Contributions in Week 1 of the crop-livestock e-consultation

From the Moderators

-----Original Message-----
From: Crop-Livestock
Sent: Sun 1/31/2010 10:17 PM
To: Crop-Livestock-L@mailserv.fao.org
Subject: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

February 1, 2010

Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development: the way forward for sustainable production intensification.

Our theme this week is on Promising integrated crop-livestock systems and innovations that merit mainstreaming and scaling, and tactics for implementation.

While agriculture may be making a comeback in the international sustainable development arena, farmers never stopped innovating around integrated farming systems to enhance productivity and income sources, decrease external inputs, and increase system resilience both environmentally and economically.

Growing demand for food for a dramatically increasing population, food price rises, energy source transitions and increasing concerns over the role of livestock (and agriculture) in environmental degradation and climate change are demanding that farmers explore win-win-win solutions. Agriculture must play a role in feeding greater numbers, providing a fair income to farmers, providing nutrition to consumers at an affordable price, reducing water use, enhancing our natural resource base, supporting employment and communities all while providing a means to mitigate and adapt to climate change.

If you witnessed the popular days of farming systems in the 1980's you are either appreciative of the prospect of a renewed interest in integrated crop-livestock systems or concerned that - for some reason - we are not making progress. Research has shown that integrated farms can be more productive and profitable than non-integrated farms, particularly if productivity includes diversity of outputs as well as overall system production. Integrated systems often have a richer diversity of species (plants and animals), capitalize upon on-farm ecosystem processes (nutrient cycles, pest management) and help optimize benefits of external inputs, resulting in improved productivity and environmental services. Integrated livestock-crop systems at both farm and area-wide level offer a means for going forward with sustainable production intensification.

Let's kick off the discussion with some scoping questions.

From your perspective:

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

- What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

- How best do we integrate these sustainable intensive production systems into a landscape scale approach?

We look forward to your responses to any or all of these questions as well as to any other questions and issues that you may feel are relevant.

The inputs and insights shared this week will also set the stage for going deeper in the coming weeks on market chains, policy, and research needs.

Please do keep in mind the three overall objectives of the consultation (what do we know about integrated crop-livestock systems for development – what works and what does not; define next steps for key stakeholders; and guide and empower FAO to better support member countries to harness the development potential of integrated crop-livestock systems) towards which the discussions must aim at over the next four weeks. Also, each week's topic should be addressed in the context of two cross-cutting issues – the role of stakeholders, and capturing public goods and incentives for action.

For the technical background document and other related information, please visit the website:

http://www.fao.org/agriculture/crops/core-themes/theme/spi/iclsd

With that we thank you and welcome your responses.

All the best,

The Moderators
Amir Kassam
Constance Neely

Theodor Friedrich
Eric Kueneman
E-mail: Crop-Livestock@fao.org

Conribution 1 from Stephen Twomlow, UNEP, Nairobi, Kenya

-----Original Message-----
From: Stephen Twomlow [mailto:Stephen.Twomlow@unep.org]
Sent: 01 February 2010 13:48
To: Crop-Livestock
Cc: Crop-Livestock-L@mailserv.fao.org
Subject: Re: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

Dear All

I will try and respond to the questions listed below a little later. But I thought I would share with you a paper we published last year looking, i admit short sightedly, as the cropping systems in southern Zimbabwe - key point coming out is that, even for the best resourced households the cropping system only met household needs one season in three. So from a systems perspective how do households survive - is it their livestcok enterprise, off farm activities or greater exploitation of the common resource base? As agricultural scientists are making full use of the life cycle approach in our smallholder systems analyses? - This alas does mean that the different disciplines that fall under the umbrella of agricultural science have to talk/ no wrong word - communicate with each other!

More later

Best

Steve
Stephen Twomlow PhD
Senior Program Officer Biodiversity and Land Degradation
Division of GEF Coordination
United Nations Environmental Program (UNEP)
PO Box 30552 (00100)
Nairobi
Kenya

Direct line: +254 20 7625076
Work Cell Phone: +254 728604550 (International Roaming)
Private Cell phone: +254 726593285 (Kenya only)
skype: steve.twomlow
e-mail: stephen.twomlow@unep.org
web site: www.unep.org

Contribution 2, from José Guillermo Velásquez Penagos at Corpoica, Columbia – In Spanish and English

-----Original Message-----
From: José Guillermo Velásquez Penagos
[mailto:joseguillermovelasquezpenagos@gmail.com]
Sent: 02 February 2010 00:47
To: Crop-Livestock
Subject: Re: Welcome to Week 1 (February 1-5) of the e-consultation onIntegrated Crop-Livestock System for Development

From your perspective:

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

Colombia:

La expectativa del productor es obtener una ganadería rentable para ello los productores actualmente son consientes del manejo ambiental y han incursionado en el manejo de los pastos y el establecimiento de sistemas silvopastoriles que le generan un mejor ambiente de confort a sus ganaderías lo que conlleva a una mayor productividad, ha incluido además la parte de cultuvos para la suplenetación en épocas criticas generando un nuevo componente en el sistema.

Uno de los aspectos importantes que se debe tratar, es el desconocimiento de la producción ganadera actual, ya hay conciencia por parte de los productores del manejo sostenible, no hay que satanizar la ganadería ni generarle gran culpabilidad por la deforestación y por muchos otros males ocasionados al ambiente.

La ganadería, es una excelente fuente de proteína para la alimentación humana. Lo importante es su explotación en forma controlada y eficiente para reducir al mínimo su impacto sobre el medio ambiente. Un punto importante es considerar las razas criollas o nativas para lograr esta eficiencia y posiblemente reducir este impacto. sería interesante evaluarlo

The expectation of the producer is to obtain a profitable cattle raising, for it the producers at the moment are you consent of the environmental handling and they have intruded in the handling of the grasses and the establishment of systems silvopastoriles that generate him a better atmosphere of comfort to their cattle raising. The above-mentioned bears to a bigger productivity, it has also included the part of cultivations for the suplementación in times you criticize generating a new component in the system.

One of the important aspects that should be, is the ignorance of the current cattle production, there is already conscience on the part of those producing of the sustainable handling, there is not that satanizar the cattle raising neither to generate him great guilt for the deforestation and for many other wrongs caused to the atmosphere.

The cattle raising, is an excellent protein source for the human feeding. The important thing is their exploitation in controlled form and efficient to reduce to the minimum their impact on the environment. An important point is to consider the Creole or native races to achieve this efficiency and possibly to reduce this impact. it would be interesting to evaluate it

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

·Colombia:

Los sistemas agrosilvopastoriles y silvopastoriles, vienen ganando espacio en nuestro país, se vienen adelantando estudios que resaltan estos sistemas y las bondades que se obtienen. Existe una excelente respuesta del productor a la introducción de estos sistemas en sus explotaciones ganaderos

He systems agrosilvopastoriles and silvopastoriles, come winning space in our country, they are come advancing studies that stand out these systems and the kindness that are obtained. An excellent answer of the producing to the introduction of these systems exists in its exploitations cattlemen

The systems agrosilvopastoriles and silvopastoriles, come winning space in our country, they are come advancing studies that stand out these systems and the kindness that are obtained. An excellent answer of the producing to the introduction of these systems exists in its exploitations cattlemen

- What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose
production?

La respuesta que se ha obtenido en estos sistemas muestra una mejor producción y productividad de las ganaderías. Es importante resaltar el confort que generan estos sistemas a las ganaderías, este confort contribuye positivamente en la producción y productividad. Se han encontrado diferencias en producción de fincas con sistemas agosilvopastoriles que superan el 15 %

The answer that has been obtained in these systems sample a better production and productivity of the cattle raising. It is important to stand out the comfort that you/they generate these systems to the cattle raising, this comfort it contributes positively in the production and productivity. They have met differences in production of properties with systems agosilvopastoriles that overcome 15%

- How best do we integrate these sustainable intensive production systems into a landscape scale approach?

Un punto importante es la formación y continua capacitación en donde un actor principal son los niños, esta formación debe venir desde el colegio. Otro aspecto importante es la difusión con visita a fincas exitosas con sistemas sustentables por parte de los productores esto

An important point is the formation and continuous training where a main actor is the children, this formation should come from the school. Another important aspect is the diffusion with visit to successful properties with sustainable systems

José Guillermo Velásquez Penagos.
Colombia, Corpoica

Contribution 3, from Salwa Amber at the FAO Subregional Office for West Africa, Accra, Ghana

-----Original Message-----
From: Amber, Salwa (FAOSFW)
Sent: 02 February 2010 13:46
To: Crop-Livestock
Cc: Mbenga, MusaSaihou (FAOSFW)
Subject: RE: Weeek 1 - Contribution 2, from José Guillermo Velásquez Penagos

Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

Yes I believe that a WELL integrated crop-livestock systems will be the answer for sustainable intensification provided that the right technical principles are applied. Let me tell you about South Yemen experience in this issue. I was supervising 8 cows' state farms plus other animal institutions. We bought about 6,000 heads of Frisians Cows from Kenya to raise them in South Yemen (down Saudi Arabia) an arid or semi arid area. We divided them among 4 farms. At the beginning the production was great, but then quickly decreased until all farms of the Frisians are dismantled by 1990, why, because of the followings:

Many developing countries have many limitations in Land Tenure, giving the right land ratio per head (it requires one Acre per head), legal context for supporting rural development policies and above all cost of the animal feed and health is so expensive beside many other factors. I do not think that even with government support, a typical developing country would be able to provide all conditions required to have a well integrated crop-livestock systems for effective sustainable intensification at this stage. Thinking of small farmer holdings of livestock, the problems would be intensified to him. No doubts the need is there for a sound strategy is badly needed but requires strong funding institutions to back it. In the west sub region of Africa, most of farmers

disputes incurred from livestock farmers because of land trespassing. The Land Tenure is so weak in this sub region but as sub sector in Agriculture, Livestock is quite promising in terms of trade.

Thank you with best Regards

Salwa Amber
Senior Policy Officer
Accra, Ghana

Contribution 4, from Jagadish Timsina at IRRI Bangladesh Office.

-----Original Message-----
From: Timsina, Jagadish (IRRI) [mailto:J.Timsina@cgiar.org]
Sent: 02 February 2010 14:20
To: Crop-Livestock
Subject: RE: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

From your perspective:

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

Yes. There is high degree of interdependency between crops and livestock. Undoubtedly, livestock rely on crop bi-products and residue and tree leaves and fodder trees for their survival and crops rely on livestock manure. Although chemical fertilizers are essential for increasing productivity to feed 9 billion people in 2050, manures and organic matters become an integral component of integrated plant nutrition systems and for the sustainability of any crop production systems. The ultimate fate of human survival depends on sustainability of integrated crop and livestock production systems.

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

The integrated crop-livestock-tree systems form a close loop, especially in small subsistence farming systems. Our work on integrated farming systems during early 90s in Nepal revealed that crop-livestock-tree systems are highly successful and innovative in the subsistence farms of mid-hills and Terai of Nepal. Crop residues were used for livestock and other purposes, livestock products were used for humans and crops and trees, tree products were used for livestock and humans, etc. These systems have been highly sustainable and successful in the rural communities even now. Successful farmers' associations and farmers' clubs were the keys for success of these systems.

References:

Timsina, J., 1998. Working with farmer groups - experiences, benefits, and problems. J. for Farming Systems Research and Extension (special issue of the journal).

Timsina, J., Singh, S.B., Timsina, D., 1991. Integration of crop, animal and tree in rice-based farming systems of hills and Terai of Nepal: some successful cases. Proceeding of Crop-livestock integration workshop, 1991. Asian Rice Farming Systems Network, IRRI, Los Banos, Philippines.

- What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

The main benefit is in terms of ecological resilience of the system.

These systems are ecologically/environmentally sound because all biproducts are being recycled by crops and livestock within the farm and hence there is no waste or polluted materials flowing outside the system and no or very less emissions of greenhouse gases from these systems. They are socially acceptable especially in the rural areas with small farms and farming systems. They are economically profitable due to internal recycling of crop and tree residues and manures for use by crops and livestock within the systems. Biomass from crop, livestock, and tree will increase and products will have multiple purpose production.

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

Our experiences in Bangladesh reveal that Farmer Field Schools are the best means of scaling up/out of these innovations. Our early experiences in hills and Terai of Nepal reveal that Farmer associations or Farmer groups are keys for sharing knowledge and for diffusion of innovations. Through such mechanisms short-duration rice varieties are being spread in northern Bangladesh. In the hills of Nepal, through farmers' traditional/indigenous knowledge, they were able to control pests and diseases in crops and livestock and through their associations they were able to scale up such local innovations to the wider communities.

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

Crop residues are not enough for raising large number of livestock as they are also left on the soil for improving soil fertility. Conservation agriculture (CA) requires that part of the crop residues be retained on soil to reduce soil degradation/erosion and improve soil fertility and conserve soil moisture. Residues are also used for cooking and for making fences and thatches, etc. in rural areas. Residues have multiple uses and hence there tends to be competition for its use for different purposes. Crop-livestock systems are of varying types and scales. For example, farmers could raise livestock varying in number from none to many with varying species of crops and

cropping intensity. These all factors pose difficulties in scaling-up/out the integrated crop-livestock systems.

- How best do we integrate these sustainable intensive production systems into a landscape scale approach?

Both qualitative and quantitative models are required for best integration and scaling-up of sustainable intensive production systems. In our earlier work in Nepal (Timsina et al., 1991, Timsina, 1998), we have provided 2 diagrams showing successful and innovative crop-livestock-tree systems for hills and Terai of Nepal. Greater degree of crop, livestock and tree integration, use of farmers' indigenous/traditional knowledge, strong local institutional/organizational support, and effective farmers associations were key factors for the hill farms to be suatainable. However, these studies were qualitative and hence can't be efficiently scaled-up. Quantitative techniques/models will be required for optimization of crop-livestock systems with and without trees. Such models can be developed and validated for different family and farm sizes considering the need of CA for sustaining soil resource base and improving crop and livestock productivity and for overcoming the impacts of global climate change. Once such models are developed, they can be used for scaling-up/out the key, innovative crop-livestock systems in large landscape approach.

Jagadish Timsina
Senior Cropping System Agronomist
IRRI Bangladesh Office

Contribution 5, from Felix Bachmann in Switzerland.

-----Original Message-----
From: Bachmann Felix [mailto:felix.bachmann@bfh.ch]
Sent: 02 February 2010 16:16
To: 'Crop-Livestock-L@mailserv.fao.org'
Subject: E-consultation on Integrated Crop-Livestock System for Development

Dear Colleagues

I would like to reply to the questions below as follows, whereby putting - wherever possible - my reflections into the context of the paper of Ncube et al. 2009: "Resource flows, crops and soil fertility management in smallholder farming systems in semi-arid Zimbabwe", which has been forwarded to us by Steven Twomlow:

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

Yes; as long as you can accept a term like "sustainable intensification" and don't see a contradiction in it itself. For me, I have no problem accepting this term and working towards "sustainable intensification".

Yes; but integrated crop-livestock systems, if they want to contribute to the feeding of the world's still growing population, have to have a clear market focus. Here I slightly disagree with the conclusion of Ncube et al. who identify household food security as the goal in farming. Agreed, food security is in the forefront and the first objective to achieve in many smallholder farm households. Nevertheless, for me food security is not a referral target, and farmers cannot even rely on it. In good years, production is "above" food security and farmers want to sell the marketable surplus. In bad years, production is below own food requirements and households are forced to look for additional food and sources of income.

Hence, if integrated crop-livestock systems shall contribute to food production, they must set goals which go beyond the food security of the system's own population. But I agree, some of the systems are located in such resource poor environments, where it is difficult to produce enough food even for the farm households themselves as the paper from Zimbabwe shows.

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

Leaving pastoralists and agro-pastoralists beside, smallholders concentrate on crop farming; and resource poor farmers stick even more to cropping than the ones who are a bit better off (also indicated in the paper of Ncube et al. 2009). On the other hand, livestock in this context is seen as an indicator for assets and wealth. Hence, if we focus on improving crop-livestock systems, we may try to improve the resource base, where among other tracks we then end up with livestock. Promoting and introducing or strengthening small-scale dairying in India and in East Africa has been in the past one way to improve the resource base of smallholders. Results have been encouraging on one hand, on the other hand, investments into livestock came along risks which not every household could bear. In this regard, the latest developments concerning livestock insurances are encouraging as they help farmers to increase their (livestock) resource base and intensify livestock production at a reduced risk level.

It is worthwhile to mention that all these steps towards intensification of livestock production took place in landed farm households, and hence, can be seen as intensification of existing farming systems, sometimes even turning them into integrated crop-livestock systems. (For further reference, you find some of my experiences in small-scale dairying on: http://www.intercooperation.ch/offers/download/s-ic-4-bachmann-livelihood-livestock-eng.pdf/view)

- What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

Economic benefits in crop-livestock systems with a strengthened livestock component are the additional income from the sale of animals and livestock products. The increased availability and use of farm yard manure has an economic value, but is also an environmental benefit through better nutrient cycling leading to improved soil

fertility (but be aware, a crop-livestock system, even if it is very well integrated, is not a perpetuum mobile). The close links between farming systems and livelihoods result in positive social benefits for the farm household.

