

CGIAR RESEARCH PROJECT LIVESTOCK AND FISH PHASE 2

ANNEX 2 - VALUE CHAINS

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BANGLADESH: DEVELOPING THE FISH VALUE CHAIN

Objectives

The main objective of research on the fish value chain in Bangladesh is to increase the consumption of fish by poor urban consumers. The population density of Bangladesh is around 1,033.5/km² making it one of the most densely populated countries in the world and the difference between rural, peri-urban and urban is relatively small in many areas. At more than 45,000 persons per square kilometer, Dhaka, has the highest urban population density in the world. Bangladesh continues with extremely high rates of urbanization (3.5 percent per annum), and ensuring urban food and nutrition security is a growing concern.

Urban markets are a major driver of the growth of intensive smallholder aquaculture in Bangladesh. A better understanding of the fish consumption needs and preferences of poor urban consumers will be used as an entry point for determining investments in the upstream value chain. Identifying and responding to the diverse needs of this group will ensure that L&F -2 investments targeting gains in productivity and production, improved value chain governance translate into gains for poor consumers and poor value chain actors.

As well as rural producers, much of the fish production which supplies these markets takes place in peri-urban areas surrounding major cities, where key input suppliers such as feed mills and fish hatcheries and nurseries are clustered, where good access facilitates rapid movement of goods to markets, and where resources such as food waste and processing byproducts and nutrient rich wastewater are readily available but underutilized as fish production inputs. This offers a diverse range of opportunities for intervening in value chains (including opportunities for creation of quality employment) around poor urban markets and the upstream rural and peri-urban value chains. It offers opportunities for coordination and synergies with ongoing interventions via a range of substantial, long-term Window 3 investments and under other established CRPs, notably CRP1.3 Aquatic Animal Systems and CRP4 Agriculture for Nutrition and Health.

With respect to specific IDOs, contributions of this value chain will be as follows:

- IDO #1 (Increased productivity) – Small and medium enterprise (SME) women and men producers in rural and peri-urban areas will adopt innovative production systems for sustainable intensification. Projected increases in productivity per ha from improvements in genetics, feeds, management: 5% per year over a 5-10 year horizon, measured by production per unit land area and/or by FCRs.
- IDO #2 (Increased quantity and quality of fish) – Production of fish (sizes/species) that meet the consumption preferences and purchasing power of poor urban consumers will increase; more fish will be produced and marketed in ways which minimize food safety risks to poor consumers: 5% increase in volume of marketed fish/capita/year over a 5-10 year horizon; significant reductions in use of harmful chemicals (e.g. formalin) in post-harvest handling of fish.

- IDO #3 (Income and employment for value chain actors) – Existing partnerships will be strengthened and new ones established with SME and corporate actors in the private sector to: develop better quality value chain opportunities (e.g. including new fish products and new markets, processing activities, input marketing opportunities); enhance the quality of existing opportunities; and ensure both women and men are entitled to take up and benefit from the opportunities: 5% increase in gross [or net?] income per producer per year over a 5-10 year horizon; 5% annual increase in employment of women along the fish VC.
- IDO #4 (Increased consumption of fish by the poor) – Understanding fish consumption preferences among the urban poor (especially women of reproductive age and young children) and intra-household food distribution practices will facilitate development of demand-led production systems and interventions to enhance intra-household equity. Developing technologies for production of nutrient rich small indigenous fish species for increased access among urban (poor and non-poor) consumers. Potentially reaching millions of poor urban consumers within a 10-12 year timeframe...
- IDO #5 (Lower environmental impacts) – Safe reuse of nutrients and byproducts from urban and periurban areas as feeds and fertilizers, recycling of effluents from aquaculture for crop production, a focus on the production of low trophic level fish species, and research on more sustainable formulated feeds will minimize negative environmental impacts of production and promote more environment-friendly sustainable intensification. World Fish scientists are developing appropriate targets for this indicator and they will be posted soon.
- IDO #6 (Policies and investments) – Engaging with policies on food safety will reduce risks to poor consumers; development of public/private partnerships will support entry of women entrepreneurs to up and downstream value chains and invite new investments. Projected annual increase of 5% in public and private sector investments into pro-poor aquaculture.

Themes and indicators

The proposed program of work will have to be driven primarily by the Genetics and Feeds technology themes, the Value Chain Theme, and the Gender Theme. Work will focus on analysis of fish seed and feed value chains to identify entry points for improving productivity, quality, market coverage, delivery and resource use efficiency, participation by poor women and men, and on engaging in processes which support the development and use of environmentally sustainable production methods and promote nutrient and byproduct reuse. Work on genetic improvement will take place at the level of hatcheries (through improving the supply and management of good quality germplasm), and through long term commitments to large scale breeding programs. These efforts will be strongly oriented toward engagement with value chain actors for effective and sustained dissemination of improved genetic material. Work on internal governance and coordination in the chain and the policy environment will focus on developing context specific modalities that can improve the functioning of the chain to ensure products reach

poor consumers and value chain participation equitably benefits value chain actors at different nodes of the chain.

The program will take a value chain based and demand-driven approach to all its activities, beginning with a gendered analysis of consumption habits, preferences and demand among poor urban consumers. This assessment will provide the basis for identifying opportunities to test innovations that enhance production, productivity, sustainability and responsiveness of aquaculture systems targeting these markets. Gender will be integrated across value chain development activities using a transformative approach. The activities will seek to test what packages of technical and social interventions perform best in overcoming the gender-based constraints limiting poor women's and men's access to resources and opportunities, and in addressing the social inequalities underlying the constraints. In this way the program will seek to understand how best to ensure that poor women and men have more and better opportunities to participate in and benefit from fish production and associated value chain activities, as well as to benefit equitably from increased supply and consumption of affordable, quality and nutritious fish.

Flagship Project

Flagship Projects on Fish Genetics, Feeds, Environment, Gender, and Value Chain Development are pertinent to the proposed program. Securing supplies of good quality fish seed and feeds is a prerequisite to the development of more productive and resource efficient aquaculture. Peri-urban areas provide a host of opportunities for recycling and reusing nutrients and wastes from agriculture, livestock and aquaculture, thereby contributing to sustainable intensification of production systems, and working in feed value chains offers opportunities to improve resource use efficiency both within the production process and on-farm. Gender and equity will be central concerns in all activities relating to production, value chains and consumption. These activities will be designed to contribute to knowledge on how to achieve inclusive, gender transformative outcomes, and avoid unintended consequences.

