did not fit the needs of the end user, failed to effectively deliver genetic gains on-farm, or where not candidates for commercialization. As a result, projects in the Livestock and Fish CGIAR Research Program aim to develop products and delivery systems in parallel.

Targeting end users and integrating actors

Community-based breeding programs (CBBP) in Ethiopia has brought tangible changes to the livelihoods of rural sheep producers. They have evolved from establishment of sheep breeding communities to formal breeders' cooperatives to commercializing breeding rams. CBBP beneficiaries continuously participate in the breed improvement program since the formation of the associations/cooperatives. The success of the cooperatives has attracted new members. Farmers have attributed their involvement in the cooperative as having helped them clearly formulate breeding objectives in line with their preferences and needs.

After a few years of the sheep breed improvement program, most associations in Menz and Bonga are now formal cooperatives registered by the government. Being legally registered ensures that their structures are more accountable to their members; it also qualifies them for support from public bodies.

Nowadays, CBBP participants earned Ethiopian ETB 3100 per household, per year, on average, while non-participants earned ETB 2486. The difference between CBBP participants and non-participants was substantial in Bonga and Menz, but less so in Horro. In Bonga, farmers clearly benefit from participating in the CBBP. If their rams are selected for breeding, they fetch as much as ETB 5000. If not, they are castrated and sold for slaughter at a price approximately 50% higher than other rams. The use of income from sheep production by women was also interesting. Women mainly spend the income on basic need requirements for the household and themselves, contributing to the empowerment of rural women in supporting themselves and their families.

Supporting delivery through an enabling policy environment

In recognizing that the delivery of selected genetic material need the involvement of both the private and public sectors, the Kenyan government developed a policy facilitating private sector involvement in artificial insemination (AI) services. The policy outlined the responsibility of the Directorate of Veterinary Service in regulating importation of genetic material, certifying the AI training curriculum and practices and maintaining insemination records. However, the policies were interpreted differently by the regulating authorities, hindering delivery of improved genetics to farmers.

Through an innovation platform convened and facilitated by the Dairy Genetics East Africa (DGEA) project, a multi-stakeholder sub-committee was immediately put in place to address this constraint with the regulatory authorities, identifying clear entry points for investment by private AI service actors. Specifically, the innovation platform helped to clarify the role of the private sector in AI delivery, opening up business opportunities for private AI service providers in Kenya.

Actor integration and knowledge feedback approaches

Fish genetic delivery systems are context-specific. Below are two different examples, one on the centralized dissemination system in Egypt, the other of a decentralized system in Bangladesh. In Egypt, WorldFish has developed an improved strain of Nile tilapia, called Abbassa. In on-station testing, it grew demonstrably faster than other commercial strains. Within the centralized system, multipliers (hatcheries) receive improved strains from specific breeding programs; they do not make any genetic improvements at multiplier level. WorldFish has started dissemination of the ninth generation of tilapia to multiplication hatcheries to produce fry for commercial farms. In parallel, a survey, conducted to collect data from commercial farms to measure economic feasibility—found the improved strain (Abbassa) was more profitable to farmers and in an on-station comparison it demonstrated a superior harvest weight by 28% over another commercial strain in an on-station comparison.

In Bangladesh, with a USAID-funded project, WorldFish started to disseminate genetically improved farmed tilapia (GIFT), tenth generation, which was produced from the GIFT breeding program in Malaysia. The imported fish from Malaysia were given to main multiplication centres. They used the 'cohort breeding' system where both mass selection and rotational breeding techniques were applied to achieve genetic improvement and avoid inbreeding. The use of the cohort breeding approach allowed the main multiplication system to make generational improvements in the genetics of the fish and rotational mating allowed the use of brood stocks from other generations, thereby avoiding reliance on the Malaysia breeding program.

.In addition, WorldFish provided training to hatchery workers on good management techniques to improve productivity. Through the provision of capacity building training, technical support and GIFT brood stock, the project ensures the supply of quality tilapia seed to farmers and supports the rapid expansion of tilapia farming throughout Bangladesh. In parallel, a similar survey to the one used in Egypt was conducted to collect data from commercial farms using improved and commercial strains to measure the impact and economic feasibility of using the improved strain¹.

Private-public investment partnership and knowledge feedback approaches

Development projects in smallholder family chicken production from the 1970s onward have focused on disease control, reduction in predation and mortality through vaccination campaigns, and improvements in housing. Genetic improvements have also been attempted through government initiatives and development agencies, mostly in crossbreeding programs involving the introduction of exotic commercial cockerels. Responsibility for most programs has been fragmented, and programs themselves have not consulted sufficiently with end users.

Seeking to overcome these obstacle, the African Chicken Genetic Gains (ACGG) project aims to integrate existing delivery systems in consultation with the private sector. The principle driver of product development is farm-level information on productivity and consumer preferences. To this end, innovation platforms have been established to bring key stakeholders together, including private sector actors, to co-create strategically integrated solutions to shared constraints in the poultry value chain, including through the fostering of public-private partnerships. Together with public sector actors in Ethiopia, Tanzania and Nigeria, ACGG has established service delivery partnerships with private brooders and hatcheries. To date, ACGG has developed and nurtured sixty-one public and private sector partnerships for service delivery, input supply, research, and extension.

Tools to enhance integration

For breeding programs to be pilot-scaled at national or sub-national levels, improved livestock genetics delivery systems must be adopted and implemented by the national research systems, development partners and private sector actors, ensuring accessibility of improved livestock genetics to livestock keepers. Researchers and other key stakeholders have identified interdisciplinary linkages and innovation platforms as valuable tools for enabling the five critical success factors.



Harvested GIFT tilapia, Bangladesh (Photo credit: WorldFish).

Innovation platforms

Innovation platforms are action oriented and build on the legitimized outputs of learning alliances where evidence and priority entry points for breeding programs are validated. If successful, they can:

1. offer avenues for social and economic interaction;
2. uncover context-relevant approaches for participatory development of new breeding processes (technologies and knowledge dissemination); and
3. offer avenues for broad dissemination and uptake of developed, available, priority and end-user focused technologies.

A range of the Livestock and Fish Program's projects have used innovation platforms as powerful tools to develop integrated delivery systems.

Crosscutting linkages

Integrated delivery is more than just delivering a single product, but rather, a suite of knowledge and technologies enabling end users to access, adopt, and optimize outputs.

More integrated delivery is a major crosscutting issue in which genetic interventions can be packaged or bundled with other relevant interventions.

Combined with capacity development support to strengthen institutional performance, model delivery systems would facilitate the incorporation of outputs from feed, health and livelihoods research, and national systems, as bundled services.

This could happen, for example, through integrated livestock business hubs, artificial insemination centres, feed selling units, or veterinary field units, offering business opportunities for women and young people.

¹ A 1998 study found the GIFT strain was 58% superior to locally available strains of Nile tilapia in terms of growth. The findings of the present study have yet to be published.

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