From the various small-scale dairy projects in India and Tanzania, I would rank the benefits from (improved livestock keeping towards) sustainable intensification of integrated crop-livestock systems as follows:

1. Higher crop yields and more different crops grown on farm due to increased availability of farm yard manure

2. Additional cash income from sale of animals and livestock products

3. Improved diet for farm household itself due to increased availability of animal source food

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

One of the best means to scale up innovations is through producer groups. However, such groups should be formed and centered around a specific economic activity like e.g. dairying where dairy cooperatives in India have been promoted under Operation Flood or the dairy farmers groups we promoted in Tanzania. (Don't form groups simply because you think doing things together is better than walking alone.) Exchange in groups goes much easier, but groups need a driving force behind, which in most case is expressed through a benefit. And it's often an economic benefit which stands out for the stakeholders, even if they may come along other benefits like social and environmental ones.

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

The natural resource base is limited; and it starts depleting, when and where pressure has become too much.

Especially for crop-livestock systems in semi-arid areas water quickly becomes the limiting factor, as shown in the Zimbabwe case. In this regard, it is interesting to note that the paper refers to rainfall (amount and pattern), but is silent on any water harvesting and/or conservation measures.

Perhaps the watershed approach and water harvesting techniques as promoted in the 80's and 90's in India with the objective to sustain and improve crop production will soon face a revival in other countries.

There are voices pointing at poor soil fertility and insufficient application of fertilizer as reasons for low crop yields in sub-Saharan Africa, but I still think that water is the limiting factor in many areas (I write on purpose water and not rainfall).

- How best do we integrate these sustainable intensive production systems into a landscape scale approach?

(I leave this question open. What is exactly meant by a “landscape scale approach”?)

Kind regards
Felix Bachmann
Berner Fachhochschule
Schweizerische Hochschule für Landwirtschaft
Agronomie

Felix Bachmann
Wissenschaftlicher Mitarbeiter
felix.bachmann@bfh.ch <mailto:felix.bachmann@shl.bfh.ch>
www.shl.bfh.ch
Tel +41 31 910 22 85 (direkt)

Contribution 6, from Maria Izabel Radomski at EMBRAPA FLORESTAS, Brazil

-----Original Message-----
From: Maria Izabel [mailto:izabel@cnpf.embrapa.br]
Sent: Tue 2/2/2010 6:36 PM
To: FAO crop-livestock
Subject: Agrosilvopastoral systems

The several impacts of the rural integration activities is an important point to discussion. Social, economical and environmental aspects are relevant. In Brazil efforts are made to expand agrosilvopastoral systems to small and big farmers. Studies has discussed the very low adoption of these systems mainly among small farmers. In this sense, we think the participatory research is an important tool to discuss, to valid and to diffuse the new technologies and integration systems that involves small farmers. The farmers objectives and the local knowledge must be identified and systematized to serve as a tool in decision making for future agrosilvopastoral projects. On the other hand the payment for environmental services of these systems also may be discuss, including the carbon sequestration, and the conservation of the weather, soil and biodiversity. The use of native species must be priorized like the multipurpose leguminous and fruit trees. The indigenous livestock also must be rescue and integrated to the production systems. The Spanish "dehesa" is an interesting example that link production and nature conservation. In Southern Brazil, the "faxinal" system is another example of traditional silvopastoral developed by small farmers linking the Araucaria forest and livestock production.

Following link and attached papers to collaborate with the discussion.

http://www.watershedmarkets.org/casestudies/Silvopastoril_Central_America.html

Best regards.

Maria Izabel Radomski
Agroforestry Systems
EMBRAPA FLORESTAS
Colombo - Parana - Brazil

Contribution 7, from Roberto Peiretti at AAPRESID, Argentina

-----Original Message-----
From: Ing. Agr. Roberto A. Peiretti [mailto:sdrob@idi.com.ar]
Sent: 03 February 2010 03:45
To: Crop-Livestock; Crop-Livestock-L@mailserv.fao.org
Subject: Re: Week 1 - Contribution 5, from Felix Bachmann

Dear Colleagues:

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

R Peiretti: For the future global scenario, we must be fully aware that "Sustainable Intensification" is absolutelly needed to be able to increase total global food production and also that it must be prioritized over the second mechanism to enlarge food production namely: area expansion. Also, keeping in mind our American experience of having more than 50 millions hectares cultivated under No-Till and the MOSHPPA Model Principles (see attached paper), we feel in shape to state that the "Intensification can be achieved under a Sustainable and even Improvement Pattern" not necessarilly by implementing crop-livestock system but by intensifing grain production. Even so I am not saying or meaning that is the only way and perfectly in many other situations the cobine activity may fit better.

Yes; but integrated crop-livestock systems, if they want to contribute to the feeding of the world's still growing population, have to have a clear market focus. Here I slightly disagree with the conclusion of Ncube et al. who identify household food security as the goal in farming. Agreed, food security is in the forefront and the first objective to achieve in many smallholder farm households. Nevertheless, for me food security is not a referral target, and farmers cannot even rely on it. In good years, production is "above" food security and farmers want to sell the marketable surplus. In bad years, production is below own food requirements and households are forced to look for additional food and sources of income.

Hence, if integrated crop-livestock systems shall contribute to food production, they must set goals which go beyond the food security of the system's own population. But I agree, some of the systems are located in such resource poor environments, where it is difficult to produce enough food even for the farm households themselves as the paper from Zimbabwe shows.

R Peiretti: I agree with the above comment in repect to the market oriented idea. For agriculture (including any agric. model or system as for example the one we are discussing - Integrated Crop-Livestock system-, to be developed under the

Sustainability idea it must be able to match the three main axes of the sustainability concept; namelly the economic, the environmental and the social one. If any of them are not matched we can not say a system is sustainable and hence it will not last as worldwide reallity has proven us repeteadly. To clarify my previous statement:

1.) If we don´t match the environmental axis, sooner or later the productivity will decline, agroecosystem will deteriorate as well as negative impacts on the general ecosystem may occur.

2.) If the economic (profit) axis is not matched we will need subsidization (which is not a sustaimable economic model in itself) or other economic source will have to suppor the system which is not the case either.

3.) The social axis should also be matched otherwise starting by the basic it will imply that not enough production or income will be generated to be self sufficient from the economic and hence from the food sufficiency standpoint.

The bottom line is that all these three points or requierements are equally valid and constitute the necessary conditions both from a global prospective as well as from a particular and small scale perspective, focusing on the small farmer of a self-subsistance scale. We must match these requirements at any scale if we are going to be able to feed humanity in the near future. Even considering the agroecosystems with extremelly poor resources (as the one described and analyzed on the Zimbabwe paper), the efficiency of utilization of the natural as well as the economic and human resources, ought to be maximized in a sustainable way.

To enlarge the level of efficiency we must do our best efforts to improve the technology applied on any system - including the one we are discussing (crop-livestock). Better technologies than the one currently used in many areas can be sucessfully introduced to improve the efficiency of the whole operation. (As an example see the attached report: Drought Tolerant Soils). To achieve this, among many other issues, as for example those related with pollitical, economical cultural and social decisions and characeristics of a given location, region, country (or even continent), should be taken into consideration. The most modern technologies that simultaneously allow to increase productivity and efficiency in a wide sense, should be locally tested and adapted and then, when proven adequate, heavily promoted. Along this pathway we should not forget "the basic". When we focus from a global prospective and watch the general trends, any agorecosystem that is suitable to raise crops of any type, will have to be cultivated in the future to generate the largest possible ammount of biomass (this is an absolutelly global trend) and then decide which is the most efficent and possible or "feseable" way to utilize the "photosynthesis product" obtained. In the general strategy it must be taken into consideration issues like the "alimentary capacity and efficency" of the products obtained. Example - how many "human daily basic diets" can be obtained from a Kg of grain (as for example a mix of corn, soy etc.)? and compare this figure with the number of "human daily diets" that can be obtained from the ammount of beef that can be produced feeding that same Kg of grain mix to a steer. Even though we must not diminish at all the capacity of the ruminants to digest cellulose and coarser hydrocarbons we must keep looking for the better (most efficient) ways to produce beef from the standpoint of the "alimentary opportunity cost" . Of course it is not so

simple to figure out and come out with the solutions for "this equation". At this point my intention is only to stimulate the discussion about this basic and central issues while looking to improve the human aliemntary status from a global prospective .

Last but not least important of all is the following. At the moment of deciding wether to feed cows with the crop stoover or "to feed the soil" to keep it productive over time, represents another difficult decision related to finding a break even point¡¡¡¡(See attached pictures taken by myself in South Africa where the competition between the crop stover utilization for sheep heavily competes with the desire and determination of covering and feeding the soil to harness the No-Till advantages, amongst them the improvement in the water management and nutrient cycling for the following crops.

We must be aware that for the soil to remain productive it must be "FED" basically with Carbon" as well as returning the nutrients that we are taking out with our harvests . If we don't do so, a sustainable stage is not possible to be achieved¡ ¡¡

Indeed we are in front of a very complex issue and huge task but not not necessarily imposible to be solved (or at least improved) and used as a feasible and appropriate agroecosystem operation models for many agroecosystems of the world.

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

R Peiretti: If we focus first in the agriculture of the developed world, the clear trend (except on the countries that subsidize the cattle raising activity as many of the EU countries do) is to use the soils to grow crops rather than to raise cattle wherever the agroecosystem characteristics allows to develop them. Within the developing countries (where I include my country, Argentina where subsidization does not exist and on the opposite the agricultural activity -grain and oilseeds raising- is strongly "penalized" by a heavy taxation), the economic forces derived basically from the international markets namelly: the prices, clearly orient the activity toward an increase of cropped area (cereals and oilseeds) replacing the cattle grazing activity. Focusing on the poorer countries scenarios, this trend may not be so noticeable probaly because grain and oilseed (and other crop production) can not be efficently developed so they can not compete with the animal husbandry of different types.

I do not pretend this to be a full, deep and even right explanation or model, but observing what is happening in the world I had noticed this "kind of trend" has certain degree of prominence around the globe. With the exeptions I had just mentioned, the borderline or boundary that divides the crops raising from the pasture grazing areas looks like determined by the capacity of the agroecosystem to allow raising a crop with a proper level of profit which after all means to be capable to generate a better profit than other agroecosystem allocation alternatives.

Even with what I have just said, there is not necesarily a clear boundary and there are ways to integrate both activities according to the extraodinary number of different

scenarios across the entire world. I am only talking or mentioning what I will call a MACRO GENERAL TREND that of course has plenty of execptions.

- What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

R Peiretti: I agree with the above comments. Also, as I said, under my understanding and providing that the MOSHPPA principles are considered, adapted locally and then adopted, the three main axes of sustainability can be simultaneously achieved.

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

R Peiretti: I agree with the above comments. The identification of leaders, the promotion of them as well as the promotion of innovative farmers groups (always mobilized under the idea of promoting the self-empowerment) is the way followed where agricultural innovations had quickly adopted around the world. Of course the proposed new farming model should be economically feasible and be able to render a better level of profit than the previous model or the one that is been attempted to be improved.

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

R Peiretti: The key constraint is located around the finding of a proper break even point for the utilization of the biomass produced in a given agroecosystem: TO FEED THE SOIL OR TO FEED THE ANIMALS. The best point for this unstable and dellicate equillibrium is that which allows to maximize the food production in a SUSTAINABLE way taking always into account the three axes of sustainability¡¡¡(See the attached my pictures taken in somehow extremelly limited agroecosystems)

- How best do we integrate these sustainable intensive production systems into a landscape scale approach?

R Peiretti: If I properly understand the question, the best landscape can be considered the one that allows to better satisfy the human needs as a first priority and condition but always within the frame imposed by the sustainability concept¡¡¡

Regards

Roberto A Peiretti
AAPRESID
CAAPAS

Contribution 8, from Salwa Amber at the FAO subregional office for West Africa in Accra, Ghana

-----Original Message-----
From: Amber, Salwa (FAOSFW)
Sent: 03 February 2010 10:16
To: Crop-Livestock-L@mailserv.fao.org
Subject: FW: Weeek 1 - Contribution from Salwa Amber

Dear All,

The following is my contribution which was copied to my Coordinator (SFW), Mr Musasaihou Mbenga. The below contribution talks about South Yemen, my homeland and that is why a clarification is needed.

I would like to address the following 2 questions:

Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

Yes I believe that a WELL integrated crop-livestock systems could be the answer for sustainable intensification provided that the right technical principles are applied for a profitable enterprise. Let me tell you about South Yemen experience in this issue. I was supervising 8 cows' state farms plus other animal institutions. We bought about 6,000 heads of Frisians Cows from Kenya to raise them in South Yemen (down Saudi Arabia) an arid or semi arid area. We divided them among 4 farms. At the beginning the production period i.e the first 2 years, results were great, but then quickly decreased until all farms of the Frisians are dismantled by 1990, why, because of the followings:

Many developing countries have many limitations in Land Tenure, water resourses; giving the right land ratio per head (it requires one Acre per head), legal context for supporting rural development policies and above all the cost of the animal feed and health which are so expensive beside many other factors for low income countries.

I do not think that even with government support of investment for even more than 2 years, a typical developing country would be able to provide all conditions required to have a well integrated crop-livestock systems for effective sustainable intensification at this stage. Thinking of small farmer holdings of livestock, the problems would be more hard to him. No doubts the need is there for a sound strategy but requires strong funding institutions to back it. In the western sub region of Africa, most of farmers disputes incurred from livestock farmers because of land trespassing and land limitation to their herds. The Land Tenure is so weak in this sub region; but as a sub sector in Agriculture, Livestock is quite promising in terms of trade food security.

Best Regards to all.

Salwa Amber
Senior Policy Officer
Accra, Ghana

Contribution 9A, from Frank Place at the World Agroforestry Centre, Nairobi, Kenya

-----Original Message-----
From: Place, Frank (ICRAF) [mailto:F.PLACE@CGIAR.ORG]
Sent: 03 February 2010 09:32
To: Crop-Livestock-L@mailserv.fao.org
Subject: Week 1 posting

I agree with all others on the value of integrated crop livestock systems and their undoubted importance in agricultural development. I wanted to add one comment on the aspect of constraint or challenge. In Africa, where farm sizes are small (about 0.2 hectares per capita in most countries, World Development Report 2008) and shrinking, a key aspect is how to increase productivity of biomass to accommodate the food-feed-soil-energy needs of households. Already tradeoffs are being made, for example, the use of dung for cooking in Ethiopia or reductions in number of livestock (or shifts from cows to goats). Added to these needs are 'new' uses for biomass such as biochar and even the payment for its retention rather than use (carbon payments, watershed protection payments). Currently, although there are examples of integrated approaches (e.g. dual purpose legumes), there is still a strong emphasis on sectoral approaches to tackle the different problems of soils or energy. What is needed is to look at the systems together and identify whether and how more biomass could be produced, what types, for what purpose, where on farm or landscape, and how its use can be made more efficient. And this then brings up the elements of the health of soils and water availability as fundamental to biomass productivity.

Frank

Frank Place
Economist and Head of Impact Assessment
World Agroforestry Centre
UN Avenue
PO Box 30677
Nairobi Kenya 00100
phone: +254-20-722-4155
fax: +254-20-722-4001

Contribution 9B, from Tilahun Amede at ILRI/IWMI in Addis Ababa, Ethiopia.

-----Original Message-----
From: Amede, Tilahun (ILRI-IWMI) [mailto:T.Amede@CGIAR.ORG]
Sent: 03 February 2010 15:07
To: Crop-Livestock; Crop-Livestock-L@mailserv.fao.org
Subject: RE: Week 1 -- Contribution from Tilahun Amede

Dear All,

Thanks for initiating this discussion on Crop-Livestock systems. I would like to highlight few issues on Crop-Livestock systems from the perspective of Eastern African highlands.

1) Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

The crop-livestock systems are in transition with different paths of intensification. The change is hugely influenced by external drivers (e.g. markets) or internal drivers (population pressure and associated land shortage) including changing household priorities. They are here to stay. If we interpret sustainable intensification in terms of efficient use of resources (land, water, nutrient and labour) for producing enough food and income while minimizing environmental degradation, functional and integrated crop-livestock systems are the most practical strategies. However, for these systems to be functional and feed the 9 billion they require policy shift from sectoral to integrated decision making, improved rainwater management at plot, farm and landscape scales, reliable markets (including input delivery) and enabled farmers in terms responsiveness to climatic and market shocks and local capacity to produce, process and market their products.

2) What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agro-ecological area that you are referencing).

From the perspective of subsistence systems of the African highlands, where erosion-induced land degradation is apparent, crop choice is dictated mainly by food habits and traditional farming practices are still predominant, the following could be listed as key lessons learned since the 1980s.

i) These systems are not static; they respond to technologies and external pressure. For instance, the expansion of maize from a garden crop to a major crop replacing sorghum, wheat, teff of the crop-livestock systems of the Ethiopian highlands was due to its high biomass for dry season feed, high grain yield for the people, government policy to subsidize seeds and fertilizer and its plant architecture allowing intercropping. Here, crop residue is becoming an incentive, particularly because of the competing and growing needs.

ii) Crop-livestock systems are also changing because of investments on land, water and watersheds. For instance, new irrigation schemes are converting dry season grazing to a command area, growing mainly high value vegetables with limited feed supply, pushing the livestock to hill sides. This could work only if irrigation designs are considering livestock into the design and water management scenario. In situations where these hillsides are protected (e.g. area exclosures) and SSI is excluding livestock these crop-livestock systems are under huge pressure; encouraging nutrient mining, and decreasing system productivity.

iii) Applying chemical fertilizers, alongside with water managment, improved the integration and productivity of crop-livestock systems, minimizing the pressure and maximizing the returns, particularly where market incentives function.