Research Benefits

Research conducted in Bangladesh under L&F-2 is expected to result in several benefits. First will be generation and adoption of economically viable and scalable, low risk fish production systems which respond to the demand of poor urban consumers; increased consumption of fish by the urban poor (including women of child rearing age and young children); development of marketing and regulatory mechanisms which improve the quality of fish reaching the consumer and reduce the likelihood of contamination (e.g. with preservatives such as formalin); creation of markets for new products (e.g. reconstituted fish products, fish based snacks); creation of good quality jobs for poor women and men in associated value chains (e.g. in processing and marketing); development of technologies for the artificial reproduction and mass culture of nutrient rich small indigenous fish species; increases in productivity of conventional aquaculture species through better genetic management in hatcheries and the

dissemination of germplasm from international genetic improvement programs; through more widespread reuse of wastes, byproducts and nutrients from agricultural systems in aquaculture and vice versa; more efficient on-farm and formulated feed production and wider uptake of more efficient feeding practices to lower feed conversion ratios, minimize resource use and waste and increase economic returns; development and implementation of policies which are more responsive to the food security needs of the urban poor and more effective in ensuring food safety for fish products; enhanced potential of poor and marginalized women and men to gain from growth in the sector through the relaxation of social barriers to their ability to participate and control the benefits.

Potential Interventions

Potential interventions are several. They include: demonstration and dissemination of proven small-scale fish production technologies to satisfy demand among the urban poor by WorldFish's existing portfolio of projects, its partners and private service providers; trainings for private hatcheries and nurseries and government officers on the artificial reproduction of nutrient dense small indigenous fish species; development of systems for real time monitoring and communication of the results of monitoring formalin in fish markets; partnering with SMEs to market fish based street food, in order to create livelihood opportunities for poor women; working with private producers to establish profitable brood multiplication businesses and markets for improved strains of brood fish; working with government to certify hatcheries based on adherence to best practices; development and dissemination of practical feed management guidelines through private sector feed suppliers, and best practices for on-farm feed production; capacity development for staff of companies producing aquafeeds to improve formulation and quality; development of value chains for agriculture and aquaculture byproducts that create value addition through use as feeds and fertilizers and provide employment and income generating opportunities to the poor; testing and implementing models for improved governance, interaction and coordination between VC actors; working with partners to propose national level changes for a more conducive policy environment; improved post-harvest handling and market information systems.

Budget scenarios, 2015-2017

The budget estimate is US\$3-5 million/year.

EGYPT: EXPANDING THE FISH VALUE CHAIN

Transforming the Egypt Fish value chain for sustainable improvements in productivity, availability and consumption of fish by the poor.

Objectives

Egyptian aquaculture has seen steady growth over the last 20 years. It is now a strategic industry, particularly for the 21 million poor people in the country. It provides around 65 percent of the fish eaten by Egyptians, the value chain employs at least 100,000 full-time equivalents, many whom are youth and aquaculture-derived fish is among the cheapest farmed animal protein sources in the country. Continued, sustainable growth of aquaculture has the potential to lift more people out of poverty and to improve poor people's food and nutrition security through increased supply of nutritious animal protein and essential micro-nutrients. Achieving this potential depends on how that growth is achieved, how sustainable it is and how inclusively its benefits are shared.

The research for development program in the Egypt aquaculture value chain focuses on four outcomes:

- Promoting growth through intensifying production systems in ways sensitive to the aquatic environment and to others who depend on shared ecosystem services;
- enhancing food quality across the value chain;
- ensuring that the benefits of increased supply of high quality fish lead to increased and better quality employment opportunities for poor women and youth;
- Expanding access to cheap nutritious fish for poor consumers.
- {All of these outcomes are supported by efforts to strengthen the enabling institutional, investment and policy environment.}
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Research questions

With strategic support including an expanded applied research program focused on the main themes of value chain development, feeds, genetics and the environment, Egyptian aquaculture can continue keep pace with the food security demands and employment needs of its expanding, young population. We estimate that there is potential for continued, sustainable production growth by 75 percent over 10 years. The main research question in achieving this goal is --

- What research approaches to increasing quantities and qualities of farmed fish, implemented through which partnerships, are most effective in delivering better welfare for poor women, men and youth ?

Selected Interventions

Under the current L&F-2 program, fish farmers have participated in a process to develop and deliver training on best management practices. Fish farmers have also been given access to faster growing fish strains. The second phase of L&F-2 will continue to research and document the impacts of this value chain upgrading on IDOs. L&F-2 phase 2 can also build on the pro-poor aquaculture systems work carried out under phase 1 such as the introduction of small-scale catfish farming systems for women and producing small fish to be sold by women retailers to poor consumers.

Nearly all the fish produced through aquaculture in Egypt is consumed as whole, fresh fish, which means that there are opportunities to upgrade the value chain across nodes by improving quality and developing a capability for added-value processing which will generate even more jobs. A key focus of the program will be identifying how to support poor women's and young people's abilities to benefit from these new opportunities, including through interventions that promote a more equitable social enabling environment.

- Assess the distribution of impacts across the value chain of increased production and improvements in product quality;
- Support the development of sustainable, representative organizations;
- Assess under what conditions interventions that improve the range and quality of women's work in the chain lead to gender transformative change

Feeds. Steady growth of the Egyptian aquaculture sector will require higher quality and more efficient feeds and feeding systems. There are opportunities for innovation, for example by using alternative feed raw materials, as well as reducing the proportion of imported raw materials. The cost of feeds represents by far the largest operating cost for most fish farms so any gains in efficiency or cost will have immediate impacts on prices along the value chain.

- Core research question: How can we improve fertilization and feeding regimes to improve the productivity and nutritional value of aquaculture products?
- Research and development intervention: Develop and test new, more efficient, feed options (including more locally sourced feed raw materials), thereby reducing competition for staples that could be used to feed people and minimizing environmental impacts.

Genetics. Long-term genetics research programs have demonstrated that significant gains can be achieved through family-based selection in the main species used in Egypt. This work will be consolidated in the second phase of L&F-2 by working collaboratively with ILRI colleagues to create a genetics research platform, while bringing in new tools, such as molecular genetics to better focus and accelerate genetic selection processes.

- Core research question: How can we ensure the timely delivery of genetically improved strains to fish farmers?
- Select research and development interventions: Applied research on improving the genetic resources for key aquaculture species in Egypt, particularly Nile tilapia and African catfish; evaluate the factors affecting adoption and impact of improved fish strains on profitability, production, productivity, prices and consumption patterns.

Environment. Farming of fish and other aquatic products can be an ecologically efficient means of producing animal source food, however expansion of production could have adverse impacts on the environment and on those who most depend upon it to sustain their livelihoods.

