

Brief Summary Week/Theme 2
E-Consultation on
Integrated Crop-Livestock System for Development:
the way forward for sustainable production intensification.
February 8-12, 2010

Building off of the background paper provided at the website <http://www.fao.org/agriculture/crops/core-themes/theme/spi/iclsd>, Week 2's discussions focused on supply and value chain dynamics and the actors associated with promising crop-livestock systems.

In our background paper, we identified a focus on: **input and output market linkage development for promising integrated crop-livestock systems and associated input and output supply chain processes and public-private service providers for different production systems and diverse markets** (including constraints and opportunities in input supply chains covering production inputs of seeds, agro-chemicals, farm power, equipment and machinery, veterinary services, advisory and innovation systems on good farming practices, marketing infrastructure and organization forms etc; constraints and opportunities in output supply chains covering animals for meat, milk and other dairy products, hides and skins from cattle and small ruminants, and meat and eggs from poultry, and meat from pig; and opportunities for processing in integrated production systems etc). That description is a mouthful but certainly did not deter our readers from responding.

This week's discussion included some 20 contributions that came from experiences in Australia, India, Mali, Sierra Leone, Uruguay, Kazakhstan, Canada, Sudan, Brazil, USA, Bangladesh, Niger, Chile, Colombia, Zimbabwe, and Ecuador among others that indicated regional and global applications. Many of the interventions were relevant to the previous week's theme (innovations) and others are readily segueing to next week's theme (policy and institutions). The following brief summary is meant to highlight the range of points that were brought into the discussion. As we noted last week, the summary is not by any means exhaustive and can not adequately capture the depth of the interventions. That said all of the individual interventions can be found on the website as a blog along with the documents, photos and links that were submitted by participants.

This week's summary is organized according to the questions that were used to prompt the discussion (as much as possible). A number of additional inputs are highlighted as well.

- ***Do integrated crop-livestock systems offer an advantage when it comes to incentives/rewards for good practice such as payment for environmental services or access to special markets? If so, what is your experience with these?***

There were not specific examples of incentives that are in place but there were examples of what integrated systems could offer. The Inland Valley System (IVS, West Africa) warrants incentives in that it can reduce the use of marginal fragile uplands and the inclusion of multi-purpose crops can which leave crop residues for livestock and reduce conflict. Payment for environmental services could be considered for protection of natural forests, increased soil organic matter and biota, and erosion control.

- *Are there market (local, national, international) dependent value chain constraints (e.g. lack of local processing facilities, food quality/safety regulations, market access, etc.) that need to be addressed? Which are these and how have they been or might they be overcome?*

Urbanization and income growth has influenced the demand for livestock products in South Asian countries yet poor livestock keepers may not benefit from this given a lack of access to inputs, technology, credit, services and product markets. Lack of credit and insurance to support livestock are often not available. Markets that are not near by drive up marketing and transportations costs (reducing the price by 15% in some cases). Through Operation Flood, small holders can participate in commercial dairying through addressing production and institutional and marketing constraints. This applies also to growers' associations, cooperatives and contract farmers. Contract farming in was noted to increase profits over non-contract farming in India.

In Sudan, there is a growing domestic and export market for live sheep and meat and this has brought crop farms into sheep raising which in turn finances the crop production. Livestock becomes the financier. Livestock is also seen to create a financial buffer against crop failures.

Constraints to overcome, identified by the Panchayati Raj Institutions (PRIs), include better linkages for farmers with markets, insurance and banks to overcome associated vulnerabilities. Further as livestock production increases, there is an emphasis on indigenous breeds, feed and fodder resources and inputs such as veterinary services to equip livestock producers.

Constraints in southern USA include: lack of information needed for managing sophisticated/complex production systems; lack of field infrastructure (fencing water sources) and supply and delivery linkages; lack of information related to chemical usage for crop, animal and human health and safety; need to balance year round forage supplies and labor; and need to develop market for alternative meet production (grain fed vs. pasture fed).

Constraints in Sierra Leone include: lack of knowledge on caretaking (housing, nutrition, and health care); lack of vaccines and persons that can vaccinate; and lack of feed either as fodder (tree sources particularly) or intensive feed. Farmer field schools with animal technicians are being used to try to address these. Inclusion of pictures in training packages for farmers and extension staff are critical.

In the Inland Valley Systems (IVS) crop-livestock enterprises in West Africa, the constraints identified included soil moisture and the availability of animal draught power to cultivate the soils. Often farmers can pool their resources to put draught teams together.