3) What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

Crop-livestock systems are not new to our region. The Crop-livestock systems in the Ethiopian highlands are as old as history, ongoing with different intensity in different places. In regions where perennial crops are grown (Coffee-banana/enset-tree systems) crop-livestock integration is intensive and complementary (the trees need the manure to grow), and commonly market oriented (fattening, dairy), while in the extensive cereal systems the integration is loose aggravating land degradation. In systems where livestock is kept beyond economic uses (risk insurance, social values..) there is limited chance to implement a well balanced crop-livestock system. The system didn't produce enough biomass to feed the livestock in the system; soil fertility is under decline, investment on land and water is limited and intensification principles are not commonly adopted.

Scaling-up of the various interventions is also a challenge because of the diversity of assets, priorities and needs of communities in these diverse systems. The packaging approach is less effective and participatory research with every community is very expensive and undoable. Moreover, changing policies and instability of institutions at local levels are weakening the scaling-up efforts.

4) How best do we integrate these sustainable intensive production systems into a landscape scale approach?

The question is: what is the entry point to intensify these systems; at farm level or at a landscape level. Experiences show that simultaneous engagement at a landscape level through collection action, and farm level intensification through technology integration works best. As the upstream-downstream interaction is strong in many landscapes, managing the integrators (e.g. run-off management, erosion control, hill side vegetation cover, livestock feed) could be critical to intensify the crop-livestock systems across scales.

Tilahun Amede, PhD
Scientist, Livestock water and nutrient productivity
International Livestock Research Institute (ILRI) / International Water Management Institute (IWMI), P.O.Box 5689, Addis Ababa, Ethiopia
Bus: +251 116463215
Mobile: +251 911 230135
Bus Fax: +251 116461252
E-mail: <mailto:T.Amede@CGIAR.ORG> T.Amede@CGIAR.ORG
Web Page: <http://www.iwmi.org/> http://www.iwmi.org <http://www.iwmi.org/> / http://www.ilri.org <http://www.ilri.org/>

Contribution 10, from Stephen Twomlow at UNEP, Nairobi, Kenya

-----Original Message-----
From: Stephen Twomlow [mailto:Stephen.Twomlow@unep.org]
Sent: 03 February 2010 15:34
To: Crop-Livestock
Subject: Re: Week 1 -- Contribution 7, from Roberto Peiretti

Dear All

I am pleased that my initial contribution raised some comments and would like to respond, add to the comments made by Felix and Roberto and endorse those made by Frank Place today.

Best

Steve

Stephen Twomlow PhD
Senior Program Officer Biodiversity and Land Degradation
Division of GEF Coordination
United Nations Environmental Program (UNEP)
PO Box 30552 (00100)
Nairobi
Kenya

Direct line: +254 20 7625076
Work Cell Phone: +254 728604550 (International Roaming)
Private Cell phone: +254 726593285 (Kenya only)
skype: steve.twomlow
e-mail: stephen.twomlow@unep.org
web site: www.unep.org

Contribution 11, from John Baker of Crossslot, New Zealand.

-----Original Message-----
From: John Baker [mailto:baker@crossslot.com]
Sent: Wed 2/3/2010 8:57 PM
To: Kassam, Amir (AGPC)
Subject: From Dr. C.J Baker, New Zealand

Hi Amir

I attach my contribution to the crop-livestock forum.

Kind regards, John

From Dr C J Baker, New Zealand, 02 February 2010

Almost all of New Zealand's cropping involves intensive integration with livestock systems. I doubt if there is a single arable-only farmer in New Zealand. So integration is a way of life for New Zealand farmers although that country's favourable climate may mean that the opportunities for downsizing what NZ farmers do for less fortunate climates is rather limited.
Nonetheless here is an outline of some of the systems and their advantages and constraints.

(1) Number 1 is a relatively new system that has only been made possible by the recent availability of "fail-safe" no-tillage technologies. It involves replacing all permanent pastures on a farm with a succession of short-rotation forage crops for animal finishing (cattle, lambs or farmed deer). The forage crops range from annual hybrid grasses through a range of forage brassicas (including forage canola), forage cereals to herbs such as chicory and plantains. Since new crops are established at least once per year and often more frequently in any one field, tillage is simply not a sustainable option. And since the risks associated with the failure of any one crop would be serious, the system relies heavily on no-tillage technologies and systems that have a very low failure rate. Currently the most frequently used no tillage system has a 95-99% success rate according to surveys.

The results have been spectacular. One leading farmer who previously finished 8,000 lambs on permanent pasture now finishes 24,000 lambs on the same area and regularly gets 400 grams of weight-gain per day with lambs and up to 2 kg/day with cattle. The trick is in planning when and what crops to sow to suit dry and wet (or hot and cold) times of the year and the stages of growth of the animals. When prices are attractive, the system also allows the farmer to substitute arable crops for forage crops from time to time on an opportunity basis.

The big issue is how well the soil will stand up to this intensity of animal traffic. Some farmers limit themselves to finishing lambs (rather than cattle) for this reason. Either way, this aspect favours the sole use of no-tillage for establishment although long-term soil effects have yet to be studied.

(2) Another integrated system involves arable farmers growing a range of summer crops for harvest and then no-tilling a forage crop into the lying residues immediately after harvest in autumn. The farmer then either buys in stock of his/her own to finish over the winter of contracts the break-feeding (behind daily-shifted electric fences) of the crop to a nearby dairy farmer who wishes to winter his/her pregnant cows or young stock off-farm. The cows usually stay on these forage crops until calving in late winter or early spring. If the farmer is finishing stock of his own for slaughter, these stock may stay on the property until killing weight is reached or the prices of the next season's arable crops are determined in which case the farmer may make a late decision to retain the stock or sell them before killing weight is reached and grow another arable crop.

In order to retain this level of flexibility, no-tillage is the preferred method of establishment. Even then, in order to protect the soil as much as possible from treading damage over the wet winter period, a no-tillage drill that can handle heavy residues (in excess of 10 t/ha) makes the system more sustainable (from a soil point of

view) than if the farmer has to either burn the residues (which is still allowed in New Zealand, believe it or not) or even worse, till the soil.

(3) Almost all predominantly-livestock farmers renew their pasture periodically. Often this involves sowing a forage crop that is fed in situ behind an electric fence, followed by sowing of the new pasture. But other farmers choose to go from old pasture to new pasture directly. Both tillage and no-tillage is used for this purpose although no-tillage is rapidly becoming the technique of choice, mainly because of cost, reduced exposure to erosion, and quicker utilization of the new pasture.

(4) Another technique centres on harvesting grass for silage. Often the last utilization of a deteriorating pasture is to shut the field up for silage production. About 4 days before harvest, the field is sprayed with Roundup, which actually increases the sugar content of the grass about to be mown anyway. The grass is harvested and the field is immediately no-tilled into a new pasture or forage crop, knowing that the existing species will not recover after harvest. Sometimes the silage is sold off-farm as a cash crop. Other times it is retained on farm for use by stock at a later date.

(5) A specialist variation of the above is for arable farmers or contractors to lease or buy land specifically to grow specialist silage crops (usually grass, maize, wheat, triticale or forage barley, sometimes in association with forage peas or other legumes such as tic-beans). These silage crops are invariably sold off-farm, usually to dairy farmers. Where the crop is a perennial (such as grass) the same land may then be leased to dairy farmers for winter grazing of pregnant cows as in the first system described above, or a new forage crop is sown specifically for this purpose as in (2) above.

There are other local variations on the above which suit specific circumstances. But there are infrastructural requirements that are common to all examples. For example, all New Zealand farm are fenced into individual fields with 7 or 9-wire fences, each of which is also supplied with reticulated water. While this makes integration of livestock and arable cropping enterprises both simple and effective it is a model that may not be easily transported to, or downsized in other countries.

Contribution 12, from Bruno Gerard, CGIAR Systemwide Livestock Programme, ILRI in Addis Ababa, Ethiopia.

-----Original Message-----
From: Gerard, Bruno (ILRI) [mailto:B.Gerard@CGIAR.ORG]
Sent: 04 February 2010 10:01
To: Crop-Livestock

Dear colleagues,

Thanks for the interesting contributions and background information shared so far in the e-consultation.

Q: Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

Small scale mixed crop-livestock farming systems will certainly play a role in feeding world population in the foreseeable future. However their evolution/trajectories and their role in food security is very much region, agro-ecology and site specific and influenced by drivers at different scales. Some systems are evolving/changing very rapidly toward specialization and moving away from integration at the farm/landscape scale (i.e. China). Other countries in South Asia like Vietnam might see rapid changes toward specialization as well and national policies (to respond to increase demand for animal products) will certainly play a major role in transforming rural systems (see below). Foreseeing/understanding those changes and evolutions should guide research priorities and development investments. Mario Herrero (ILRI will certainly tell us more on that).

HCM CITY — The animal husbandry and poultry sectors will be reviewed and restructured so that they develop in a sustainable and competitive manner, an official said at a conference in HCM City yesterday.

Hoang Kim Giao, head of the Ministry of Agriculture and Rural Development's Animal Husbandry Department, said under the Livestock Development Strategy, the country would increase the ratio of livestock production to 38 per cent of the total agricultural output by 2015 and 42 per cent by 2020 from the current 30 per cent.

By 2020 the livestock industry targets production of 5.5 million tonnes of meat, 14 billion eggs, and more than 1 million tonnes of milk. This translates into 56 kilogrammes of meat, 140 eggs, and more than 10 kilogrammes of milk per capita per year.

By then the populations of pigs, chicken, and dairy cattle are expected to increase respectively by 2 per cent, 5 per cent, and 11 per cent to 35 million pigs, 300 million chicken and 500,000 dairy cattle.

Apart from meeting the domestic demand, the livestock industry also would target overseas markets in the future, Giao said.

To achieve these targets and to meet the increasing food demand, the country would modernise its animal husbandry and poultry sectors, shifting from household-based to industrial farming, he said.

It would also focus on breeding hygiene and safety and reducing diseases to improve productivity and quality, he said. Slaughterhouses and meat processing plants would be required to install waste treatment systems, he said.

Improving the quality of animal strains and developing the animal feed industry were also vital to the sector's development, he said.

Courses providing farmers information on farming techniques and food safety and hygiene would be organised, he added.

The livestock sector plays an important role in Viet Nam since 72 per cent of its population lives in rural areas.

However, the small scale of its operations and outdated production techniques have led to high costs, rendering the country's livestock produce less competitive than that of other countries.

The volatility in animal feed prices and high risk of disease are also causing difficulties for animal breeders. — VNS

Source: http://www.worldpoultry.net/news/vietnam-livestock-and-poultry-industry-under-review-6997.html

See also the SLP/RWC funded study lead by CIMMYT in the Indo-Gangetic plains, illustrating the diversity of challenges and opportunities within a region which is very much intensified and influenced by national policies.

http://www.vslp.org/vslp/upload/pdf/CLISS%20synthesis%20-%20Final.pdf

Are intensified small scale mixed-systems transient goal to more specialized systems everywhere in the world or do they in are some regions/agro-ecologies a stable, sustainable and efficient way to produce crop and livestock products while providing improved livelihood to people (the best option for achieving MDG)?

In SSA Africa, intensification, better integration of crop-livestock and sustainable use of resources at the farm and landscape scale appears as a necessary step for further development.

Few words on scaling out innovations related to integrated crop-livestock systems:

- Research wise: complex issues, requiring study scales ranging from plant/animal to landscape regions and global and the need for good inter and multi-disciplinary approaches and interactions (see Steve Twomlow's first contribution)

- Mechanisms for sharing knowledge:

o No silver-bullet solutions and need for adaptive research

o In most cases, tools and approaches used so far are too prescriptive and lacks the opportunity for some integrative approaches. To our knowledge FFS have been conducted mostly at the field scale and looking at technical solutions (local and exogenous knowledge/options). Some of the critical problems faced by smallholders are not and cannot be addressed exclusively by a rigid FFS approach. Those include several issues related to animal production, resources allocation (labor, land, inputs) decisions at the farm/household level, market access, integrated soil fertility management and sustainability issues, risk management, knowledge and information dissemination, nutrition. Thus the need to (re)think participatory development, innovations, co-learning and co-experimentation at scales beyond

plants/animal/fields and get inspiration from successful past and on-going efforts (lessons learnt for integrative R4D initiatives).

o Integration at the landscape scale: what is beneficial a farm scale can be detrimental at the landscape scale, and/or create/increase inequities

On sustainability and nutrient cycling in mixed systems in Africa, ILCA 1993 conf. proceedings contain a lot of very valuable scientific information still valid today:

http://dspace.ilri.org:8080/jspui/handle/10568/401

Best wishes,

Bruno Gerard
CGIAR Systemwide Livestock Programme
ILRI
Addis Ababa

Contribution 13, from the Moderators

-----Original Message-----
From: Crop-Livestock
Sent: Thu 2/4/2010 2:04 PM
To: Crop-Livestock-L@mailserv.fao.org
Subject: Week 1 -- Contribution 13, from the Moderators

Dear Colleagues,

The following is a message from the Moderators.

Should the R & D community re-examine alley cropping?

One recalls the innovative work on alley cropping in the late 70's and early 80's where rows of leguminous trees were planted about 10 meters apart and food crops were planted (generally no-tillage) in between the tree alleys. Small, young branches were cut from the legume trees and used to mulch the soils for the food crops and were also used as cut-and-carry feed for confined animals. IITA and ILCA worked together on this in West Africa. The biology of the systems looked robust but the adoption in West Africa was close to zero. Most of the work was done on research stations or occasionally on farmer fields run by researchers who may have not really turned the discovery and adaptation process over to the farmers.

One wonders if some version of this crop/tree/livestock integration merits re-appraisal, perhaps using adult education approaches like Farmer Field Schools to involve farmers in finding appropriate solutions to make it work in their local context.

Could someone comment on these experiences and on the merit of re-visiting the alley cropping concepts with greater farmer involvement in tweaking the system?

Regards.

Moderators
Crop-Livestock-L

Contribution 14, from Terry Wolllen at Heifer International, USA.

-----Original Message-----
From: Terry Wollen [mailto:Terry.Wollen@heifer.org]
Sent: 04 February 2010 15:27
To: Crop-Livestock
Subject: Week 1 Contribution from Terry Wolllen - Heifer International

Dear Colleagues:

Here are my perspectives working with Heifer International families and communities:

--- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

Feeding the world cannot be achieved by any one food system. Each set of market value chains, landscape resources, livestock characteristics and cultural perspectives call for an approach that best suits these resources and opportunities.

Heifer International works at the community level. Our development program is primarily with limited resource men and women farmers who first form strong local community groups that identify shared values and commit to sharing resources. Training and capacity building in agro-ecological practices are emphasized, such as continuous group strengthening, managing natural resources and improving technical assets and resources. Crops and livestock that are resourcing each other are essential to sustainable rural development. Appropriate financial tools are incorporated in the community project, such as micro-credit or another group lending mechanism.

Appropriate livestock health and husbandry, crop and grazing management systems are all parts of the training and are well documented by others in this forum.

--- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agro-ecological area that you are referencing).

One practice that has benefitted Heifer's livestock farmers in grassland areas is improved grazing management. These practices have received a lot of critical study with excellent recommendations on how to assess vegetative resources and how to define correct stocking rates and grazing duration. Good management leads to improved vegetative re-growth as well some extension of grazing seasons. Livestock

give back to the lands with the natural stirring / cultivating action of their hooves and an abundance of dung and urine to help restore the nitrogen balance and soil tilth.

--- What are the key benefits that arise from these systems - economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

With diminishing grazing land and the environmental problems associated with overgrazing, availability of improved pastures can become a critical problem. Successful communal grazing operations require community management. With proper management, biomass and biodiversity of the vegetation can be enhanced to provide more abundance and broader nutrient quality. However, the community management piece of open grazing is the most difficult challenge.

--- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

Heifer uses our Learning Centers for practical, hands-on training programs in the US for local farmer organizations. Internationally, farmer field schools and community-based animal health care training are the major means of training.

--- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

While it may initially seem off-target, Heifer has found that the formation of strong community groups is key to any success. Great ideas taken on independently from community buy-in last only as long as some one individual is bankrolling them and do not consider the broad agro-ecology of the food sheds. Partnering is a great idea; successful accomplishment takes team building of all parties to share goals, work and resources.

****

Terry S. Wollen, DVM
Director of Livestock Advocacy

Heifer International
1 World Avenue | Little Rock, AR 72202 | USA
www.heifer.org; terry.wollen@heifer.org

Contribution 15, from Judson Ferreira Valentim, Embrapa, Brazil

-----Original Message-----
From: Judson [mailto:judson@cpafac.embrapa.br]
Sent: 04 February 2010 13:25
To: Crop-Livestock
Cc: Crop-Livestock-L@mailserv.fao.org
Subject: Re: Week 1 -- Contribution 13, from the Moderators

I believe that there were 2 main problems that prevented wide adoption of alley cropping technologies:

1) Labor is a scarce resource in many rural regions of the world and alley cropping technologies are very labor demanding. If most of the research had been done at farm level including the participation of producers, this problem would have been noticed where labor was a relevant factor and these technologies would have been widely adopted where there was no opportunity cost of labor, meaning that it would have been adopted where farmers had no other economic, social or cultural activity competing for the labor force available.