- Core research question: What approaches to enhancing sector growth and improving VC performance can best balance economic, social and environmental objectives?
- R and D intervention: To develop and promote profitable management practices that produce nutritious food that meets consumer needs with minimum demands on environmental services.

Budget Scenarios, 2015-2017

The estimated annual budget is US\$5 million for the period 2015-2017.

INDIA: GROWING THE DAIRY VALUE CHAIN

Introduction

Milk and milk products are the major components of the Indian livestock sector and accounts for more than two-thirds of the value of output of livestock products. India emerged as the largest milk-producing nation in 1998 with production of 74.1 million tons, overtaking the United States and has maintained that position ever since. Presently the milk production is 127.3 million tons (in 2011-2012); with 281 grams per capita availability of milk. However this growth is uneven, within in India when compared to regions where per gram availability of milk is very low for instance- Assam (71 gram/day), Orissa (104 gram/day) and Bihar (163 gram/day), with vast dairy potential but hitherto been untapped and neglected. Interestingly, over 50% of the Indian population is vegetarian and milk constitutes a key diet for eliminating malnutrition. But unfortunately, one third of the world's undernourished children live in India. Gross gap between demand for and supply of milk persists despite milk production contributes 18% to agricultural Gross Domestic Product, involving small, marginal and landless marginalized farmers, which contribute to 70% of the milk production. Further, most dairy workers belong to socially and economically disadvantaged communities of which about one third of the labour in dairying is provided by women.

The main objective of research on the dairy value chain in India is to address the issues of market access by the marginalized communities, low productivity, low genetic potential animals; poor feeding, health, and husbandry practices; and low prices offered by largely inefficient milk formal and informal sector. Improving these issues of dairy sector in India will benefit producers by providing livelihoods options thereby improving income and employment along the value chain by providing quality hygienic milk to consumers at affordable prices. There are some serious concerns over existing production systems, delivery systems, and dimensions of public health, food safety, and quality. This clearly indicates the opportunities for alignment and integration with ongoing interventions under other important Consultative Research Program mainly CRP4 Agriculture for Nutrition and Health.

With respect to specific IDOs, contribution of this value chain will be as follows:

- IDO #1 (Increased productivity) – 40 % reduced calf mortality, reduced morbidity, reduced outbreak of FMD disease, disease incidence, develop unadulterated semen provision and technology
- IDO #2 (Increased quantity and improved quality of milk) – Doubled milk production, clean and quality safe milk with affordable price that meet the consumer preferences.
- IDO #3 (Income and employment for value chain actors) – Both traditional and modern supply chains offer risks and opportunities for achieving better nutrition and more sustainable food therefore better quality value chain opportunities (e.g. exploring new milk niche products and new markets, processing activities, input marketing

opportunities); enhance the quality of existing opportunities; and ensure both gender engagement to benefit from the opportunities

- IDO #4 (Increased consumption of milk by the poor) – Understanding milk consumption preferences among the rural and urban poor (especially women of reproductive age and young children). Studies on one health concept, gender, animal health interaction, adoption, ex-ante studies. Address malnutrition.
- IDO #5 (Lower environmental impacts) – Exploit digital information technology for identifying site specific feed technologies, environment impact assessment, GIS based studies on impact assessment on dairy, studies on water, carbon foot print, health risks related to dairy.
- IDO #6 (Policies and investments) – Engaging with policies on food safety will reduce risks to poor consumers; development of public/private partnerships, communication and knowledge management through partnerships, support to women entrepreneurs in value chains and invite new investments.

Themes and indicators

The proposed program will work with -Genetics and Feeds technology, Value Chain, Gender, targeting sustainable interventions, communication and knowledge management, policy and capacity development themes.

Work will focus on dairy value chain analysis so as to identify entry points for technological interventions on breed, feed, health care, and market. Research will be undertaken on use of crop residues in feeding systems, feed processing. Identification of superior dual-purpose (food and feed) cultivars, fodder seed production, introduction of better animal breeds, cross breeding, conservation of indigenous breeds, health care and management. Larger profitability can be accrued by partnership with public and private players related to feed, dairy, veterinary input and services. Gender research on conservation and preservation of traditional indigenous milk foods/ products, gendered aspects of decision making at household levels. Vertical and horizontal value chain upgrading, environmental assessments. Studies on best bets, uptake of technologies will be undertaken.

Research Benefits

The proposed India dairy research and development program under L&F-2 will collaborate closely with researchers on Flagship Projects in genetics, feeds, the environment, and gender. Research conducted in India under Livestock and Fish is anticipated to result in the following benefits:

- By making indigenous breed more productive by crossbreeding and/or by inducting new improved cattle, better feed, health care and management practices milk production will be doubled.
- This will be further reinforced by policy support. Consequently, the benefits will reach to all the Value Chain actors participating women and men, commercial private players like

feed manufacturers, veterinary suppliers, service providers, processors, sweet makers and transporters. Premium price can be charged by the producer for quality and safe milk production.

- Highly nutritious milk will improve the health of women men and young children ensuring less cost to society, food security with lead to better quality of life. This will have an overall impact on economic growth and employment.

Potential Interventions

Potential interventions include: demonstration and dissemination of proven (gender specific) technologies on animal husbandry practices, value addition of milk products. Better profitability, high increased incomes would be achieved through identification of dual purpose food -feed crops, residue based feeding, straw chopping for effective resource and residue use, clean milk production, quality feed provision, better animal health services, improved management of common property resources, linkage with microfinance/banks for better credit access, gender equity, vertical and horizontal upgrading of the dairy value chain.

NICARAGUA: EXPANDING THE DUAL PURPOSE CATTLE VALUE CHAIN

Introduction

Cattle and dairy production are a major income source for Nicaraguan smallholders. Several factors limit the expansion of smallholder cattle incomes in formal and informal value chains alike. The quantities of milk produced by traditional farmers are small, with high seasonal fluctuations in supply and prices, markedly reduced production during the dry season, and constant problems of poor quality. Beef production is low too, with income largely coming from selling steers at weaning age with little value addition.

The low incomes derived from smallholder cattle in Nicaragua reflect many constraints. The greatest are feeding systems based on low quality materials, often from progressively degrading pastures populated by a single grass species. Other constraints are inadequate on-farm investment in animal housing and milk collection, unhygienic milking practices, low genetic potential stock, and absence of collective investment in cooling systems on farm and during transport.