One intervention featured the multiple dimensions of integrated pasture-tree and pasture-crop systems in the Ecuadorian Amazon. While they constitute the main production approach much expansion has been carried out through unsustainable practices that play a role in deforestation and climate change and have also instigated value chains in the region. The intervener queries whether intensification the way to reduce deforestation in the Amazon knowing that integrated systems can reduce environmental impact and green house effect. Intensification of pastures can reduce animal numbers and large areas of degraded pastures can be put in agroforestry. The diffusion of agroforestry technologies include

climatic conditions, economic growth of urban centers, presence of agro-industry, manpower availability, capital and credit, producer organization and incentives. Education is critical and the State and international cooperation have an essential role to transform to alternative systems “with shade” and develop markets for environmental services (and carbon) that come from the forest. This intervener also emphasized that the commercial economies have negative effects on the marginal sector – thus preferential attention should be given to institutional structure, research, extension and the farmer promotion.

Two colleagues provided diagrams of the inter-related supply chains of crop and animal production systems (graphics should be viewed in blog).

- Sims highlighted the inputs (products and services) that each provides to the system (from livestock, agroforestry, and conservation agriculture) as well as the outputs for value chains (food crops, fibre products, meat, wool, eggs, vermicompost, honey, etc.). This system highlighted the complementarity of CA and AF – for efficiency of natural resource use, provision of favorable production environments, profitable production systems and environmental protection and management.
- Twomlow offered up another graphic (adapted from Thomas 2003) that depicted biophysical constraints and interrelationships with production systems, households and communities with the natural resources management as the central feature. The crop-livestock project elements increased the inputs and flexibility of production systems, which in turn contribute to NR sustainability. Constraints are identified in production systems (e.g. drought, low productivity of rangelands, low diversification); household community (e.g. low investments, infrastructure, cohesion); and socioeconomic factors that influence community and production systems (lack of credit, subsidies, insurance). Interventions are required to strengthen institutions, empowerment of communities, provide conservation techniques, and enhance crop-livestock systems.

Integrated systems have enabled improvements in quality of meat and milk at competitive costs – this is derived from combining perennial and annual forage species, management tactics, pasture fertilization and animals with high genetic potential. Pasture finishing is satisfying requirements and markets. In South Brazil, over the last 10 years, area under crop-livestock systems has doubled and the integration of forage and cover crops have increased the profitability (net income) while diminishing risks.

It was noted that the global economy is influenced by crop-livestock systems (noting an example where Chilean farmers directed their crop-livestock systems toward European markets until quotas were imposed and the integrated crops livestock systems became less viable. This example was used to show that beyond innovative systems (breed, traceability, welfare for specific markets), government and political support must be associated with the innovation in order for the integrated systems to be improved. Further, farmer training must be done by well motivated and paid professionals that can address the reality of these systems.

- *Who are the input supply chain and output value chain actors and how do they inter-relate? Who drives the chains (farmers, input providers, markets, government, etc)? How equitable are the benefits to different actors along the input supply chain and output value chain? Are there examples of input chain and output value chain actors working together to gain more competitiveness and sustainability or stability?*

It was noted that private sector should be the main actor in supply of inputs and purchasing, transporting, storing and processing of outputs from the systems. All actors need to make a living (partial or full) from the supply chain activities. The public sectors' role is to fulfill extension, training and PES.

In India, working with clustered groups of villages who wish to work for the common cause (building on the PRIs and self-help groups and women self-help groups) increases the representation of women and more marginalized members of society and assists with the implementation of project interventions and direct linkages with relevant line agencies. Cluster approaches can sustain projects even when donor funding is absent. Action research on crop-livestock-fish integration has also worked with the Directorate of Research on Women in Agriculture to insure women's perspectives are addressed in technology development.

- *Might we see a shift toward greater local/national sustainable markets in light of decreasing availability and increasing costs of transport fuel, climate change, food insecurity, etc.?*

The main challenge will be from feeding the growing urban population and most of the food will come from medium and large farms which are in continuous grain accompanied by land degradation. The key role of pastures by fixing and recovering soil carbon balance will be crucial given increasing nitrogen fertilizer and petrol prices/shortages.

The IVS in West Africa is typically situated near large cities and towns and pressure toward intensification will increase with increasing numbers of people who are migrating to cities. Food security will be an important driver as well as meeting the demands for richer consumers.

A historical view of livestock integration in Uruguay demonstrated that ley farming took place in degraded grassland ecosystems introducing legumes and ultimately rotation of perennial pastures with grain crops. By the 90s, 90% of grain crops were in rotation with pasture one out of four years. Most recently these well integrated systems on larger scale farms have been undermined by continuous soybean production despite rising meat prices. The integrated systems continue on medium and small farms.

Integrated systems are on the rise in India to reduce farmer dependence on grain crops and allowing for additional sources of income.