2) In many parts of the world small farmers have agricultural activities side by side with livestock. Alley cropping technologies require that the areas are kept isolated from animals grazing either private or community lands. Fencing technologies are expensive and labor demanding.

I believe that participatory R&D for development and validation of technological innovations on crop rotation and crop-livestock-trees with a wide variety of arrangements, including annual food crops, livestock and trees (fruits, wood) would lead to wide adoption of these technologies world wide considering the environmental, social, economic and cultural characteristics of specific farmers and farmer's communities.

Judson Ferreira Valentim
Chefe Geral da Embrapa Acre
Rodovia BR-364, km 14, Caixa Postal 321
CEP: 69908-970 - Rio Branco-Acre, Brasil
E-mail: judson@cpafac.embrapa.br
Fone: (068) 3212-3205 / 3212-3200 - Fax (068) 3212-3284

Contribution 16, from John Landers, APDC, Brazil

-----Original Message-----
From: John Landers [mailto:john.landers@uol.com.br]
Sent: 04 February 2010 14:23
To: Crop-Livestock
Subject: Re: Week 1 -- Contribution 13, from the Moderators

Dear Moderators,

In reply to the question "Should the R & D community re-examine alley cropping? "

I believe that the concept of alley cropping should be extended to include Crop-Livestock-Forestry integration, as we are successfully doing with Eucalyptus, teak and other timber spp. in Brazil

Best regards,

JNL

John N. Landers, OBE
Relações Internacionais / Novos Projetos
Associação de Plantio Direto no Cerrado - APDC
Fone: 55 (61) 3366-5307 / 3366-1984
Fax: 55 (61) 3366-5307
E-mail: john.landers@uol.com.br
End: SMDB - Conjunto 9 - Lote 5
Lago Sul - CEP: 71680-090
Brasília - DF

Contribution 17A, from Maria Izabel Radomski, Embrapa, Brazil

-----Original Message-----
From: Maria Izabel [mailto:izabel@cnpf.embrapa.br]
Sent: 04 February 2010 16:47
To: FAO crop-livestock
Subject: About alley-cropping

I subscribe to the response of our co-partner Judson, from Embrapa Acre. I also made a comment in Contribution 6 that participatory research is a fundamental tool to validate and diffuse new or ancient technologies like the alley-cropping. The technology "per se" is not a problem, the inadequate use is the problem. So it is relevant to consider the social, economical, cultural and environmental differences in crop-livestock-forestry integration research.

Izabel

Maria Izabel Radomski
Agroforestry Systems
EMBRAPA FLORESTAS
Colombo - Parana – Brazil

Contribution 17B, from Jagadish Timsina at the IRRI Bangaldesh Office

-----Original Message-----
From: Timsina, Jagadish (IRRI) [mailto:J.Timsina@cgiar.org]
Sent: 04 February 2010 17:06
To: Crop-Livestock
Subject: RE: Week 1 -- Contribution 15, from Judson Ferreira Valentim, Embrapa, Brazil

I do agree with Judson Validson and John Landers that perhaps we shouldn't promote alley cropping. Instead, we have several forms/intensities of crop-livestock-tree integration. Such integrations are diverse with diverse species of crops and trees in hilly ecosystems of Nepal, Bhutan and Indian hills as well as in flat lands and low-lying areas of Bangladesh. We should characterize the diversities and develop innovative research and development strategies for successful and sustainable

intensification of crops, livestock and trees and for up- or out-scaling of the successful cases.

Jagadish Timsina
Cropping System Agronomist
IRRI Bangladesh Office

Contribution 18, from Geraldo Martha and Lourival Vilela of Embrapa, Brazil

-----Original Message-----
From: Geraldo Martha, Jr. [mailto:gbmartha@cpac.embrapa.br]
Sent: 04 February 2010 18:07
To: Crop-Livestock
Cc: lvilela Vilela; macena@cpac.embrapa.br
Subject: Week 1 Contribution from Geraldo Martha and Lourival Vilela

Dear Moderators,

Crop-livestock systems in the Brazilian Cerrado, in spite of not being the only one option for a sustainable agricultural intensification, are certainly an outstanding strategy to increase food, fiber and biofuel production and to avoid further encroachment into native vegetation in the coming decades.

Crop-livestock systems represented a significant share of pasture establishment in the Brazilian Cerrado during the 70's and the 80's. After trees were cut down, rice was generally cultivated for one up to three seasons and then cultivated pastures, mainly Brachiaria spp., were established. Limited fertilizer amounts were used in the rice phase as well as during the pasture establishment; in fact, in large areas no fertilizer at all was used in the pasture phase. Given the low-fertility of the Cerrado's acid soils, and the absence of fertilizer use, the pasture degradation process was intensified after three or four years from the establishment.

In the last 15 years, and especially in the last decade, crop-livestock systems in the Brazilian Cerrado have changed considerably. Now, the focus is on high-yielding crops and pastures, which means that corrected, high-fertility soils are needed. Under this condition, production and economic risks might be significantly reduced because the system as a whole is much more buffered against droughts, for example, and much more prone to quickly adapt to market signals, for example, to introduce corn instead of pasture as a second crop or vice-versa.

Research in the Brazilian Cerrado has found that well-managed, highly productive integrated crop-livestock systems emerge as a tremendous promise toward the sustainability of farming systems. In integrated crop-livestock systems, nutrient use efficiency is potentially improved because of enhanced soil fertility (chemical, physical and biological), increased soil organic matter and a more efficient nutrient recycling and more effective soil and water conservation and use. Consequently, the risks associated with nutrient losses are minimized whilst bioeconomic performance might be sustained or even increased. The potential to reduce the business risk and to boost crop and pasture productivity are clearly associated with economic benefits. The

better soil and water management on these systems and their huge sparing-land effect potential are key-points under an environmental perspective. The system has the potential to increase year-round demand for labor in comparison to only-crop regions; compared to only-pastures sites, especially when degraded pastures are an issue, the overall amount of jobs can be significantly increased. And, given the likely effect of increased labor productivity, wages can be augmented. Additionally, in this scenario, is expected that with adequate public policies and private/public investments, multiplier effects in rural areas – in terms of better income and job creation, on-farm and in local commerce and industry –, would potentially be boosted.

By now, farmers in many sites in the Cerrado are rapidly adopting the use of pasture as soil cover for no-till planting. Including the animal component in the system is also increasing. More research and extension efforts are obviously a big issue to prompt the scaling up of crop-livestock systems. Adequate training and financing, to overcome system's complexity and high-costs, respectively, are needed for a significant widespread adoption in the near future.

Cheers,

Geraldo Martha and Lourival Vilela

Geraldo Martha, Jr.
Pesquisador - Embrapa Cerrados
Integração Lavoura-Pecuária/Economia Agrícola

Contribution 19, from Frank Place at the World Agroforesty Centre, Nairobi, Kenya

-----Original Message-----
From: Place, Frank (ICRAF) [mailto:F.PLACE@CGIAR.ORG]
Sent: 04 February 2010 18:51
To: Crop-Livestock
Subject: RE: Week 1 -- Contribution 13, from the Moderators

Some principles or aspects of the system are certainly worth continued exploration. I hear from a colleague that alley farming (with nitrogen fixing species) is being practiced by several communities in Flores Indonesia where it spread and persisted without much external intervention. We have found systems with higher densities of trees to perform better, either in a rotation (i.e. fallow) or in an intercrop system in sub-humid/humid sites in Africa. In the intercrop system, preventing light competition seems to be very important and thus these are managed with very low-to-the-ground cutting. As noted in the question, technically these perform very well. There appears to be some promise in terms of adoption with intercropping systems in Malawi, but it is early days.

Apart from alley farming as a soil fertility strategy, as John Landers notes, there are many instances of creating alleys using other plants of high value – e.g. animal feeds, fruits or timbers.

Frank Place

World Agroforestry Centre

Contribution 20, from John Landers, APDC, Brazil

-----Original Message-----
From: John Landers [mailto:john.landers@uol.com.br]
Sent: 04 February 2010 20:28
To: Crop-Livestock
Subject: Re: Week 1 -- Contribution from John Landers

Dear Moderators,

As this is an e-consultation, I am giving you a contribution in bullets to answer the question : Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

In tropical Brazil, integrated crop-livestock systems using Zero Tillage (ICLZT) with wide-spaced Eucalyptus spp. or teak are working well between latitudes 3º S and 18º S and probably further South. They are reported to sequester an average of 6 ton/ha/year of carbon with Eucalyptus planted in year 1, a rotation of mechanized upland rice 1 or 2 years, soybeans 1 or 2 years and Brachiaria intersown, undersown or oversown in the third year, thereafter grazed between the Eucalyptus until it is cut at 8 years old: stocking rate about 1.5 to 2 AU/ha. By Brazilian law, crop drying energy must come from firewood, which the Eucalytus logs are used for, besides construction etc. Satisfying energy needs is part of the equation for feeding the world.

Soybean farmers in Mato Grosso adopting ICLZT have adapted cheap designs for water and feed troughs and salt shelters on skids, see fotos courtesy Rogerio Arioli, Campo Novo dos Parecis-MT. The feed troughs are made with one ton fertilizer bags and the water troughs are made from strong black plastic of the type for lining reservoirs,

“Without Zero Tillage, ICLZT is uneconomic” says Alysson Paolinelli ex-minister of agriculture of Brazil, an adopter of ICLZT for over 5 years...

Finally, in his book “Eat More, Kill Less” (ca, 1985) Robert Goodland, the first ecologist in the World Bank, advocated vegetarianism as the best ecological solution to loss of biodiversity, as all the pastures would then be converted to crops, with many times more human carrying capacity. A fork for your thoughts.

JNL

John N. Landers, OBE
Relações Internacionais / Novos Projetos
Associação de Plantio Direto no Cerrado - APDC
Fone: 55 (61) 3366-5307 / 3366-1984

Fax: 55 (61) 3366-5307
E-mail: john.landers@uol.com.br
End: SMDB - Conjunto 9 - Lote 5
Lago Sul - CEP: 71680-090
Brasília - DF

Contribution 21, from Farhad Mirzaei, Iran

-----Original Message-----
From: Farhad Mirzaei [mailto:farmir2005@gmail.com]
Sent: 04 February 2010 20:23
To: Crop-Livestock
Subject: Re: Week 1-- Contribution 18, from Geraldo Martha and Lourival Vilelaof Embrapa, Brazil

Dear Friends,

I will be very grateful if some of you scientists and researchers can give me and others an applied framework of crop-livestock farming systems because as you are seeing in this e-forum, we are looking at so many examples from different countries, but I am feeling the absence of analysts to give the readers a common definition of this topic.

Finally, I have to say that this forum is one of the most interesting ones for me as a researcher who is working on this topic.

Best regards,

Farhad Mirzaei,

Ph.D Research Scholar From Iran,
Dept. of Livestock production and Management,
National Dairy Research Institute (N.D.R.I.), Karnal, 132001, India
(<http://www.ndri.res.in> http://www.ndri.res.in)
Member of Department of Animal Production Management, Animal Science Research Institute of Iran.
<http://www.asri.ir/biography/MIRZAEI.mht>
http://www.asri.ir/biography/MIRZAEI.mht

Contribution 22, from Markus Ascher, IICA-PROCITROPICOS, Brazil

-----Original Message-----
From: Markus Ascher [mailto:markus.ascher@procitropicos.org.br]
Sent: 04 February 2010 21:19
To: Crop-Livestock
Subject: RES: Week 1-- Contribution 18, from Geraldo Martha and Lourival Vilela of Embrapa, Brazil

Dear Colleagues,

In addition and support to the contribution from Geraldo Martha and Lourival Vilela of Embrapa, Brazil, I would like to add some quite interesting figures I found in a very recent IICA-Publication (in Spanish) on the prospective demand for agricultural land in the Latin America and Caribbean Region (LAC) (Gazzoni, Decio Luiz: Biocombustibles y alimentos en América Latina y el Caribe. San José, C.R.: IICA, 2009). As Geraldo and Lourival pointed out (Contribution 18), intensification of livestock production systems in Brasil allready is taking place for some 10 to 15 yeras. Estimates show that there is no future demand for extending the pasture area in the LAC-Region (which is good, though! in order to "avoid further encroachment into native vegetation", here, of course, the Amazon Basin), at the contrary pasture land is expected to be reduced at a scale of about 65 million ha over the next 2 decades, while the prospective demand for annual crops, perennial crops, planted forests and biofuels adds up to a demand of about 143 million hectares for the region.

Table: Latin America and the Caribbean. Prospective demand for area used for agriculture - 2010 – 2030 (in million ha)

Table: Latin America and the Caribbean. Prospective demand for area used for agriculture - 2010 – 2030 (in million ha)

Year	Biofuels	Annual crops	Perennial crops	Pasture land	Woods	Total	Expansion area still available
2005		144,0	19,8	550,0	12,0	**728,8**	599,9
2010	5,0	175,0	20,0	557,0	13,3	**770,3**	558,4
2015	7,0	197,0	22,0	5530,	14,7	**793,7**	535,0
2020	11,8	215,0	24,4	539,0	16,2	**806,4**	522,3
2025	12,0	234,0	26,9	516,0	17,9	**806,8**	521,9
2030	12,5	260,0	29,7	485,0	19,7	**806,9**	521,8
Increase 2005 to 2030	**9,5**	**116,0**	**9,9**	**-65,0**	**7,7**	**78,1**	

Source: Gazzoni, Decio Luiz. Biocombustibles y alimentos en América Latina y el Caribe. San José, C.R.: IICA, 2009.

Best regrads
Markus Ascher

Markus Ascher
Assessor Técnico
IICA-PROCITROPICOS

SHIS QI 01, Conjunto 01, Casa 20 – Lago Sul Brasília, DF, 71605-010 Brasil
Tel.: (++55-61) 3365-2908 / 3365-2907
Fax: (++55-61) 3365-5093

<mailto:markus.ascher@procitropicos.org.br> markus.ascher@procitropicos.org.br
markus.ascher@cimonline.de
<mailto:procitropicos@procitropicos.org.br> procitropicos@procitropicos.org.br
<http://www.procitropicos.org.br/> www.procitropicos.org.br

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http://www.cimonline.de

Contribution 23, from Lieven Claessens, CIP-Nairobi, Kenya

-----Original Message-----
From: Claessens, Lieven (CIP-Nairobi) [mailto:l.claessens@CGIAR.ORG]
Sent: 05 February 2010 05:22
To: Crop-Livestock
Subject: RE: Week 1 -- Contribution 12, from Bruno Gerard

Dear colleagues,

Besides intercropping and alley farming as possible strategies for sustainable smallholder crop-livestock system intensification, I would like to bring in research on dual-purpose crops into the discussion. Besides earlier work by ILRI on adoption of dual-purpose cowpea in the dry savannah in west Africa (Kristjanson et al., 2002, in attach), at CIP, together with ILRI and NARS, we've recently done some studies on the possibilities of dual-purpose sweet potato in East Africa (Peters et al., 2006; Claessens et al., 2009, in attach) and in Vietnam (Leon Velarde et al., links to presentations below). There definitely seem to be some interesting possibilities, although there are still plenty of challenges for breeders as well as for scientists assessing the reasons or failures of actual adoption. Regards, Lieven Claessens

http://www.cipotato.info/docs/abstracts/SessionIX/OP-68_C_Leon_Velarde.pdf

http://www.cipotato.info/docs/abstracts/SessionIX/OP-69_C_Leon_Velarde.pdf

Dr. Lieven Claessens
Environmental Scientist
International Potato Center - SSA regional office
Production Systems and the Environment
P.O. Box 25171
00603 Nairobi
Kenya
Tel: +254 20 422 3612
Fax: +254 20 422 3001
Web: www.cipotato.org

Contribution 24, from Scott Day, Manitoba, Canada

-----Original Message-----
From: Scott Day [mailto:treelane@mts.net]
Sent: 05 February 2010 06:27
To: Crop-Livestock
Subject: Week 1 -- Contribution from Scott Day (sorry this seems to be the only address that works for me):

First of all let me say what an honour it is to be included in these consultations, the discussion has been fascinating and I am somewhat intimidated to join in but I will still share my thoughts regardless: I farm in the Southwest Corner of Manitoba near the exact centre of North America, I am also an agronomist and an ag researcher for our Provincial Government in this region of the Canadian Prairies. Integration of Livestock/and cropping systems has always been a passion of mine having grown up on a small integrated swine and grain farm - the farm that I now manage with my father. In my other job with the Province I work with 100's of farmers with all types of operations in this part of the country, my perspective will be from my local region here in the heart of the Continent.

From this background I have observed that those that raise livestock and those that raise crops are two different types of people, often very different. As you all know this is not a new observation but it is sometimes as distinct as a doctor from a dentist. Now I have seen livestock producers evolve into crop producers but it is very rare to see a person that raised crops evolve into a livestock producer. Even on those Prairie farms that have both livestock and grain you will find people on that farm that concentrate on grain and others that look after the livestock. It is very rare to find someone that has good command of both types of enterprises. However, this does not mean we can't have a vibrant integrated crop/livestock farming model or system.