Ineffective commercial practices also hamper cattle incomes. Stock are usually sold or exported as live animals. Only 40 to 50 percent of milk is processed, with most small scale industries focused on fresh cheese, cream, milk sweets, and other products for local consumption. Only larger plants produce UHT milk. Large volumes of milk are sold on-farm and consumed raw, particularly by poor consumers. Links of individual farmers to associations, and ultimately to buyers, are weak. Such weak links limit information on product quality, but also block the establishment of quality-based incentive systems that benefit farmers and buyers; most of the products traded are produced by many medium- to low-scale processors and have minimal compliance with food safety standards. From the consumer angle, access to high-quality, protein-rich food (like dairy products) is often limited for many households in both urban and rural areas.

Smallholder cattle also create environmental costs that are partly borne by farmers. Traditional animal production has long been an important cause of habitat and biodiversity loss, which reduces the grazing value of pastures. Grazing on slopes can be an important cause of soil erosion and hence of crop yield loss.

Objectives

The main objective is to improve the competitiveness and income of small cattle farmers in Nicaragua through the creation and strengthening of sustainable dairy and beef value chains, with emphasis on women agents, to increase access to high-quality products for poor consumers, and diversify products for national and regional markets, while reducing the environmental footprint.

Implementation of the Nicaragua project will contribute to the CRP IDOs as follows.

- Improved feeds and forages for sustainable production intensification (IDOs 1, 2, 5, 7);
- Improved farm management, animal husbandry, milking practices (quality, hygiene); (IDOs 2, 3, 6);
- Improved milk processing (quality, hygiene); (IDO 2);
- Improved market access, generating added value (product diversification, certification); (IDOs 3, 5, 6);
- Improved food/nutritional security for consumers (IDOs 2, 4);
- Increased natural resource integrity through sustainable production intensification, and further development of silvo-pastoral systems in vulnerable areas (IDOs 5, 7); and
- Increased participation of women in decision-making and benefits along the value chain (through their role in milk production, processing and marketing).

General Hypothesis

The general hypothesis is that sustainable intensification of production of dual purpose cattle, associated with improved market access, will lead to increased income and employment among smallholders. It will also improve nutrition of vulnerable groups, preserve land from erosion and loss of habitat, and reduce net GHG emissions per unit of output.

Specific hypotheses

Following from the general hypothesis, we state specific hypotheses about impact pathways.

Production and use of improved forages in integrated systems (e.g., silvopastoral) is the best entry point for higher and more sustainable milk and meat productivity because improved forages respond to the binding feed constraint on small farms (as is discussed in the Flagship Project on “Sustaining feed-based intensification of animal production”);

Improved farm management, animal husbandry and milk hygiene are the most effective measures to create added value at farm level ;

Improved milk processing is the best way to improve quality and add value at the intermediate market link;

Improved production and food safety quality control are the most effective entry points to improve access of poor consumers to high quality milk and meat;

Intensification of milk and meat production is the most effective way to increase natural resource integrity through land conservation (as is discussed in the Flagship Project on “Reducing the Environmental Costs of Animal Production”); and

Greater participation of women in value addition increases the nutritional status of vulnerable groups (e.g., pregnant women and small children) and empowers women (as discussed in the Flagship Report on “Reducing Gender Disparities”).

Target benefits of public research

Work over the 2015-2024 period would test the general specific hypotheses with the following target estimates of benefits by research theme.

The productivity theme would target:

100 percent increase in average milk yield per ha (from 3 to 6 kg/ha/day);

100 percent increase in daily live weight gain per ha (from 200 to 400 g/ha/day);

Decreasing calving intervals from 24 months to 18 months; and

Increasing stocking rate from 1 animal per hectare to 2 animals per hectare

The value addition theme would target:

Small farmer incomes increased by 100 percent and employment by 50 percent along the value chain; and

50 percent of farmers benefitting from ecosystem services (e.g., carbon credit certification schemes).

The market access theme would seek:

90 percent of milk produced by smallholder farmers sold to formal markets; and

30 percent increase in steers delivered for slaughter

The nutrition and consumer access theme would target:

Increase by 50 percent of animal source food (women and children under 5).

Defending natural resource integrity

50 percent decrease in degraded pastures

60 percent grassland covered by silvopastoral systems

20 percent of (mostly degraded) area in the field sites used for forest production

50 percent of water sources (rivers, creeks, waterholes) protected

Reducing gender bias theme

100 percent increase of male and 200 percent increase of female farmers in access to high value formal markets

Development interventions

Pasture and forages. The theme of pastures and forages improvement seeks management alternatives appropriate for small scale dairy farms to increase and sustain milk production, with an emphasis on grasses and leguminous shrubs in integrated crop-livestock systems. Goals are to:

- Facilitate the development of farmer-led seed supply systems among local producers to disseminate improved forage alternatives.
- Train technicians and producers in methods to balance rations using mostly local feeds.
- Milk quality. The milk quality theme will improve and promote the quality of milk produced on farms and received by collection points.
- Train technicians and producers in the improvement and management of milk quality and hygiene
- Prepare manuals on milking techniques, milk handling and conservation, and the suitable infrastructure and equipment for hygienic milking
- Develop low-cost traceability systems for collection points capable of assessing the milk quality of individual producers and promote the use of payment systems based on milk quality
- Provide technical assistance for the establishment of (farmer-led) milk collection points, which will in turn supply the mid-scale industries. As for the improved feeding systems described above, using the infrastructure of these collection points assists organizations in creating Service Centers to provide farmers with technical assistance

Farm management. The theme of improving farm management seeks to strengthen the competitiveness of smallholder actors in the dual purpose value chain. Once the market opportunities are identified, the approach will be to:

- Develop a strategic vision for groups of farms by sub-region;
- Elaborate and execute a strategic plan for business development for those groups;
- Link small-scale farmers to local and formal milk quality schemes and animal health services

- Enhance co-learning opportunities in the application of good livestock practices
- Improving consumer access to animal source food theme will work indirectly through production and market access advice to consumer groups.

Natural resource integrity theme will seek to

- Establish and improve silvopastoral systems;
- Identify, validate and establish payment for ecosystem services;
- Establish pastures with improved forages.

The Gender theme will operate through capacity building on processing and entrepreneurship, marketing of dairy products.

TANZANIA: SUSTAINING INTENSIFICATION OF SMALLHOLDER DAIRYING

The Tanzania LaF vision is to increase dairy productivity and income to reduce poverty and vulnerability among dairy-dependent livelihoods, and to increase milk availability and consumption by poor households in order to improve nutrition security¹.

Objectives

The LaF CRP in Tanzania has interpreted the LaF IDOs into three project goals.

- Poor smallholder dairy farmers have reliable access to quality inputs and services in order to raise milk productivity;
- Smallholder dairy farmers have access to efficient milk markets, resulting in gains in income and employment; and
- Poor consumers have more access to quality and safe milk at affordable prices and increase their per capita consumption of milk and other dairy products.