Markets were noted as playing a large role in driving the intensification/specialization of crop-livestock systems and these are diverse across and within regions. A table showed the intensification gradient (extensive to intensive) by elements of integrated systems (feed, power, finance, market orientation, evolution, costs, innovations) – provided by Bruno - source Erenstein and Thorpe, 2009. Increasing overall demand for livestock products, urbanization, niche markets at diverse scales are emerging and within changing environments that must be addressed (e.g. equity, conflict over resource use, land deals and environmental challenges).

In Asia, projections suggest that demand for maize will be faster than for wheat because of the demand for livestock and poultry feed as well as increasing demand for food (rapid population growth, rising price of wheat and rice) and bio-fuel. This is expected to be a main driver toward shift in food consumption patterns in poverty stricken areas – driven by increased demand for raising livestock.

A new article in Science magazine offered up by colleagues in the CGIAR (Herrero *et al.*) was shared which uplifted the importance of mixed crop-livestock systems for food security. Two quotes here: "According to the CGIAR analysis, the world's one billion poor people (those living on less than 1\$ a day) are fed primarily by hundreds of millions of small holder farmers (most with less than 2 ha of land, several crops, and perhaps a cow or two) and herders (most with fewer than five large animals) in Africa and Asia. Furthermore, mixed crop-livestock systems could be the key to future food security; two-thirds of the global population already live in these systems, and much of the future population will occur there. Already mixed systems produce 50% of the world's cereals and most of the staples consumed by poor people". And, "Faced with population growth and climate change, small holder farmers could be the first targets for policies to intensify production with carefully managed inputs of fertilizer, water and feed to minimize waste and environmental impacts, supported by improved access to markets, new varieties, and technologies."

Additional Inputs:

Gender equity. Several colleagues pointed to the importance of gender issues and analysis and women's role in farming systems (historically and with women's self help groups in Asia).

Alley Cropping Lessons Learned. It was stressed that participatory approaches will not succeed if it does not meet the farmers need. The intervention noted that beyond scarcity of labor, the farmers did not see the direct benefit such as lack of commercial return from alley cropping e.g. environmental benefit alone is not sufficient. However the commercial value of livestock in small holder systems over the past 10-15 years has increased the interest as there is a practical application of tree legumes for livestock (citing *Leucaena* with grain crops in Australia).

Benefits. Increasing organic matter and biological fixation of legumes to support crop nutrition is a clear benefit. The intervention highlighted that fertilizers are much less effective at reversing land degradation. Another intervention noted that precious bi-produce of manure may exceed the value of meat or dairy animal products particularly on subsistence farms.

Area-wide integration. We were reminded of the fact that integration can take place on farm within the same management unit. Rather functional integration can readily be across a community or landscape.

Carrying capacity. Promoting integration of livestock calls for understanding the capacity for providing forage and essential feeds from the land base. Further, imported feed impacts livestock production as well as manure chemistry which has environmental outcomes. In nutrient poor environments, improvements in livestock productivity enhance manure quality and have a positive impact on crops and pastures. Assessment of tradeoffs must be carried out.

What did we learn? One intervention stressed the fact that we need to review what we did learn in the 70s, 80s and 90s as some of ideas emerging were core decades ago. However, there may well be socio-economic conditions that have changed which may augment the capacity to implement these systems now. A literature search to map new directions is needed and brought forward in multiple messages.

From land degradation to sustainable production. A case from Kazakhstan was presented to demonstrate different methods for converting abandoned land into pastures. Some successful outcomes pointed to the practice of sowing annual forages instead of follow to produce green forage, hay and grain as well as the ‘green conveyor approach for the production of annual forages as well a perennial ones to prolong availability of forages. Crested wheatgrass and sainfoin was a successful mix in Central Kazakhstan (legumes were difficult in the north) and in Canada alfalfa can replace the sainfoin.

Crop residue. Several contributors raised the issue of conflict over the use of residues. Integration of livestock requires the provision of fodder production through partial harvesting, separate fodder banks, or improved fallows. The intervention from Sudan noted that ‘crops and horns never co-exist’ as in this country the migratory, semi-migratory and agro-sedentary systems are present.

More Examples of ICLS. Additional examples of integrated crop-livestock systems included honey bees in Ghana and Rice-Duck cultivation in Japan, Korea, Philippines and Vietnam – a win-win for sustainable crop intensification.

Getting the meaning. One colleague noted that there are many wrong ways to intensify agriculture and that we need to be clear that agricultural intensification protects (rather than increase) productivity and prolongs good yields, reduces yield variability and production costs, while increasing food security and respecting the natural capacity of the environment and addressing cultural differences. The intensification of CA needs to integrate crop with livestock to preserve and strengthen diversification. And, a final quote “Seems difficult? Nobody said it would be easy!!”