So with this in mind maybe the best option is to encourage those that successfully raise crops to continue to do so and those that raise livestock to continue on as well. Don't try and encourage them to be something they are not, but instead look for ways for them to utilize each others skills and resources. In some of the research we have been doing we have been trying to find ways to incorporate livestock and forages into large acreage grain farms. We are fully aware of the soil building, nutrient building, and pest control benefits from including forages and livestock into our annual cropping rotations. However, these benefits are not nearly substantial enough for most crop producers to go out and buy a herd of cattle and all the necessary infrastructure that goes with them, and vice versa. So how do you get them to work together? Dr. John Baker (Contribution 11) has mentioned many ideas that are already in play in New Zealand. We certainly have the obvious examples here of grain farmers growing feed and forage for their livestock producing neighbours, and in return gaining access to the manure and other benefits. However, we have one system that takes this a bit further, it involves grain farmers sowing (everything is always 0-till in my area) some of their fields to alfalfa (lucerne), or some type of high production pasture. Then these fields are rented out to livestock producers to intensively graze these fields for 2 or 3 years before being brought back into annual crop production. In some cases the crops farmer is paid an allowance per pound of gain on the animals - that way the livestock owner knows exactly what their costs will

be. The grain farmer knows he is getting the extra benefits from having alfalfa/forages in the rotation so he is willing to take a bit more of the risk in not knowing what the actual pounds of gain will be until the end of the season. In other cases it is just a fee per acre basis between the two parties. The grain farmer gets to have livestock/forage in his farming system without having to learn(or endure the risks) to be a livestock farmer and the livestock producer gains access to an easy to manage increase in feed supplies, leading to greater capacity and efficiency for his operation. With modern high tensile electric fences, and pasture pipeline plows, 100's of hectares can be fenced in a day, so rotating these "livestock fields" is not difficult. This also allows a grain farmer to add acres to their farm without having to add more grain producing resources. Of course the key to all of this is economics, each party needs to have a tangible benefit! However, in Canada the livestock industry has basically collapsed over the past few years while grain has become very strong, so I now see very few examples of this sort of symbiotic relationship, but as economics change and the livestock sector rebounds I expect to see these relationships start again. So first and foremost; there has to be a clear economic gain for both parties not just a perceived or expected benefit of better soil and better pest control, or more "sustainability". And secondly; rather than encouraging crop producers to get some cattle or stockmen to buy some grain land maybe first find ways for them to work together. This has maybe been your intent all along but I think it needs to be stressed here again. I think this is relevant no matter where you farm in the world.

Below are the conclusions from a long term study we have been conducting at the Manitoba Zero - Till Research Farm looking at the inclusion of forages and livestock into a 0-till farming system. Further details can be found at http://www.mbzerotill.com/page.aspx?page_id=270, this rotation study is the first one that comes up on the list of MZTRA projects. The study is not quite finished and the 2009 data is still being finalized, expect a final report in the next couple of months.

1. Alfalfa in a rotation as a short term stand can significantly reduce commercial nitrogen requirements for the annual crops grown following the stand termination. We will be producing a crop of oats in year 2 following the stand termination and have 130 and 107 lbs/acre residual nitrogen in the soil samples from fields 103 and 203 at the beginning of the season. The requirements for nitrogen for producing the winter wheat crop during the first year out of the rotation was reduced to 55% of the nitrogen required in a rotation producing only annual crops. Nitrogen was not the limiting factor in any yield losses during 2008.

2. There is some risk growing winter wheat following alfalfa. Alfalfa when grazed does not necessarily leave enough stubble to trap snow to protect winter wheat from exposure to cold. Alfalfa can also leave the top soil deficient in soil moisture therefore having potential to reduce the winter wheat crops viability in the event of a prolonged period of adverse weather. During the 2008 growing season we experienced these conditions and saw reduced plant populations in some regions of our winter wheat fields. These reduced populations were not limited to any particular landscape feature so the problem was more complex than normal over-wintering losses. The yield map from field 203 in 2008 clearly delineates the difference in yield between the grazed and hayed portions of the previous alfalfa crop. Yield differences were primarily due to plant population differences. All areas of the field had good germination, emergence and growth in the fall and had viable roots in the early spring but failed to successfully break dormancy.

3. Grazing cattle on a pure stand of alfalfa at the bud stage of growth of the alfalfa is high risk and requires good management skills. Alfasure if administered properly has excellent results and good control of frothy bloat. When employing the strategies that we have been employing in our grazing program there is little room for mistakes. During the 2008 grazing program we allowed the water to go without the alfasure injection on 2 separate occasions which resulted in 3 mortalities. The fourth mortality was caused by moving the calves late in the evening. All of these situations could have been prevented with better management.

4. Reduced input strategies can be an effective way to reduce inputs and input costs. The use of alfalfa in a rotation to provide an alternative is effective. The inclusion of alfalfa in a rotation can also increase risk as the risk of producing alfalfa includes production risks, harvesting risks and market risks which are difficult to protect a farm operation from. Alfalfa can be a good strategy to use to improve soil quality and improve the water balance as it will draw down the water level in years of good production and allow more precipitation to infiltrate therefore providing more storage capability in the soil.

Scott Day
Box 816
Deloraine, MB.
R0M 0M0
204 747 2392

Contribution 25, from Stephen Kimani, Kilimo Trust, Uganda

-----Original Message-----
From: Stephen Kimani [mailto:SKimani@kilimo.co.ug]
Sent: 05 February 2010 07:26
To: Crop-Livestock; Crop-Livestock-L@mailserv.fao.org
Subject: RE: On Alley cropping

On Alley cropping…

There is certainly need to continue further exploration.

Depending on land sizes and climatic conditions, I see further work on fodder legumes such as Calliandra calothyrsus or other similar species which will contribute towards soil conservation when planted along contours, improve soil nitrogen via N2 fixation, and contribute as livestock fodder. This system fits well in intensive crop-livestock systems e.g. in East Africa, mainly humid and sub-humid zones. Rotations would fit more where land sizes allow, whether humid or sub-humid.

Alley cropping also fits well within nutrient cycling theme, in the sense that manure quality especially N content would improve as a result of feeding livestock with high nitrogenous leguminous materials.

Cheers,

Stephen Kimani
Kilimo Trust

Contribution 26, from Eric Vall, from CIRAD, France

-----Original Message-----
From: Eric Vall [mailto:eric.vall@cirad.fr]
Sent: 05 February 2010 08:54
To: Crop-Livestock
Subject: Re: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

Je vous prie de trouver ci-après une contribution au forum à propos de nos travaux conduits au Burkina Faso (zones de savanes subhumides)

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

Aujourd'hui, dans les zones de savanes subhumides de l'Afrique de l'ouest du Burkina Faso et du Mali sud la grande majorité des exploitations pratiquent en même temps l'agriculture (coton, maïs, sorgho, légumineuses...) et l'élevage (petits ruminants, bovins de trait, bovins d'élevage...) et ces deux activités sont plus ou moins intégrées (valorisation fourragère des résidus agricoles, production de fumures organiques, exploitation de l'énergie animale). Mais il existe une diversité de modalités de combinaisons de l'agriculture et de l'élevage selon les exploitations. Les très petites exploitation agricoles (5 ha de culture environ) sans traction animale existent encore et peuvent atteindre 10-20% des cas dans certaines régions.

Les exploitations dominées par l'agriculture (3ha à 20 ha de surface cultivée), où l'élevage se limite bien souvent à la traction animale, sont ultra-majoritaires (50 à 60%). Les exploitations où l'élevage de troupeaux de bovins (20 à 100 têtes) constituent l'activité dominante représentent de 5 à 20% des cas, l'agriculture se limite à une petite production vivrière de céréales. Enfin, un système agro-pastoral combinant l'agriculture sur des surface moyennes à grandes (10 à 50 ha) et ayant constitué un noyau d'élevage (10 à 100 têtes) a émergé ces 20 dernières années entre les 2 pôles précédents (10 à 20% des exploitations). Ces exploitations "d'agro-éleveurs" se caractérisent aussi par une assez bonne intégration de l'agriculture et de l'élevage (exploitation importante de l'énergie animale pour l'agriculture et le transport, modes de production diversifiés de fumure organique, stockage de résidus fourragers importants). Il me semble que l'on peut qualifier les systèmes des agro-éleveurs de systèmes innovants.

- What are the key benefits that arise from these systems? economically,

environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

Le systeme agro-pastoral développé par les agro-éleveurs est innovant mais est-il durable pour autant? Des études plus fines nous ont montré que sur le plan économique la combinaison des 2 activités rend ces exploitations globalement plus perforantes que les autres (et plus résistantes aux chocs économiques et climatiques grâce à la combinaison des productions) avec une meilleure garantie en terme de sécurité alimentaire. Mais souvent, ces exploitations restent guidées par des logiques extensives. On cherche à accroitre le plus possible les surfaces cultivées et la taille des troupeaux. Ceci pose des problèmes multiples dans un environnement ou bien souvent on atteint un seuil de saturation eu égards aux ressources en terres agro-pastorales encore disponibles (ce qui conduit à une multiplication des conflits avec les autres exploitations, une trop forte pression d'exploitation sur les ressources naturelles). Donc les systèmes des agro-éleveurs sont innovants et sans doute durables tant qu'ils conservent une dimension raisonnable en terme de surface cultivées et en terme de taille des troupeaux.

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

Dans l'environnement de l'Afrique de l'ouest caractérisé par de multiples incertitudes en terme pluviométrique, de garanties de débouchés, avec peu/pas de filets de sécurité économiques, la combinaison des activités agricoles et pastorales dans les exploitations leur confère plus de flexibilité. Dans un espace en voir de saturation foncière, l'intégration de l'agriculture et de l'élevage permet de produire plus, à surface exploitée constante. D'important progrès restent à faire, mais les pratiques de productions de fumures organiques ont fortement progressées (production de fumier en fosse à la maison, en parc à bétail de compost au champ...) l'utilisation de l'énergie animale est une pratique courante pour l'agriculture et pour les transports, les cultures fourragères ne sont plus limitées aux essais en station même si elles restent peu développées.

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

Dans l'ouest du Burkina Faso nous travaillons depuis quelques années sur la conception des innovations avec les producteurs en suivant une démarche de recherche action en partenariat. La RAP naît de la rencontre entre une volonté de changement de la part des acteurs de terrain et une intention de recherche des scientifiques et poursuit un objectif dual : produire des connaissances, réussir un projet de changement délibéré. Elle se développe au sein d'un cadre éthique négocié et accepté par tous. Elle est pilotée par des cadres de concertation hybrides composés de scientifiques et d'acteurs de terrain. Elle est conduite en milieu réel, le plus souvent par des équipes interdisciplinaires, selon une approche systémique. Le travail est conduit simultanément selon 3 axes : i) l'analyse des situations complexes pour les rendre intelligibles, ii) la prévision des evolutions possibles des situations, iii) l'étude de la faisabilité des options de transformations, leur mise en œuvre et leur évaluation.

L'analyse des pratiques et des systèmes de production, l'expérimentation en milieu paysan, la modélisation d'accompagnement, l'évaluation multicritères, sont des outils privilégiés par la RAP. Cette méthode est expérimentée dans un province du Burkina Faso (le Tuy) sur différents thèmes : production de fumure organique au champ (compost de tiges de coton), renforcement de la place des légumineuses dans les systèmes de culture sous différente forme (culture pure, associé, scv, agroforesterie), gestion concertée des resources agro-pastorales à l'échelle communale. Elle permet de conduire des expérimentations chez et avec les producteurs en grand nombre ce qui permet le traitement statistique des résultats, la prise en compte des contraintes de travail de l'exploitation, et de produire des connaissances originales sur les savoirs locaux. Mais elle induit des couts de transaction importants avec les expérimentateurs, et une simplification des dispositifs expérimentaux.

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

Dans cette région du monde on peut citer comme contrainte au développement des systèmes agro-pastoraux : le manque de main d'oeuvre disponible sur les exploitation, le manque d'accès au crédit (achat d'animaux, achats d'équipements de transport), l'abandon des cultures associées pour les cultures en lignes (difficultés à réintroduire les cultures associées dans des systèmes de cultures façonés par la mécanisation à traction animale), le manque de sécurité foncière (on hésite à investir dans des champs où l'on est simple locataire...)...

Bien cordialement
Eric Vall

Contribution 27, from Azage Tegene of ILRI, Addis Ababa, Ethiopia

-----Original Message-----
From: Tegegne, Azage (ILRI) [mailto:A.TEGEGNE@CGIAR.ORG]
Sent: 05 February 2010 10:26
To: Crop-Livestock-L@mailserv.fao.org
Subject: Definition - Crop-Livestock systems

From discussions and comments in week 1, I realize that there is a clear difference in our perception and understanding of crop-livestock systems.

Appreciate if we can agree on a working definition of the key term and system we are all talking about.

Best regards,

Azage Tegegne (PhD)
Animal Scientist
International Livestock Research Institute (ILRI)
P.O. Box 5689, Addis Ababa, Ethiopia
Tele: Office: 251-1-646 3215 (ext 2406)
Mobile:251-911-24 64 42

Fax: 251-1-646 1252
Email: a.tegegne@cgiar.org
Web <http://www.ilri.org/> http://www.ilri.org
Where phone calls to the USA are cheaper than to Ethiopia use:
Phone +1-650-833-6696
Better lives and lands through better livestock livelihoods
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Consultative Group on International Agricultural Research
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Contribution 28, from Brian Sims, UK

-----Original Message-----
From: BrianGSims@aol.com [mailto:BrianGSims@aol.com]
Sent: 05 February 2010 10:42
To: Crop-Livestock-L@mailserv.fao.org
Cc: Crop-Livestock
Subject: Message from Brian Sims

Colleagues,

If the challenge is to feed 9 ´ 109 people by 2050, perhaps it would be sobering to realize that we are failing to feed our 6.8 ´ 109 population today. At least 1 billion people are severely undernourished and over 30% of sub-Saharan Africa's population is actually chronically hungry.

On top of this situation we have the growing deleterious impact of global climate change with increased desertification, drought incidence and severe weather events. All of which will conspire to weaken food production in vulnerable areas. If we then add the negative impact of the burgeoning bio-fuel production on world food production we can see that the outlook is, indeed, grim and that 'business as usual' is not a viable option to reach our goal.

What can be done to increase food production without unleashing devastation on our natural environment? One sure way is to stop ploughing and to keep our soils covered to conserve this most precious of resources. Conservation Agriculture (which includes direct planting and permanent soil cover with cover crops) provides an attractive means for achieving this. If we then add complementary Agroforestry practices (especially the incorporation of the fertilizer legume tree Faiherbia albida) then we have away to protect and fertilize our soils and, at the same time, provide forage and browse for livestock enterprises. This keeps soil safe from the depredations of grazing cattle after harvest and reduces the pressure on natural forests for browse and fuel wood.

These ideas are expanded in a presentation made at the II World Congress of Agroforestry in Nairobi in August 2009 and the conclusions are given below. The paper has also been summarized in the Tropical Agriculture Association's newsletter

8 for winter 2009. The remarks of particular relevance to the question of crop-livestock interactions are highlighted:

II World Congress of Agroforestry
23-28 August 2009, Nairobi, Kenya

Agroforestry and Conservation Agriculture: Complementary practices for sustainable development

Brian Sims, Theodor Friedrich, Amir Kassam, Josef Kienzle

Conclusions: Complementary CA and AF for broader synergistic impact

The exploration of the many facets of CA and AF in this paper has led us to the following conclusions on the highly desirable compatibility and complementarity that exists between the two connected paradigms:

Ø Both AF and CA seek to emulate natural recycling mechanisms and other ecosystem services (especially the elimination of soil erosion) found in forests.

Ø Both CA and AF promote soil health and biodiversity and so both will enhance soil fertility and hence its productive capacity.

Ø AF systems (especially versions of alley cropping or live fences with leguminous tree species) produce nutritious browse which can alleviate pressure on cover crops. Free grazing of cover crops after main crop harvest is one of the major constraints to CA adoption in SSA.

Ø AF systems neatly complement CA systems in the provision of soil cover, animal feed, nutrients, household fuel, hillside protection against soil erosion and wind erosion control through shelter belts.

Ø Carbon sequestration, a key weapon in the fight for climate change mitigation, is vastly enhanced both in the soil (through no-till) and biomass (principally in trees and shrubs).

Ø Adaptation to climate change is facilitated by the increased water infiltration and storage in soils under CA and AF systems. Improved soil structure as a result of no-till and increases micro-faunal activity improve infiltration whilst increased SOM improves holding capacity.

Ø Degraded land is best rehabilitated with AF systems in conjunction with CA (which is better designed to perform under good soil conditions). Soil protection and anchorage through the establishment of tree species whilst maintaining cover and eliminating tillage with CA is a logical solution to rehabilitation.

Ø Crop and enterprise diversification are encouraged by CA and AF. One of the key components of CA is the use of crop rotations (for both main and cover crops) to

exploit different soil strata and so recycle more nutrients. More and different crops can facilitate growth into new enterprises, such as livestock production. AF has vast scope for diversifying into fruit and timber production as well as livestock to exploit the additional feed produced.