The research aim in the Tanzania VC is to prove the concept that marginalized pre-commercial groups can be integrated into commercial dairy production. Recognizing the current low per capita milk availability in Tanzania, the initial focus is on creating linkages in the downstream components of the value chains (inputs and services) to improve cattle productivity and to strengthen informal market linkages. Various adaptations of the hub approach² are being piloted as a mechanism for achieving economies of scale and improving access to demand-led inputs, services, and better value chain governance.

This note assumes that this concept will have been proven through on-going pilot projects, and that the evidence needed for expanding the value chains approaches has been generated. Thus, the VC will be on track towards achieving its long-term objectives over the next 10 years, which are reflected in the tailored IDOs for the VC. increased productivity in milk; increased quantity of milk supplied by smallholder dairy farmers through improved access to inputs, services and efficient marketing arrangements; increased feed availability through innovative and sustainable feed production approaches; increased employment and income; increased consumption of milk; and better policy incentives.

¹ This vision is referred to by dairy sector stakeholders in Tanzania in Swahili as “*Maziwa Zaidi*”

² Hubs are localized groups of smallholder producers with common interests who come together for purposes of achieving a critical mass in economies of scale to access inputs (e.g., feed, breeding, animal health) and services (e.g., production related, training, credit, insurance, collective bulking & sale)

Research Hypotheses

The CRP will support a dairy development project through research to create innovation in components – targeting (site selection), genetics, animal health, and feeds and forages.

Targeting. The project will try to reach more beneficiaries through spatial livestock allocation modeling (SLAM). Complementary targeting will look at projections of milk supply and demand as well as associated livelihood and environmental outcomes such as lower waste generation from improved animals.

Genetics. Long-term investment in genetic improvements including choices of breed, breed combinations, models for their continuous improvements and delivery, are critical for sustained animal and farm productivity advances. A viable starting point is better genetic management practices – such as reversing negative selection and avoidance of inbreeding -- and use of genetic platforms for evaluation and delivery of upgraded genetic material (through AI or otherwise). Testing the viability of alternative delivery mechanisms is therefore central to sustainable genetic improvements.

Feeds. Feed interventions are considered to have the most significant potential for improving overall productivity and less seasonal production. Enhanced year-round supply and utilization of feeds and forages through mechanisms such as innovation platforms to improve feed quantity and quality, especially in the dry season, are likely to produce significant productivity gains. Testing the viability of such platforms will, therefore, be central to promoting sustainable access to feeds and better feed utilization.

Health. Farmers, traders and processors lack information on best technologies to manage endemic diseases, to prevent epidemic diseases, and to handle zoonotic risks. The health component will therefore seek to improve animal health services, with positive effects on productivity.

Nutrition and food safety. At the consumer end, a key aim of the LaF Program in Tanzania is promoting equitable access to quality and safe milk for the poor. This theme will investigate the role of consumer-led dairy value chains in improving poor consumers' access to milk and milk products. Gender equitable interventions will ensure more equitable access to affordable milk. Findings will be used to engage value chain actors in strategizing how to re-orient dairy value chains to deliver safe and quality milk to women, men and marginalized groups, as well as to identify how to encourage more equitable allocations within households

Value chain development will consist of institutional innovations – marketing hubs -- for better delivery of inputs and services, while giving farmers with better opportunities to sell their milk. These trading innovations will reduce costs, increase incomes and create new jobs. Growth of hubs will further increase capacity utilization in processing plants and possibly induce investment in new processing capacity, presenting further employment opportunities.

Gender disparities are a research theme across the VC. The aim will be to address existence of gender disparities in access to resources, markets and technologies and their effects on agricultural production. Gender research and development interventions will seek to ensure

that poor women and marginalized groups benefit from better income and job opportunities in the VC, notably in bulking centers, chilling and processing plants.

Candidate interventions

A candidate for a large dairy intervention in Tanzania is the East Africa Dairy Development 2 (EADD-2). EADD-2 envisions improved livelihoods through a growing commercial dairy industry. The intervention targets 50,000 farm families and hopes to benefit approximately 280,000 individuals by {year}. Project objectives are higher dairy incomes of smallholder and other agents with attention to womens'; share of value added; a growing commercial sector; and improved food security in dairy households.

Benefits of public research

The role of public research will be to: (a) address on-going constraints through MLE; and (b) address long-term problems, such as environmental costs. Its possible benefits include:

An enhanced supply and use of feeds and forages. Identification of feed innovations, including forages, to enhance year-round access to quality feed by smallholder dairy farmers;

New tools for managing seasonality in feed supply and monitoring how they affect productivity, jobs and income;

Improved evaluation and delivery of new genetic material

Identification of appropriate breeds for different farming systems.

Genetic improvement based on local cattle population through application of both conventional and emerging genomic techniques

Identification of alternative forms of breeding services and effective delivery mechanisms

Improving delivery of animal health services

Evaluation of disease constraints and options for risk reduction through delivery of promising interventions such as ITM for East Coast Fever (ECF) vaccination³.

Identification of platforms and innovations for sustainable delivery of healthcare services

Identification of health strategies and innovations for improved milk quality and safety

³ The ITM vaccine has been tested in Tanzanian cattle. It is unclear whether and by how much it increases productivity, whether vaccine strains replace those circulating, and its effect on tick infections.

Promoting hub approaches for improved delivery of inputs and services

Identification of suitable hub approaches for different production and marketing systems

Analysis of consumer, retailer and trader demand for milk and dairy products as well as supply constraints to serving dynamic markets.

Developing and employing alternative indices for measuring changes in VC performance

Establishing critical points along the VC where milk contamination occur as a guide for implementing milk hygiene and quality control measures

Measure performance of the hubs in realizing the delivery of inputs and services as intended in the hub concept

Nutritional studies

Understand the place of milk in the diets of the poor, factors affecting demand for milk, and intra-household milk distribution patterns

Simulation of potential nutritional impact of increased consumption of milk by respective vulnerable groups.

Gender

Gender strategies and ML&E studies to track gender integration and provide feedback to projects for enhanced integration and equity into the VC.

ETHIOPIA: ADDING VALUE TO SHEEP AND GOAT VALUE CHAINS

With a population of 48 million small ruminants (FAOSTAT, 2012) Ethiopia has one of the largest animal populations in sub-Saharan Africa. The annual meat production from small ruminants is relatively small compared to the number of heads. The average annual off-take rate and carcass weight per slaughtered animal for the years 2000-2007 were estimated at 32.5 percent and 10.1 kg, respectively (FAO, 2009); the lowest among sub-Saharan African countries. Demand and prices for sheep and goat meat show an increasing trend due to population growth, urbanization and increased income in the cities and increased demand from the Gulf countries. From 2000 to 2008 the price of live sheep and sheep meat increased by 157 percent; the increase for live goats and goat meat was slightly lower at 107 percent (FAOSTAT 2010). A structural model of the Ethiopian livestock sector estimates the total consumption of sheep and goat meat at 91,200 and 91,600 tons in 2010, respectively, which exceeds the estimated small ruminant meat production by 47 percent. The same model predicts a per capita annual growth rate in sheep and goat meat consumption from 2010 to 2020 by 3.4 percent and 1.3 percent, and an overall change of 41 percent and 14 percent, respectively (Fadiga and Amare, 2010).

Objectives

In a nine year horizon the project seeks to achieve a 25 percent increase in herd productivity, measured as increase in offtake (IDO1). Other objectives are to:

Achieve an increase of 69 percent in the quantity of sheep and goat meat supplied from the target value chains in seven districts (IDO2) in the piloting phase (till 2015)

In the first expansion phase (2016-2017), in which the number of villages per district will be increased from two to five, 1852 t additional meat per year will be produced leading to an added value of 185 million Birr (10 million US\$) per year;

Achieve an increase of 69 percent in household revenues (not accounting for potential price increase through more efficient marketing strategies) of low-income actors in the target value chains (IDO3); it is expected that the increase in income will also lead to increased food security and diet diversity;

Improve meat quality and safety through improved animal health care, including control of endoparasites, zoonoses and other infectious diseases, as well as through reduced age of animals at slaughter (IDO2);

Reduce methane emissions per unit meat produced per animal kept (IDO 5); an estimate of reduction is not yet available;

Inform policies related to major constraints in small ruminant production or the livestock sector per se through well documented and communicated research findings (IDO6).

Research areas of greatest impact

A participatory assessment in the seven districts prioritized major areas of technology and institutional interventions to promote sustainable VC development. Developing and testing technologies for specific agroecologies and production systems to increase quantity and quality of feed resources while reducing environmental impacts (e.g. adapted forages or shrubs, efficient utilization of crop residues, economic fattening systems).

Animal Health diagnostic and epidemiological studies for key diseases, production of quality vaccines and methods of quality control, economic assessment of preventive programs;

Impact on productivity and production costs (IDO1), environmental impacts: soil fertility and erosion, GHG emissions (IDO5);

Impact on morbidity and mortality of animals and thus on offtake (meat quantity and quality), and production costs (IDO1);

Developing/strengthening and assessing organizational and institutional arrangements for efficient marketing with equitable benefits along the VC, such as producer marketing cooperatives, multi stakeholders platform to create market linkages between producers and other actors, and access to up-to-date market price information

Impact on product price, volume of sales, cash flow and income (IDO3),

Design breeding programs and delivery of improved genetics to smallholders in the most cost efficient way (controlled mating, fertility management, minimum recording, information flow to farmers, and dissemination of breeding animals)

Impact on productivity (IDO1), product quality (IDO2) and on income of producers and input suppliers (IDO3)

Assessing and developing efficient strategies/models for organizing input delivery systems for smallholders with regard to required partnerships (government, private partners, development projects); required investments by smallholders (micro-credits) and required supporting training/extension programs for involved actors

Impact on productivity and production costs (IDO1)

Assessing meat quality and safety issues along the VCs (slaughtering methods and health control, safe preparation and handling of meat)

Impact on meat quality (IDO2) measured through product price and consumer preference

Links to Flagship Projects

The value chain development in Ethiopia would draw on several big ideas proposed on technologies (optimized feed production for sustainable intensification; improved utilization of

highly ligneous plants; new or improved vaccines and diagnostics, and improved institutional arrangements for animal health services; improved breeding programs and delivery of improved genetics, and understanding of adaptive traits, which are of particular importance for small ruminants that are competitive in marginal areas; and environmental assessment framework for livestock and fish value chains).

Development Interventions and Partnerships

To achieve a full development of the small ruminant value chains in Ethiopia, technology development and adaptation in each of the major intervention areas mentioned above needs to be combined with the respective capacity development and matching development interventions. This include need based capacity building of extension staff, organizing animal health delivery services, the supply of inputs, and interventions to improve the efficiency of small ruminant markets.

The research is likely to benefit a range of stakeholders in the small ruminant production and marketing system, including the newly created State Ministry of Livestock, the federal and regional research institutes, the Ethiopian Agricultural Transformation Agency (ATA), the national livestock master plan, the Livestock Market Development Project, and the Livestock and irrigated value chains for Ethiopian smallholders (LIVES).

Budget Scenarios, 2015-2017

Estimated costs for the second phase (2015-2017) are \$US8.4million; for a nine year program (2015-2023) the costs are estimated to be \$US24 million.

MALI: DEVELOPING SMALL RUMINANT VALUE CHAINS

Sheep and goat meat value chains in Mali contribute to the first IDO of L&F-2 CRP which is to increase production and productivity of small-scale livestock and fish systems so as to increase availability and affordability of meat, milk and fish for poor consumers thereby reducing poverty through greater participation by the poor along animal source food value chains.

Objectives

The main objectives of the value chains are: (i) to sustainably increase the productivity of small-scale sheep and goat production and marketing systems thereby increasing revenue and consequently enhancing livelihood of rural poor through better animal nutrition, health and market access; (ii) to facilitate greater participation by the poor along the small ruminant value chains and to enable participation in and access to pro-poor and gender equitable production and marketing systems, with emphasis on addressing current gender disparities; (iii) to promote uptake of technologies for increased availability of feed resources including food-feed crops of better quality and for better use of existing feeds; and (iv) To strengthen capacity of agents along the sheep and goat value chains.

Impact Pathways

The following hypotheses will be tested under the sheep and goat meat value chains in Mali:

- Improved husbandry practices (health and feed) increase productivity and profitability of smallholder sheep and goat production assuming favorable market conditions. This hypothesis directly addresses the indicators on productivity (quantity per animal and or per unit of land), increased household income and reducing gender disparity; and
- Upgrading sheep and goat meat value chains facilitates better access to markets and enhances livelihood particularly income generation by smallholder crop-livestock farmers. Indicators addressed by this hypothesis include income generation, employment opportunities and productivity.

Some of the proposed outputs from the Big Ideas are quite relevant and can be of potential impact on the sheep and goat meat value chains in Mali especially those that address animal health and feed. These are:

- Information and knowledge to guide farmers and market actors in the target value chains in using best practices and available technologies to manage animal health, food quality and safety to enhance profitability and public health.