Ø Family livelihoods are improved through CA and AF as labour requirements for soil preparation and weeding are reduced, crop production is increased and so incomes can be raised. Diversification of crops leads to better diets and a more constant supply of food crops throughout the year.

Ø The policy implications for developing country governments are clear: both CA and AF should be actively supported through incentive programmes (e.g. easier access to essential inputs), training programmes (for extension agents and farmers), and encouraging and nourishing the formation of farmer self-help groups (such as FFS). These ideas are encapsulated in the declaration following the IV World Congress on Conservation Agriculture held in New Delhi, India in February 2009.

Brian Sims

Contribution 29, from Paulo Salgado et al., from CIRAD, France

-----Original Message-----
From: Paulo Salgado [mailto:paulo.salgado@cirad.fr]
Sent: 05 February 2010 11:02
To: Crop-Livestock-L@mailserv.fao.org
Cc: Jonathan Vayssières; Eric Scopel; penot@cirad.fr; Emmanuel Tillard; Dusserre Julie; Stéphanie Alvarez; Michellon; eric.penot@cirad.fr; Vincent Porphyre; plecomte; Patrick DUGUE; Pierre-Yves Le Gal; 'SALGADO Paulo'
Subject: Re: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

February 5, 2010

Dear Moderators,

On behalf of my colleagues and myself, please find in this message the collective perspective of some researchers (Emmanuel Tillard, Philippe Lecomte, Eric Penot, Eric Scopel, Jonathan Vayssières, Julie Dusserre, Stéphanie Alvarez, Roger Michellon, Vincent Porphyre, Patrick Dugue, Pierre-Yves Le Gal … and myself) from CIRAD (French Agricultural Research Center for International Development) which are presently positioned (or closely connected) in the Indian Ocean sub-region (mainly Madagascar and Reunion Island).

Taking advantage of this interesting e-consultation, we are convinced that it would be useful in the near future to create a kind of inventory / database / network from existing references and activities on integrated crop-livestock systems in North and South, in temperate and tropical regions to be shared between Institutions or for future additional works. Environment diversity, and differentiated assets and constraints lead

to a geographical diversity of crop-livestock systems which will be interesting to explore.

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

In the context of a sustainable intensification, the synergies and trades that could be optimized between crop and livestock systems generally addressed in separate fields, shown as an important factor in improving rural economies and agricultural environmental impact. For instance, the dynamics of concentration of livestock farming, in periurban situations produce nutrient surplus and latent pollution. Conversely in the cropping systems, especially in tropical conditions and with economically limited smallholders, fertility management on the long term is a key issue in order to maintain staple and commercial crops productivity. On the other hand, the disequilibrium introduced with deforestation to develop agricultural activities will contribute to natural land degradation processes such as erosion or quick soil organic matter (SOM) mineralization. The loss of carbon as well as problems of fragility and fertility of tropical soils, where the demand for organic inputs is high, remains a major issue. In addition, the rising cost of fertilizers in relation to the volatility of energy prices and green house gases (GHG) emission costs for manufacturing and transportation, as well as the scarcity/competition around resources (e.g. phosphorus) raise questions on how to re-design an integrated soil fertility management and to do so, a closer integration between livestock and crops is crucial.

That integrated crop-livestock systems are probably an answer to boost some Conservation Agriculture (CA) systems. In fact these systems are based partly on the use of a “service crop”, which generally can be a pasture crop or a cover crop used as a forage, and a pluriannual rotation where the local staple crop (rice, cassava or maize) is in rotation with some crops which can also be used as well to complement livestock feeding (i.e. maize, some leguminous, etc.). Therefore livestock is a natural output for some of the products and provide generally a better return that being sold as a sole crop. The example of dairy production is exemplary of such case. When there is effectively an increase in output value, there is therefore an incentive as well for intensification. The side products of livestock, organic manure, can be widely used in order to maintain, or even increase soil fertility, particularly in the case of CA, leaving the use of chemical fertilizers to what is only necessary to profit from the potential of improved varieties. Therefore, such combination of CA on one side, rationalized intensification for sustainability, and livestock and crop integration on the other side became extremely attractive for farmers.

Crop-livestock integration may (should) also be an answer for sustainable intensification in developed countries. For instance, in Reunion island (France), in high input dairy systems, closer crop-livestock integration (i.e. better use of manure to fertilize forage crops + better use of forages to feed animals) is a truly good opportunity to improve both environmental and economical farm performances (win-win option). Better use of on-farm produced resources is the opportunity to replace costly inputs. While farm efficiency is improved, nutrient surplus decreased and farmers’ revenues improved by closer crop-livestock integration.

In the general questioning on the future of food productions, livestock systems are in a critical position. They have to face strong societal doubts. In view of the effects and wide diversity of practices for developing products, crop-livestock systems become the challenge of not only productivity but also increased efficiency on the technical, economic, environmental and social levels. Integrated crop-livestock systems will certainly have an important role in the future for the growing demand for food but are probably not the only solution. More efficient information technologies, better management strategies, precision agriculture (crop & livestock), etc. will also be needed to address this issue. However, animal health and fertility, plant protection still stay major concerns in several regions across the world.

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

Several research units from CIRAD (French Agricultural Research Center for International Development), located in the Indian Ocean sub-region (mainly Madagascar and Reunion island), are currently carrying out R&D activities on integrated crop-livestock systems including: (1) impact of organic fertilizers (manure, compost) in forage yields and soil fertility; (2) characterization of variation factors of quality organic fertilizers in dairy herds; (3) valorization of sugar-cane byproducts by ruminants (feeding, bedding animals and composting) using the modeling approach; (4) integrated zero tillage crop–livestock systems based on Conservation Agriculture (CA) principles, (5) introduction of temperate grass species to increase winter forage production and to improve forage quality.

In Madagascar, and particularly in the Alaotra lake region (east-central part of the country), the adoption of CA systems, a real change of paradigm for local farmers, linked with livestock production ensure sustainability in agricultural production as well as economic stability (less or no more problem of economical balance, better valorization of farm products and organic manure production and use).

- What are the key benefits that arise from these systems? Economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

Integrated crop–livestock systems decrease external inputs (improve farm economy), improve manure and byproducts management and so can reduce the negative impact of agriculture (crops & livestock) on the environment.

In the case of Conservation Agriculture (CA) integrated crop-livestock systems, cropping systems often incorporate multifunctional cover crops (soil protection, biomass production, water efficiency, nutrient recycling, SOM improvement, C sequestration, soil biology enhancement, soil porosity, etc.). Most of those plants are very productive forage that can be used in grazing activities and grazing intensification, mainly during dry season when other pastures are already consumed. On the other sense, cattle manures are one of the main sources of fertilizer to be used onto the field crops to improve or maintain productivity, especially for very poor

farmers from the south (e.g. Madagascar). Once collected, they can be combined with green manure from some CA cover-crops, first of all legumes, and some chemical fertilizers whenever available, to develop efficient Integrated Soil Fertility Management (ISFM) strategies. Such efficient integration would avoid some classical environmental externalities both from agricultural or grazing intensification processes.

In Madagascar, CA provides a better biomass production and use, a better valorization in the long term of organic manure provided to the field leading to a better agronomic sustainability in agriculture production meanwhile livestock products increase economic sustainability, in particular dairy production.

In Reunion dairy systems, benefits are both environmental and economic. However, we found that closer crop-livestock integrating often means accrued labor demand. Concerning environmental concerns, closer crop-livestock integration leads to better whole farm nutrient and energy efficiencies. Consequently nutrient surplus, energy consumption and green house gas (GES) emissions are mitigated (these results are based on a whole-farm modeling approach).

Even if there are negatively connoted interactions linked to the prospect of a classical livestock intensification, unambiguously oriented toward market economies, regarding the “South”, we have to back on the complexity and the multiplicity of the functions (food, capital, cash, traction for cultivation, fertilization, religion, gifts, ...) and the economic and social influence that hold the animal and the livestock activities in poor economies.

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

In Madagascar, development projects (BVLac and BVPI-SE/HP funded by AFD, or French Development Agency) are implemented since 2003 with emphasis on CA technologies, land use improvement, land certification process, animal husbandry health improvement, compost, and manure producing facilities, and livestock crop integration. The main mechanisms used by these development projects for scaling-up and sharing knowledge include credit access, technical assistance, exchanges of experiences between farmers, demonstration fields, scientific and technical documentation, trainings courses etc.

In Reunion, participatory modeling was tested as a mean to facilitate adoption of more integrated systems. Despite the limited number of involved farmers our project showed positive effect of participatory modeling on farmers’ learning and adoption of more efficient practices. After the project the knowledge of farmers about biophysical processes played a role in crop-livestock integration (grass growth, N loss during manure handling and storage, etc.) was significantly improved.

Some experiences in Brazil and Madagascar show that the innovative CA systems are brought by institutions to farmers by technical support and facilities input access (mineral fertilization, weed killers, seeds, etc.). Many smallholders are really interested in these new agricultural systems due to the technical assistant and the

advance of input (which they will have to buy after yield). In fact they accepted to participate on the project, try to make “what the scientists said”, but the most often they deviate the use of the input to the system the most economical interesting for them. The smallholders have to answer daily to economical constraints. Then, if the selling milk has the most economical value the innovation can be deviated for this purpose. It always the interrogation about what will happen when the project will be gone. How much the innovation will be integrated in the agricultural system of the farms? Will they try to access by themselves to necessary inputs? Those are the difficulties of innovations diffusion.

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

In Madagascar, a better knowledge on farm mechanisms between livestock activities and crop production as well as farm strategies according to local contexts (erratic rainfall, climatic risks, outputs price volatility, etc.) is required to improve recommendations.

In Reunion, subsidies for main inputs (mineral fertilizers and concentrate feeds) make external input use very attractive and while labor cost is very high crop-livestock integration is forgotten.

Smallholders have to coordinate the key constraints which are daily needs (food, animal feed, cash, etc.) with climatic risks. It is difficult to make them integrate long-term concepts when the needs are daily. The implementation of integrated crop-livestock systems have to make sure that they will reduce the short and long –term (farm) risk.

- How best do we integrate these sustainable intensive production systems into a landscape scale approach?

It will depend if landscape use is already regulated by “local organization”, with a specific form of negotiation, or any other collective space where the valorization of territorial and/or global resources is already planned. If there isn’t any, local collective organization should be enhanced.

In Madagascar several CA systems are developed for each level of the landscape, in function of their bio-physical characteristics, but in function too of each type of farmer. Farmers will often choose to concentrate forage production (and also CA cropping systems involving forage cover-crops) in the hillside, in new lands. But every time more new systems are developed to introduce forage in the more fertile lowlands in rotation with rice or maize production.

In other contexts, the limited crop-livestock integration at farm scale can be compensated by an integration of these two activities at regional scale. The modeling approach considering at once the economic, biophysics and sociological interactions could allow a better analysis of the potential of these sustainable production systems. A regional optimization model is actually developed in La Reunion Island to represent possible complementarities between the sugar cane and the dairy sector mainly in term of biomass exchange (feeds for organic fertilizers). In this French Region the

main constraints are environmental (mountainous island) and organizational (the two sectors do not communicate for historical reasons). The optimization regional model may be used to support discussions and explore future “closer sector integration” scenarios with both stakeholders.

Best regards,

Paulo Salgado
Pôle ELEVAGE
CIRAD REUNION
7, Chemin Irat - Ligne Paradis
97410 Saint-Pierre

Téléphone ++ 262 (0) 262 49 92 53
GSM ++ 262 (0) 692 76 76 04
Secrétariat ++ 262 (0) 262 49 92 02
Fax ++ 262 (0) 262 49 92 95

Contribution 30, from the Moderators

-----Original Message-----
From: Crop-Livestock
Sent: Fri 2/5/2010 12:06 PM
To: Crop-Livestock-L@mailserv.fao.org
Subject: Week 1 -- Contribution 30, from the Moderators

Dear Colleagues,

The following is from the Moderators.

1. Some of the most interesting new approaches to the on-farm integration are the intensified systems emerging in Brazil where Conservation Agriculture (minimum soil disturbance with crop residues left on the soil surface, plus crop rotations) is being linked to livestock production systems as pastures are sown and incorporated as part of the rotation. The biology of what is being learned and applied in Brazil could be applied to smallholders in Africa and elsewhere, but there are issues of controlling the grazing of livestock in the smallholders systems. What solutions are being found to protect some of the crop residues? Is living fence a good option? Is applying alley cropping and/or using wire- or tree-fencing the perimeter an option? How can one optimize the management?

2. Under what conditions does moving livestock into cropping lands add to soil health? For example, we have heard a thoughtful contribution from Terry Wollen of Heiffer Foundation (Contribution 14) about hoof action to enhance water infiltration, for example. Does this help in general or only in highly degraded soils with serious surface compaction? Another point for clarification here is the benefit of manure as plant nutrients; if the manure comes from biomass grown on the same field where the manure is deposited, is there a net nutrient gain? a functional ecosystem gain?

Regards,

Moderators
Crop-Livestock-L
Crop-Livestock@fao.org

Contribution 31, from P. Parthasarathy Rao at ICRISAT, India

-----Original Message-----
From: ParthasarathyRao, P (ICRISAT-IN) [<mailto:P.PARTHA@CGIAR.ORG> mailto:P.PARTHA@CGIAR.ORG]
Sent: 05 February 2010 12:16
To: Crop-Livestock
Subject: RE: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

To the moderator,

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

I did not see many responses from South Asia except a few from Bangladesh. Bulk of the milk and meat production (except poultry meat) comes from mixed crop -livestock systems. In India, as also in most south Asian countries crop residues by far the most important feed resource particularly in the semi-arid, arid ecologies. For example, in India, 50 to 70% of total feed (on dry matter basis) is from crop residues of fine cereals, coarse cereals, and leguminous crops. In the summer months stored crop residues are the only source of feed. Thus crops and livestock are integrated on the same farms making full use of the available biomass throughout the year.

Farm sizes are small in south Asia and hence mixed crop livestock systems are more profitable compared to only crop production. For example in India 85% of the farms are below 2 hectares (more than 60% are marginal farms i.e., less than 1 hectare). A majority of the farmers marginal, small, and large have livestock (draft animals, milch animals, and small ruminants).

Given the above scenario the question is not if these systems can feed the growing population but how can we increase the productivity of these systems and make them sustainable since the lives of so many poor farmers is dependent on them. The alternative is only industrial systems which contribute to environmental pollution etc.

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop- livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

Integration takes place outside the farm also, for example landless livestock keepers in a village link with crop producers (for their surplus fodder) while the crop producers link with livestock keepers for manure etc.

What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

All the biomass that is produced on the field is utilized effectively thus avoiding burning etc that causes pollution. Income from crop production is generated once or twice in a year while income from livestock can be on a daily basis (particularly milk). Women play an important role in livestock rearing and have control on the income from livestock sector that is used for household health and nutrition.

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

Lack of appropriate infrastructure facilities linking mixed systems with demand centers located in urban areas, small scale production and small surplus making long distance marketing uneconomical, lack of information on improved crop and livestock technologies or their availability.

P.Parthasarathy Rao
Principal Scientist
Global theme on Institutions, Markets, Policy and IMPACTS
ICRISAT
Patancheru, India

Contribution 32, from Shirley Tarawali at ILRI, Nairobi, Kenya

-----Original Message-----
From: Tarawali, Shirley (ILRI) [mailto:S.TARAWALI@CGIAR.ORG]
Sent: 05 February 2010 12:44
To: Crop-Livestock-L@mailserv.fao.org
Subject: Contribution from Shirley Tarawali (ILRI)

Dear Colleagues

Thank you for this great opportunity, and for the interesting discussions so far, here are a few thoughts on week 1 issues

Shirley

From your perspective:

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

If crop livestock systems are to play a role here its going to be important to recognize that these systems are heterogeneous – not all will have a trajectory of change that will directly benefit smallholders in an environmentally friendly way whilst being able to respond to the major demands for livestock products – there is no "one size fits all" approach. Furthermore, if real practicalities of systems transition are to be addressed, vastly different approaches for research and development will be required that bring together policy, institutional, social dimensions to enable smallholder market participation – most often before technology dimensions are addressed. The present "juggling acts" that many smallholders are undertaking to manage risk and eke out a living are vastly different from integrated, market linked smallholder crop livestock production systems, which may be increasingly focused on single commodities. There is a tremendous potential to address future food by developing some crop livestock systems in an environmentally, economically and socially sustainable way, but it will require some real innovation in all dimensions to manage the transition!

The contribution from New Zealand is interesting – it highlights the vast difference between smallholder crop livestock systems in developing versus developed countries. But perhaps there are some dimensions that we can learn from? Such as….. input and output markets working; no single approach (on a farm, or landscape or temporal scale); availability of information that allows farmers to be responsive; integration across farms (providing fodder for the neighbor etc) – and perhaps a key bottom line that applies everywhere – farmer livelihood (which includes sustainability of the natural resource base) is an underpinning issue.

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

A number of interventions at this forum have pointed out diverse potential benefits of improving or intensifying livestock or crop production. One aspect on the technology front that we (ILRI) have pursued with national and international partners in West and East Africa and South Asia crop-livestock systems is to investigate "multi dimensional crop improvement". This arose out of the recognition that for many farmers in these systems, choices of crop varieties are not only based on grain (or sometimes tuber) yields, but on the quantity and quality of crop residues that are used to feed animals. Bringing together animal nutritionists to look at the quality/quantity of residues with crop plant breeders had in the initial stages a couple of key dimensions:

- Identification of significant variation in key quality parameters that relate to animal productivity, but without compromising grain yield. This means there is something to breed for!