- Improved knowledge on institutional arrangements to assure farmers and market actors in the target value chains of sustainable access to the veterinary services and products needed to manage animal health and food safety.
- Assessment of ligno-cellulolytic biomass availability, quality, competition, utilization and costs in small ruminant value chains.
- Scaling up of technologies that can be used along feed value chains with partners from farmers' organization, cooperatives, NGO's and private sector.

Feasible benefits of public research on those themes in the principal value chains.

Increased productivity of small-scale sheep and goat production and marketing systems will provide the poor with an important source of cash income particularly women who are key players in small ruminant production in West Africa and will enhance household food security as much of the income is used to buy staple foods. Another feasible benefit is value generation and more equitable distribution of profits along the value chains through enhanced participation of smallholder actors in the sheep and goat met value chains and by addressing gender disparities. In addition, the capacity of key actors along the value chains will be strengthened through better participation. Apart from sheep and goat keepers who will benefit from productivity enhancing interventions, likely to include feed, animal health and livestock market innovations, other beneficiaries along the value chain will include small-scale traders and feed manufacturers, as well as other input and service providers.

Possible development interventions along the value chains include:

- Review causes of high mortality among sheep and goat flocks and conduct complementary epidemiological studies in order to design strategies to reduce mortality rates in young animals and high abortion rates in adult females.
- Pilot-test thermo-tolerant PPR vaccine and assess effect on sheep and goat production.
- Assess forage resources and feed markets for matching feed resources with sheep and goat requirements to identify deficit and options to meet shortfall in intensifying smallholder production systems.
- Investigate biomass use, trade-offs, transactions and trading in the key areas and identify pertinent actors in these value chains, and assess current and future (livestock revolutions scenarios) demand for feed biomass and the potential competition of biomass for sheep and goat production. Assess the economic feasibility of sheep and goat fattening under different feeds scenarios in rural and peri-urban areas.
- Disseminate technologies that are suitable for up-grading ligno-cellulolytic biomass on-farm through appropriate input suppliers and establish business enterprises around processing and selling feed from up-grade lingo-cellulolytic biomass.

- Design sustainable pro-poor input and support services delivery systems namely veterinary inputs and services, feed, seeds, market information and credit.
- Analyze sheep and goat marketing systems in Mali including institutional constraints to market efficiency.
- Analyze existing formal and informal credit systems for actors in the sheep and goat meat value chains.
- Validate findings from the value chains through innovation platforms.

UGANDA: A PIGGER VALUE CHAIN

Introduction

Pig production and pork consumption in Uganda have increased significantly in the past 20 years. Uganda has now the highest per capita consumption of pork in Africa (3.4 kg/person/year). Smallholders (1.1 million households), of whom the majority are women, dominate production in low input-low output systems. Pigs are opportunistic and cheap investments in that they use low-value crop residues and kitchen scraps, they generate manure to fertilize crops, and they have short reproduction intervals and high fecundity.

The potential for improving pig production to benefit smallholders and small operators in the informal chain is high. Potential has not been realized, however, in the typical smallholder systems of Uganda because of limited knowledge, lack of supporting services for health care, feed, housing, and management of residues. Similar challenges of knowledge, inputs and technology are faced by informal pig and pork marketing chains – where pigs are sold, informal markets are often inefficient and have compromised product quality and food safety.

In 2012 ILRI and its partners initiated efforts to characterize the smallholder pig value chains in Uganda, has identified constraints and opportunities, and based on those have designed potential interventions at different entry points of the value chain. However, there is need to extend these efforts in time and geographical coverage testing best bet technologies and piloting strategies to improve productivity on-farm and efficiency and safety in the marketing chain, such that benefits are enhanced for poor farmers' households, market actors and consumers while minimizing negative environmental impacts. The end result will be a number of options for designing an intervention strategy –and an evidence base demonstrating the benefits it can achieve– ready for implementation at scale by development partners.

Objectives

The specific objectives are to:

- Develop and test interventions for building the pig value chain through improved productivity at lowered environmental costs, enhanced access to inputs, services and output markets, and assuring that safe pork and pork products reach the marketing systems;
- Assess the effectiveness and sustainability of the best-bet interventions, refine and expand through development partners; and
- Identify and promote policies that enhance the role of pig value chains in improving the livelihoods of poor rural and peri-urban households, and contribute to assure that safe and good quality pork reach consumers.

Relevant themes and associated research objectives

In order to achieve the IDOs, the proposed research-development operation has identified the themes of animal health, feeds, genetics, value chain development and gender themes. The following are the specific objectives and implementation arrangements by theme:

Animal Health and Management. The major health constraint is African swine fever (ASF) which causes high mortality and induces panic sales of animals thought to be infected, thereby making prices lower and more variable. Research and development work under this theme will seek to:

- Collaborate with partners to develop an integrated strategy for improved pig health, with respect to priority diseases, such as ASF, and parasites that incorporates better biosecurity along the value chain, to be implemented in the local production context;
- Generate data and antigens for use by vaccine and diagnostic assay researchers and manufacturers to design vaccines and improved diagnostics for ASF and other priority diseases, in collaboration with advanced research institutes; and
- Reduce the negative effects of current management practices on water and air quality and to promote collection and use of manure through animal confinement.

Feeds. Most smallholder pig producers rely on natural pasture/forage species and crop residues for feeding their pigs. Poor pasture productivity, the seasonal nature of pasture and crop production, and prolonged drought periods in addition to the lack of forage conservation strategies are major limitations for the constant supply of forage for pigs. This theme will focus on developing technologies and strategies for sustainable provision of nutrients throughout the year, and will include:

- Development and promotion of fodder conservation and strategic supplementation of pigs using local feed resources according to genotypes.
- Generation of high quality protein by use of crop residues such as banana peelings as substrate.

Genetics. The main sources of pig breeding services in Uganda are the village boars which are often shared among pig farmers without proper selection and breeding management. Besides, knowledge on the breed composition and types of individual animals is often lacking as pedigree records are unavailable. In the second phase of the L&F CRP, this theme will focus on:

- Phenotypic characterization of existing breeds in order to identify and promote genotypes according to the management systems.
- Design village breeding schemes and develop strategies to improve access by farmers to improved boars.

The indicated themes focus will have the greatest impact on farm level productivity through reduction in pig and piglet mortalities and productivity gains.

Value Chain Development. Under the current L&F program, players in the pig value chain have been identified, mapped and constraints identified. Most of the smallholder pig farmers and other actors along the pig value chain in Uganda are not organized and are loosely integrated with most lacking access to the required inputs and services. During the second phase of the program the theme will develop strategies to stimulate uptake of productivity enhancing technologies, upgrade the value chain and improve value chain integration through:

- Development of strategies for establishing sustainable and well-organized pig business hubs delivering demand-led inputs and services to improve access to quality inputs, services and output markets; and
- Identification of value addition niches for pig products through processing.

The theme will work closely with development partners including legalized commodity fora to achieve impact at scale. Its focus will have impact on availability and quality of pigs/pork products and employment and income generation for the value chain.

Gender. The gender theme prominent in the L&F program and will continue to be embedded in the pig value chain to promote more equitable access by poor women, men and marginalized groups to affordable animal source foods through gender equitable interventions including:

- Development and implementation of strategies and approaches through which women and marginalized groups improve the nature and level of participation in the pig value chain; and
- Development of strategies and approaches that increase women and marginalized groups entitlement to access markets and control resources, technologies, labor, power and the benefits of their work in the pig value chain.

Research benefits

Research conducted in Uganda pig value chain under the L&F program is expected to result in the following benefits: Reduced risks associated with pig diseases especially ASF and parasites and improve public health related to zoonoses; Improved incomes from the pig value chain benefiting the poor especially women, due to improved productivity, higher marketable surplus and improved linkage with input and output markets; Employment for poor men, women and the youth in the pig value chain (processing and marketing of inputs and outputs); Enhanced marketing and regulatory mechanisms which improve the quality of pork reaching the consumers; Creation of markets for new products such as processed products from pig offals; Minimized risks of air and water pollution through adoption of proper waste management in the pig production and marketing system; Development and implementation of policies that promote smallholder pig value chains.

Budget

The proposed budget for 2015-2017 is US\$6.13 million.

VIETNAM: SUSTAINING INTENSIFICATION OF SMALLHOLDER PIGGERIES

The livestock sector in Vietnam contributes over 21percent of agricultural GDP (6percent of national GDP). Pigs account for 71percent of livestock output and 75percent of meat consumption. The recent increases in animal production have been driven by domestic demand, particularly in urban areas where incomes have risen fastest and by a shift in diets from starches to a more diversified diet with more meat, fish, and dairy.

Pig production in Vietnam is characterized by large numbers of small-scale, widely scattered farms, with a small proportion of medium to large scale producers (Lapar et al 2003). The distribution of pig farms is dominated by the small scale household-based producers with 1-5 sows (84percent of all households raising pigs in 2006, down from 92percent in 2001). Household members provided the bulk of the labor needs, with women providing 1.5 times the labor input of men. Further, smallholders are demonstrated to have comparative advantage in supply cross-bred piglets to specific high value markets, partially as a result of indigenous breeds' ability to include forages in diet. Pig raising households account for 65percent of all agricultural households. As a consequence, smallholders remain the dominant contributors to supply with industrial producers only providing some 5percent of supply. At the same time, national policy is aimed at increasing the share of industrial production as a means to mitigate disease risk, and due to perceptions of higher efficiency with scale. Importantly however, analysis has shown that even under the most optimistic scenarios, large scale industrial production may only supply 12percent of needs in 10 years. Demand growth will almost certainly exceed supply, leading to more imports.

The context shows that smallholders will dominate pig production for many years; that smallholder productivity will remain below potential; and that impending trade deficits imply strong growth opportunities.

Intermediate Development Objectives

The project addresses to some extent all 6 IDOs of the Livestock and Fish CRP, but focuses in particular on IDO#1 – Increased productivity, IDO#3 – Increased incomes, and IDO#6 – Better policies and better public investments. The project objectives mirror closely the target IDOs:

Sustainable increase in smallholder farm productivity and value chain performance, in terms of yields, quantity, returns and risk mitigation

Higher and more reliable incomes as well as asset accumulation among smallholder pig producers and other value chain actors; and

Changes in national and local policies, investments and development actor practices that enable expanded opportunities to address the first two objectives.

Impact Pathways

The impact pathway – growth in productivity per animal and per hectare – depends on the assumption that smallholders can improve productivity and comply with product quality and safety standards to participate in the growing pig sub-sector. Moreover, smallholder producers are assumed to maintain pig production using a combination of own-farm and purchased inputs.

Production characteristics of and demand for indigenous and cross bred pig breeds provide specific opportunities for smallholder producers, particularly in marginalized communities

Upgrading of pig value chains in terms of food safety, disease risk mitigation, service access and efficiency can result in both improved consumer and producer welfare

Key Research Areas

Develop and pilot production strategies to improve productivity, with focus on feeding options from local resources, and disease risk mitigation.

Develop and pilot production and organizational models that allow smallholder to supply high value cross-breed markets, including public-private options for sustainable maintenance and supply of breed stock

Develop and pilot organizational and technical options for upgrading value chains and improving access to services and inputs, including improved food safety and product quality

Analyze policy, investment and development options for both private and public investors and decision makers that promote opportunities for smallholder pig producers and value chain actors, as well as consumer welfare.

Target regions

The project will work in the three main regions of Vietnam, including (a) the northern zone encompassing market systems and highland traditional systems with ethnic minorities; (b) central zone of mixed systems; and (c) southern zone of rapidly commercializing production systems.

Resource scenarios, 2015-2017

Scenario # 1: Current level of investment, about \$US1 million/year. Under this scenario, the emphasis would be on Research Areas 1 & 2, addressing on farm productivity and cross breeding. With CIAT, feeding options through forages would be explored, as well as strategies for biosecurity and disease control, including demand for diagnostics. Cross-breeding strategies

and markets would be explored in limited areas in NW Vietnam with national partners. RA 3 would be addressed largely through existing bilateral work jointly with CRP on Health and Nutrition, and RA 4 would be addressed through updating of an existing partial equilibrium model of the Vietnam pig industry, jointly with the CRP on Policy, Institutions and Markets. Human resources consist of part time input from several ILRI and CIAT staff, and a national research assistant, in addition to partners.

Scenario # 2: 125percent of current level of investment, about \$US1.25 million / year. In this case, in addition to the above activities, greater investment would be directed towards RA 2 on models for sustained cross breeding. The additional effort would include piloting public private models for supply of breed stock, and exploring longer value chains including exports of suckling pigs to high end markets in Hong Kong and China. This level of resources would allow the recruitment of 1 full time IRS staff member to be based in Hanoi.

Scenario #3: 150percent of current level of investment, about \$US1.50 million / year. Under this scenario, in addition to the activities in both of the scenarios above, greater investment would be directed towards RAs 3 and 4. The focus of value chain upgrading (RA 3) would be on exploring innovative models for combining product marketing and input supply (e.g. hubs) to complement the research on disease risk and food safety being conducted through bilateral efforts. Policy analysis would be expanded to address a wider range of topics including breed policy, feed resources and impact of disease control.