- Ability to develop NIRS (Near Infra Red Spectroscopy) equations for these parameters that enable significant numbers of samples to be quickly and simply analysed. Something again that facilitates the breeding and selection process (animal feeding trials with huge numbers of test varieties would be unfeasible!)

More recently, some other aspects that emphasise the non technical issues have come to the fore:

- We see increasingly that crop residues are traded and transported, and that prices are related to quality (as perceived visually and/or after feeding – eg in milk production). There may be major implications here in terms of nutrient movement with the challenge of spatial separation of livestock and crop production and what that means for soil fertility – which is a complex mix of non and technical issues…..

- Taking this work further requires participation of diverse actors involved in the seed sector, feed processing and local entrepreneurs

- Improved crop residues alone will can improve animal productivity, but will not raise such to the levels required to address future demand. Combining feeds (including crop residues, local by products, strategic supplementation) and processing feeds (chopping etc) can increase productivity further, but raises considerable challenges in terms of feed input delivery systems, information and the like.

See recent intervention from Lieven also on this topic, of crop residues and a few more references available at:

SLP research web page (for several issues that have been discussed so far) (http://www.vslp.org/vslp/front_content.php?idcat=21).

See also the 2003 Special Issue of Field Crop Research on Food-feed crops:

http://www.sciencedirect.com/science?_ob=PublicationURL
<http://www.sciencedirect.com/science?_ob=PublicationURL&_tockey=%23TOC%235034%232003%23999159998%23467286%23FLA%23&_cdi=5034&_pubType=J&view=c&_auth=y&_acct=C000001618&_version=1&_urlVersion=0&_userid=995675&md5=ef7d3e4adbcd67cd6ef69907fc43b593>
&_tockey=%23TOC%235034%232003%23999159998%23467286%23FLA%23&_cdi=5034&_pubType=J&view=c&_auth=y&_acct=C000001618&_version=1&_urlVersion=0&_userid=995675&md5=ef7d3e4adbcd67cd6ef69907fc43b593

- What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

Some of the comments about the need to manage biomass and understand trade offs in crop livestock systems are pertinent. The System-wide Livestock Programme (www.vslp.org) together with partners in four regions of developing country crop livestock systems has recently initiated a series of regional studies to investigate such issues in relation to crop livestock systems at various levels of intensification and in different market settings. See below a summary of this work.

"Mixed crop-livestock systems are very dynamic and are evolving rapidly in response to external drivers such as demographic pressure, development of urban markets and

increased demand for crop and livestock products, climate variability and change. In addition, the recent interest for bio-fuel production exacerbates further the pressure on biomass in production systems.

The SLP study aims at better understanding the tradeoffs in crop residue uses in cereal based systems in four regions: millet, sorghum, maize based systems in West Africa; maize based systems in Eastern and Southern Africa; and wheat/rice based systems in South Asia. The major tradeoff in most systems is the short term benefits of using crop residues to feed livestock versus leaving the crop residues in the field to improve soil productivity (nutrient balance, erosion control, and soil health).

The study focuses on the decision making processes at the farm/household level and will capture the diversity/contrasts and recent changes in CR uses at various scales in order to better target technical, institutional and policy options to improve livelihood without compromising long term system sustainability."

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

I think it's a much broader context (rather than single innovations) that addresses market demand and the opportunity for smallholder participation – which does not work for all systems in every place and will need to be nuanced depending on things like livestock commodity, economic stage of the country (GDP, whether agricultural, transforming or urban), agricultural potential…etc. One aspect that is key to the potential of smallholders to remain competitive is land and labour costs, especially at production level, meaning for example in some instances, smallholders often have an advantage over large scale enterprises for dairy, but not so for pigs and poultry.

See for example:

Baltenweck I., S. Staal and M.N.M. Ibrahim. Demand-driven crop-ruminant intensification: trans regional analysis (TRA) to understand patterns of change using village level data from three continents. http://bsas.org.uk/downloads/mexico/015.pdf

(Other links related to TRA: http://www.vslp.org/upload/pdf/trasnregionl.pdf and http://www.trajectories.org/issues.asp)

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

There needs to be some careful consideration of WHAT is to be scaled up. Single technology focused approaches (eg the alley farming discussion) are unlikely to work, but need to be approached in ways that allow for integrated market (input and output), institutional (at various levels from local to national and regional – including the participatory approaches and community engagement), policy dimensions with technology aspects (which also should not focus on just single interventions but – for example bringing together issues of crop varieties and management with livestock husbandry, feeding, improved breeds and veterinary care….etc. In many instances, crop livestock systems (as we have seen from the discussion so far) are already

integrated, and the challenge includes how to build on such integration and evolve to address these multidimensional requirements that have been well highlighted.

Contribution 33, from Pedro Machado, Embrapa, Brazil

-----Original Message-----
From: Pedro L O A Machado [<mailto:pmachado@cnpaf.embrapa.br> mailto:pmachado@cnpaf.embrapa.br]
Sent: 04 February 2010 23:59
To: Crop-Livestock; Crop-Livestock-L@mailserv.fao.org
Subject: Re: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

Dear all,

Hope I am not late.

1. Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

A. Yes if ICLS leads to nutrient cycling (cover crops in rotation with cash crops help on K and N cycling) and weed suppression by plant residue covering the soil surface and keeping soil moisture during dry spells commonly observed on tropical climates (1500 mm rainfall with dry season for 5 months).

2. What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

A. The Cerrado - neotropical savanah (see climate characteristics above) covers 25% of Brazil with clayey Ferralsols (50-60% clay) being predominant but significant portion of sandy soils also present. During the 1980s and still nowadays planted pasture abounds, mostly suffering from certain level of degradation (low meat production due to low forage to soil water erosion on the landscape). This covers 100 million ha approximately. Farms for grain production are characterized by soybean in the summer rainy season followed by fallow during the autumn/winter dry season. Maize may be planted at the end of the rainy season. Zero-till is being widely adopted, but precise area is hard to be found. Most information on zero till area is anecdotal based on questionnaires to farmers or consultants and farm coops. However, by mid-1990s the recovery of degraded pasture was initiated by ranchers in collaboration with scientists and included intensive heavy-disc harrowing (tilling not deeper than 13 cm) of 200 to 500 ha areas at the beginning of the summer rainy season. Maize or upland rice mixed with African Brachiaria grass and mineral fertilizer. Maize showed better performance and the resulting yield enabled payment of the costs for pasture recovery. This works when maize prices are ok. Nowadays, maize prices hardly pay the costs for tillage and fertilizer.

Later, scientists and farmers (not ranchers) adopting zero-till for soybean followed by fallow identified the possibility of sowing maize mixed with brachiaria grass after soybean harvest taking advantage of the residual rainfall of the summer season. After the harvest of maize, brachiaria is left to grow during winter dry season, zebu oxen are brought to the area to gain weight for meat and after being sent to slaughter houses, brachiaria is desiccated with glyphosate and soybean is sown again in the area with a zero- till planter. Pasture may be prolongated for two years before soybean is planted again.

There are other ways of ICLS with goats, pasture grass and grape production.

3. ...

Have to go now. Kids need me to have teeth brushed and to go to bed. More later...

Bye,
Pedro L O A Machado
Soil Scientist
Embrapa Rice and Beans
Brazil

Pedro L O de A Machado
Email:pmachado@cnpaf.embrapa.br
Pesquisador A - Dr. nat. techn. Solos
Embrapa Arroz e Feijao
Rodovia GO-462, km 12
35735-000 Santo Antonio de Goias, GO

Contribution 34, from Ramon Costa Alvarenga at Embrapa, Brazil

-----Original Message-----
From: Ramon Costa Alvarenga [<mailto:ramon@cnpms.embrapa.br>
mailto:ramon@cnpms.embrapa.br]
Sent: 05 February 2010 14:50
To: Crop-Livestock
Subject: Crop-livestock

Dear colleagues,

My contribution:

Yes. I believe that the integrated crop-livestock systems was the proposal for greater impact on food production for Brazil in the last two decades. Historically, most farmers produce cereals and cattle production in isolated systems. Add these two activities into a single system has generated breakthrough. Traditionally, almost all cattle production is grazing on soils naturally low and the pattern of production is low, something around 100 kg of live weight per hectare per year. By integrating these areas with the crop production, you can double or triple the cattle production in the

short to medium term. The pasture also gives considerable contribution to the fields: a straw of very good quality and quantity for the implementation of no-tillage. For the most areas in Brazil which typically has a hot and humid climate that favors rapid decomposition of crop residues promoting a poor management and soil and water conservation, the integrated crop-livestock system it is showing to be a very good management. With this new reality is being able to increase both the cattle and the plant production and this will undoubtedly help to feed a growing world population.

In the state of Minas Gerais, Brazil, some experiments show encouraging results (see in
<http://www.cnpms.embrapa.br/publicacoes/publica/2007/circular/Circ_93.pdf>
http://www.cnpms.embrapa.br/publicacoes/publica/2007/circular/Circ_93.pdf
and
<http://www.cnpms.embrapa.br/publicacoes/publica/2006/circular/Circ_80.pdf>
http://www.cnpms.embrapa.br/publicacoes/publica/2006/circular/Circ_80.pdf
and

<http://www.cnpms.embrapa.br/publicacoes/publica/2009/comunicado/Com_166.pdf
> http://www.cnpms.embrapa.br/publicacoes/publica/2009/comunicado/Com_166.pdf
).

The intercropping of maize and grass, I believe, is the most prominent technology although other combinations of crops and fodder are also possible. One of the main advantages of this consortium is the economic exploitation of the soil throughout the year: spring / summer – crop + forage grass, fall / winter - grassland can still last for one or more years.

Environmentally, these systems allow the use and rational management of soil with gains in quality of soil and water. No-till is more easily made possible due to the initial conditioning of the soil and the increased supply of straw for pasture for soil mulch. Thus, soil erosion is reduced, soil degradation and sedimentaion of reservoirs and water courses is minimized. This system has been showing reducing of using of pesticides to control pests, diseases and weeds. In summary, the synergism between tillage and pasture strongly contributes to the sustainability of farming.

Economically, the increasing of the productivity with lowering cost production promotes a profitable system. In addition, increasing the availability and quality of products. Socially, the increase in revenues improve living conditions in the field, consequently increased labor supply by encouraging people to remain in the field. In Brazil there is an emptying of the countryside with people migrating to cities, swelling the slums, etc…

The interaction of research with the state technical assistance have allowed the farmers take these innovations. Courses, field days, lectures and other types of work "on farm" is going on. More than a thousand of extension agents have been trained, government programs encourage the replication of these technologies on farms throughout the state: more than one thousand units of observation and transfer technologies are set up. It is estimated that only in 2009 more than thirty thousand farmers had access to these technologies. Many colleges and universities already have

in their curriculum the teaching of integrated crop-livestock systems even in graduate school.

In my opinion the best way to integrate these systems with the landscape is through the integrated crop-livestock-forest systems. The forestry component comes not only the restoration of forest around the watercourses and protection of slopes, but also the production of wood from planted forests for multiple uses contributes markedly to reduce the demand on natural forests which are thus preserved. In the system itself, no-tillage management is very useful.

_____
Ramon Costa Alvarenga
Pesquisador Embrapa Milho e Sorgo
Manejo e Conservação do Solo e da Água
Coordenador PROTILP
C. Postal 151-35701-970 Sete Lagoas-MG
Tel: 31-3027.1251 Fax: 31-3027.1188

Contribution 35, from Michel Duru at INRA, France

-----Original Message-----
From: Michel Duru [<mailto:mduru@toulouse.inra.fr>
mailto:mduru@toulouse.inra.fr]
Sent: 05 February 2010 15:11
To: Crop-Livestock
Subject: Re: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

Dear Moderators,

As an agronomist working for INRA (French National Institute in Agronomy). I have a lot of experience about livestock systems in beef system (less favoured areas: mountains, hills) as well as intensive dairy systems, mainly in France.

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

Yes, I do believe they have such a place, although the current economical and environmental context is not yet favorable to such developments in Europe. However, I think that the expected changes, as global change or energy crisis would favour such evolution in the next decades.

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

Several research units from INRA are involved in research programs relying on integrated crop-livestock systems (East and Centre of France). Both combined "system experiments" and participatory research through networks of farmers. The main problem is that economic drivers don't favor very much such a system in the current context.

- What are the key benefits that arise from these systems? Economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

The key benefits of integrated crop–livestock systems are to decrease inputs (fertilizer, pesticides….), improving farm economy and reducing environmental impacts.

For social issues, crop-livestock systems can increase mental workload which can be discouraging farmers from adopting them; but they offer the opportunity to spread the labor all the year long, avoiding surplus of labor at some key periods of the year.

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

The response to this question is not easy, taking into account of economical, environmental and social drivers in Europe.

Most often, Market favors crops in comparison to milk and meat, so that the most favored areas decreased animal production. In less favored areas, where it is difficult to grow cereals (wheat, corn), livestock is most often the alone agricultural activity than can occupy the land. These two reasons tended to specialize the landscape for crops or livestock even if the environmental benefice of integrated crop-livestock systems is now well known. However, global change, especially increasing extreme climatic events, should encourage the development of more robust farming system. Integrated crop-livestock systems can be more resilient that specialized agricultural systems. A strong increase in energy prices will certainly lead to the development of integrated crop-livestock systems producing the same quantity with less energy consumption (concentrates, fertilizer….).

- How best do we integrate these sustainable intensive production systems into a landscape scale approach?

In Europe, the landscape is very patchy (except in the great plains used for annual crops) in terms of farming system and environmental conditions (slope, aspect, soil characteristics) at different scales: farm, catchment…… A first approach would be to examine at what scale complementarities can be interesting: within and between farms.

Regards

Michel Duru
INRA
France

Contribution 36, from Jill Lenne, UK

-----Original Message-----
From: Jillian Lenne [mailto:jillian.lenne@btopenworld.com]
Sent: 05 February 2010 16:03
To: Crop-Livestock-L@mailserv.fao.org
Subject: Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

Dear Contributors

I have greatly enjoyed reading the contributions from Week 1. The breadth of experience with crop-livestock systems globally is very impressive. Clearly there is a need to bring all of this valuable information together into an accessible knowledge base so that all practitioners working in crop-livestock systems can be informed of past and current successes. Perhaps a Global Crop-Livestock Initiative?

Five years ago, a colleague and I collated and analysed the relevant outputs from some of the DFID-UK funded Africa-based projects in crop-livestock systems with a view to identifying the key elements of successful initiatives which could be applied to future research in these systems. Very few of these projects were "crop-livestock" projects per se but were implemented in crop-livestock systems. I have attached the publication from this study.

Key characteristics of successful and productive projects were that they:

* fostered multidisciplinary research teams of crop, livestock and social scientists;
* worked with both crop and livestock R&D institutes;
* built on existing knowledge bases and integrated multiple knowledge bases;
* 're-worked' the stock of knowledge according to farmer and system needs;
*developed productive and sustainable partnerships; and
* sought opportunities for spill-overs to other locations and regions.

Many of the analysed projects were "crop" projects that potentially offered more than the implementing scientists realised at the time. However, the full realization of the benefits from this substantial research effort continues to be hampered by the historical and ongoing lack of cross-disciplinary linkages and cross-sectoral approaches. "Crop" and "livestock" scientists are located in different institutes. It is usually only through a project that they have a chance to work together. When the project finishes, it is very difficult to maintain the partnership. In most countries, agricultural institutes are organized on disciplines and there are barriers between the soil, plant and animal sciences. This situation precludes a holistic approach to complex system-based problems. Within animal sciences, pasture science and animal

nutrition have often been separated from animal production (i.e. management). Such an organizational structure ignores the real problems faced by farmers and interactions in farming practice between the disciplines. If the benefits of successful initiatives are to be enjoyed by farmers in crop-livestock systems, crop and livestock research needs to be better integrated.

For me, the critical constraints to implementing successful crop-livestock research to need current and future populations are a) the lack of a global knowledge base and b) the general lack of cross-disciplinary linkages and cross-sectoral approaches in crop-livestock research.

Best wishes
Jill Lenne
Scotland, UK

Contribution 37, from Jorge Ribaski at Embrapa, Brazil

-----Original Message-----
From: Jorge Ribaski [mailto:ribaski@cnpf.embrapa.br]
Sent: 05 February 2010 17:04
To: Crop-Livestock
Subject: Crop-livestock-forestry systems

Dear colleagues,

My contribution:

Silvopastoral systems as a support for sustainable development in the southwest region of the State of Rio Grande do Sul, Brazil

The anthropic pressure in the natural ecosystem of the Southwest region of the State of Rio Grande do Sul (Pampa biome), Brazil, characterized by large sandy soils formations, has caused a significant reduction of its vegetation cover, facilitating the extensive erosion occurring in several regions. The natural limitations for agriculture and traditional extensive cattle raising added to the inappropriate land use have aggravated its natural erosion process, gradually amplifying the areas with scarce vegetation coverage and sandy fields. This process of environmental degradation has had negative impacts upon social and economic conditions, decreasing quality of life of country population.

Currently, there is great incentive to develop strategies capable to promote sustainable land usage. In this context, the development of integrated silvopastoral systems is seen as an alternative to mitigate the desertification and to aggregate value to the rural properties through forestry and wood production. The use of integrated silvopastoral system is coherent with governmental developmental policies, which are aimed at actions capable to promote socioeconomic development without adverse effect in the environment.

The objective of this study is to develop sustainable silvopastoral systems according to economic, social and environmental points of view, aiming at improving welfare and quality of life of farmers, adding economic value to their farms through wood exploitation and natural resources conservation of this ecosystem.

Jorge Ribaski
Embrapa Florestas

Contribution 38, from Jagdish Timsina at the IRRI Bangladesh Office

-----Original Message-----
From: Timsina, Jagadish (IRRI) [mailto:J.Timsina@cgiar.org]
Sent: 05 February 2010 17:08
To: Crop-Livestock
Subject: RE: Week 1 -- Contribution 32, from Shirley Tarawali at ILRI, Nairobi, Kenya

I would like to add/emphasize the following points to this last day of discussion on Week 1 :

1. Conservation agriculture (CA), climate change, and crop-livestock integration are closely linked. CA emphasizes (a) reduced or minimum tillage (minimum soil disturbance) (b) partial or some level of residue retention (c) diversified, profitable and sustainable crop rotations. All these three assist in development and promotion of crop-livestock integration systems. Reduced tillage helps retain crop residues in the field and can be used for improving soil fertility and organic matter as well as can be used for feeding livestock. No doubt, reduced tillage will help mitigate greenhouse gas emissions as reduced tillage means reduced carbon emissions, and thus reduce the impact of climate change. Partial residue retention has been suggested in CA so that at least some residues are retained in soil for lowering soil temperature, conserving soil moisture, and building soil organic matter (all these processes help crop species adapt to climate change) while some residues are used for livestock. Diversified and sustainable crop rotations generally imply leguminous or nutrient adding food crops or fodder or cover cops to cropping systems. Such rotations provide nutritious fodder or feed for livestock.
2. When we attempt to develop or improve the productive and profitable crop-livestock systems, we must consider the effect of global climate change on such systems. Just like climate change will change the adaptability of crop species and cultivars, climate change will also affect the adaptability of the fodder and forage species as well as that of livestock. Likewise, how crop-livestock systems will contribute to mitigating or emitting the greenhouse gases must also be analyzed. For example, rice lands and ruminants contribute to methane emissions. How can we optimize the crop-livestock systems so as to mitigate the climate change?

3. As has also been indicated by different contributors, cereals provide crop residues as well as grain (feed) for the livestock. Of all cereals, maize is becoming quite popular in Asia. Maize hybrids (yellow color) are grown widely mainly because the grains are used as feed for livestock (mainly for poultry but also for cattle) while

white maize is used as food for humans. Maize leaves and residues are also used widely in Asia. In case of wheat and rice, mostly residues are used and but less grain is used as feed. Hence, cereal (maize)-livestock integration is the best form of crop-livestock integration in Asia.

Thanks,

Jagadish Timsina
IRRI Bangladesh Office

Contribution 39, from José Campero Marañon in Bolivia

-----Original Message-----
From: José Campero Marañon [mailto:jrcampero@hotmail.com]
Sent: 05 February 2010 17:17
To: crop-livestock-l@mailserv.fao.org
Subject: Week 1

Dear Moderators:

I have greatly enjoyed reading the contributions from Week 1. Perhaps it is necessary to have a Global Crop-Livestock Initiative in order to facilitate the development of sustainable intensification. On the order hand, my is English is very poor. But I think that the language is only one of the ways of communication.

Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

Yes. The utilization of by-products generated in a subsystem as input for another subsystem is important. In highlands of Bolivia, the integrated systems of production are being practiced from before the Spanish conquest of these lands. In these integrated Andean systems the surface of the principal crop depends on the capacity of the livestock component, composed principally by llamas, alpacas and sheep, to produce manure.
Nevertheless, it is in the extensive systems of production of meat with bovine where the strategy of sustainable intensification is much more important. In Bolivia, these systems are very inefficient and the annual production per hectare is only 16 kg of corporal mass; productions that have a value of near 8 dollars. In these natural range it is urgent to include an agricultural component such as rice, maize or tolerant soybean to acid soils; close to the crop, it is necessary to include lime and fertilizers to the soil (lime and chemical fertilizers) in order to correct the pH and the deficiencies of the soil nutrients; and, finally jointly with the annual culture it is key to establish the permanent pasture, generally it is some species of generous of Brachiaria or Panicum. This practice of pasture establishment is very common in Tropical Chapare; this technology was improved and documented by EMBRAPA Brazil.

This strategy allows to establish and to correct the fertility of the soil at a zero cost; because the sale of the excess agricultural crop pays for the cost of the improvements

to the soil and the establishment of the pasture. It is documented that this strategy for sustainable intensification allows productivities per hectare superior to 500 kg of corporal mass of bovines per hectare and year.

What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

In Bolivia, several technologies were transferred in order to intensify native savanna production, such as: the partial or total substitution of the savanna native vegetation by improved pastures or leguminous, incorporation of leguminous arboreal into savanna native vegetation, and many others. Nevertheless, they failed in the massive application of these technologies, because of the low cost of the land, particularly certainly in the tropical lowlands; and, because there existed little political interest from the neoliberal governments for democratizing the access to the land. Actually, the land must perform an economic and social function. In consequence, it becomes necessary to intensify the production in order to reach this function that the law demands from the land.

In the way of sustainable intensification of the extensive systems of livestock production, the principal strategy or the most promising technology, in my modest opinion, is: annual crop (rice, maize or soy bean) + improved the fertility of soils; and, + the culture of the improved pasture. Technology that was reported in the lines above.

What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

The sustainable intensification of extensive livestock systems will allow reaching economic, environmental and social benefits.

Economic. It is demonstrated that the intensification of extensive livestock systems will allow major economic income due to an increase of the current productivity from 16 to 500 kg of corporal mass of bovine per hectare. It means, the intensification will allow to increase the productivity for surface unit by more than 30 times in relation to the current levels

Environmental. Additionally, this process (intensification) will allow using minor surfaces of native savanna to produce meat and, in parallel, it is possible to transform the surfaces of savannas that are not used as natural forests or cultivated forests, helping to mitigate the effects of the climatic change by carbon sequestration in tropical grassland ecosystems.

Social. The way livestock intensification is possible is if there is more land allocated for crop production or integrated crop-livestock systems. Also, it is possible to minimize requirement of land allocated for livestock. The land not used for livestock purpose, will allow the creation of a land market, democratize the access to the land for people that at this moment do not have land for agricultural uses.

The main benefit is in terms of ecological resilience of the system.

The principal ecological benefit is that there will be reduced pressure on forest land. And, at a global level this will be increase forest capacities to sequestration of Carbon. It is possible that in the near future the technology allows the reduction of the CH4 emission from ruminants in grasslands.

How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

Our experiences in Bolivia, the Estate will develop specific policies to improve these innovations. These policies will be in relations to development of differential incomes in order to improve the innovation associated with sustainable intensification. Other aspects are to bring to the producers credits and production inputs at low prices. The most important is that the Estate and Farmers association agree about the way for this process of sustainable intensification.

What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

The principal key constraints for the development of the integrated crop-livestock systems is the high demand of rangelands that are needed to offer to the agricultural system the sufficient quantity of mature that demands the agricultural component. It is possible to resolve this issue with the use of chemical fertilizers. But this use, will be tested in terms benefits/water and soil contamination.

How best do we integrate these sustainable intensive production systems into a landscape scale approach?

In Lowlands of Bolivia, the support capacity of the native savanna has an average of 0.28 UA. And, with this capacity of support of native savanna there is 30 million of hectare under this management. This information shows us the necessity to develop a process of sustainable intensification. The best way, in our opinion is the technology known as “Barreirao” (BS) that was documented by Kluthcouski et al (1999).

In Bolivia, especially in the Chapare region, it is the form of establishment of B. decumbens or humidicola. The BS needs to know the fertility and acidity of the soil in order to correct it; and, the requirements in nutrient of the annual crop, the method of preparation of the soil and the epoch as well as the depths and epochs of soil preparation. The forage culture uses the residual fertilization to consolidate its establishment and to guarantee the temporary sustainability.

José R. Campero
DIRECTOR ALIANZA BOLIVIANA DE LA
SOCIEDAD CIVIL PARA EL DESARROLLO SOSTENIBLE

Contribution 40, from Alan Franzluebbers at USDA

-----Original Message-----
From: Franzluebbers, Alan [mailto:Alan.Franzluebbers@ARS.USDA.GOV]
Sent: 05 February 2010 18:48
To: Crop-Livestock-L@mailserv.fao.org
Subject: Week 1 response

Dear Colleagues,

Contemporary research in the USA has not been particularly focused on integrated systems in general, but there have been some pockets of activities in various regions. These activities could serve as examples of the processes to achieve successful integrated crop-livestock system. I can relate a bit from our research in the southeastern USA (a warm, humid climate similar in characteristics to other parts of the world). For a review of the region and some of the research conducted in this regard, see the attached article (2007a_AF.pdf). Winter cover crops are a great strategy for the region to control soil erosion, recycle nutrients, and build belowground biodiversity. The high quality forage of many annual species makes them an excellent choice to integrate cropland with livestock (2007b_AF.pdf). At least in the medium term when stocking rates are balanced with available forage, the negative impacts of animal traffic can be minimized and lead to improved nutrient cycling at the soil surface as well (2008d_AF.pdf and 2008e_AF.pdf). Integration of crops and livestock does not necessarily have to be limited to within a farm, but also might be possible among farms in a community (2007c_AF.pdf).

Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

Yes, integrated crop-livestock systems can be a part of a package for many regions to achieve sustainable agricultural systems under the pressures of trying to increase production for the expected food, feed, fiber, and fuel needs of society. Resource-efficient farming systems would dictate that resources be shared among components of a diversity of production systems.
What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

In the southeastern USA, converting conventionally tilled cropland to cropland managed with conservation tillage (reduced, strip, no tillage) has been essential to stop erosion and build soil quality. Producers are also realizing that successful conservation tillage systems require continuously vigorous plant cover on the land. Utilizing cover crops for animal forage has been slowly attempted and has a place to increase nutrient cycling and still preserve vegetative cover through the winter period.

What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

Economic and environmental benefits have been realized in some cases, but the social acceptance of winter grazing of cover crops and pasture-crop rotations has been difficult to achieve at this point. Case studies are available to show that overall farm productivity increases with integrated systems.

How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

Conservation production systems training conferences and field days are being developed more often and farmer-led conservation tillage associations are slowly recognizing the potential value of integrated crop-livestock systems.

What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

Extending knowledge from research experiments to farmers is still lacking with integrated systems in the USA. Region- and location-specific information is also lacking for a diversity of integrated approaches and this limits broad-scale adoption.

How best do we integrate these sustainable intensive production systems into a landscape scale approach?

Buy-in from key land management support groups is necessary. Vocal, innovative farmers must serve as examples to their fellow farming community to illustrate what the advantages and disadvantages might be.

Alan J. Franzluebbers
USDA - Agricultural Research Service
1420 Experiment Station Road
Watkinsville GA 30677
Tel: 706-769-5631 ext 223
alan.franzluebbers@ars.usda.gov

Contribution 41, from Paulo César de Faccio Carvalho at UFRGS, Brazil

-----Original Message-----
From: Paulo Cesar de Faccio Carvalho [mailto:paulocfc@ufrgs.br]
Sent: 05 February 2010 20:14
To: Crop-Livestock
Subject: Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

Dear Moderator,

Please find below some comments on proposed topics. Please consider this contribution from myself and from Dr. Anibal de Moraes (Universidade Federal do Parana).

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

I am not sure ICLS are an answer to sustainable intensification in the way we usually refers to. I think we can consider ICLS certainly as a sustainable option to feed people, since almost no other system can mimic the natural nutrient fluxes in the way ICLS can potentially reach (obviously depending on systems characteristics). In Southern Brazil ICLS have been considered as a strategy to both smallholders and large cash crop oriented farms.

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

I will refer to Southern Brazil (subtropical area). ICLS I this region are mainly based on cash crops (maize, soybean, and rice)/pasture (annual C3 and C4/perennial C4 grasses) rotations. Thus livestock comprehends mainly dairy and beef cattle operations. One comment merits reference in this topic. We have learnt the need of diversity as the basis of rotation in ICLS, and the benefits of grazing animals in enhancing this diversity and its positive consequences. Agricultural systems based only on cash/crop and no-till systems have been suffering from unsustainable intensification leading to loss of biodiversity, nutrient pollution and habitat fragmentation. Innovative crop-livestock systems are being considered in the concept of higher diversity in the rotations (C3, C4, annuals, perennials, mono, dico, trees, etc.), and the necessity of a grazed pasture phase to perform nutrient cycling in a way only crop rotations cannot perform.

- What are the key benefits that arise from these systems? Economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

Some of the main key benefits we have been experiencing are: i) economically – diversification of incomes (in nature and in time); risk decrease, increasing crop and/or livestock yield; land, labor and machinery use efficiency; ii) environmentally – increasing organic matter and many soil quality attributes; recycling nutrients, increase diversity, decreasing gas emissions (being evaluated); decreasing pressure to open new agricultural areas (mainly natural pastures in the Southern Brazilian case); iii) socially - increasing profits decreases migration pressures from smallholders; ICLS are creating new specialists/specialties demand to work with (human resources, technologies, equipments, etc…);

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

Two main references on this topic. Lessons learned show Southern Brazilian farmers are responsive for Cooperative educational systems, as well as field demonstrations. We have an excellent experience with MAPA/Brazil within the PISA project, which

comprises 22 demonstration units in 31 municipalities and 3000 participants in Brazil. The basis is a participatory approach, knowledge being applied and adapted on farm by a local committee fostered by specialists. Field demonstrations allow for multiplication of the results. The originality remains on how the committee is structured and works, which is difficult to explain here.

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

A very complex question with very possible answers. One point to be mentioned is there is no organized public-oriented initiatives to foster ICLS. FAO can have a crucial role on that.

- How best do we integrate these sustainable intensive production systems into a landscape scale approach?

A landscape scale approach needs some kind of public intervention and clear economic benefits. Once more FAO can help in emerging oriented policies.

Regarding moderator comments below, just a few words...

1. Some of the most interesting new approaches to the on-farm integration are the intensified systems emerging in Brazil where Conservation Agriculture (minimum soil disturbance with crop residues left on the soil surface, plus crop rotations) is being linked to livestock production systems as pastures are sown and incorporated as part of the rotation. The biology of what is being learned and applied in Brazil could be applied to smallholders in Africa and elsewhere, but there are issues of controlling the grazing of livestock in the smallholders systems. What solutions are being found to protect some of the crop residues? Is living fence a good option? Is applying alley cropping and/or using wire- or tree-fencing the perimeter an option? How can one optimize the management?

A crucial issue is in which measure we can control grazing. Livestock systems in Africa are quite different from those in Brazil, but the key remains on grazing control (frequency, which considers animal movements, and intensity, which consider stocking rates and grazing intensities). Fencing, pastoralism, and other grazing controls… there are many “precision grazing” tools solutions that have been recently developed (GPS location control, virtual fencing, pedometers, etc..). Anyway, for management optimization there is need for some measure of grazing control.

2. Under what conditions does moving livestock into cropping lands add to soil health? For example, we have heard a thoughtful contribution from Terry Wollen of Heiffer Foundation (Contribution 14) about hoof action to enhance water infiltration, for example. Does this help in general or only in highly degraded soils with serious surface compaction? Another point for clarification here is the benefit of manure as plant nutrients; if the manure comes from biomass grown on the same field where the manure is deposited, is there a net nutrient gain? a functional ecosystem gain?

The main condition to allow soil health enhancement by moving livestock into is the use of moderate grazing. The way animal influence soil health can be positive or

negative depending on grazing intensity. This experience have been observed in many soil/systems conditions. Concerning the second question, the ecosystem functionality by manure produced by biomass grown or not on the same field considers the absence of grazing in the system where manure comes from outside? “Nutrient gain” refers to what exactly? We need these clarifications to go further.

I thank you all for this opportunity and congratulations for the organizers initiative.

Kind regards, Paulo

Paulo César de Faccio Carvalho
Departamento de Plantas Forrageiras e Agrometeorologia
Faculdade de Agronomia - UFRGS
Av. Bento Gonçalves 7712 Cx Postal 776
CEP 91501-970 Porto Alegre, RS, Brasil
+51 3308 7402 ; +51 9919 7196
Grupo de Pesquisa em Ecologia do Pastejo

Contribution 42, from Lindsay Coulthard, Manitoba, Canada

-----Original Message-----
From: mztra [mailto:mztra@mts.net]
Sent: Sat 2/6/2010 12:38 AM
To: Crop-Livestock-L@mailserv.fao.org
Subject: Week 1 comments

Dear Moderator:

I am passing along my comments on the week 1 consultation. I appreciate the opportunity to follow this process and to be able to read the observations from other parts of the globe on farming issues.

Lindsay Coulthard
Farm and Extension Manager
Manitoba Zero Tillage Research Association
Brandon, Manitoba, Canada

- Do you believe that integrated crop-livestock systems are an answer for sustainable intensification? Do they have a place in our strategy for feeding 9 billion people in 2050?

I do believe that an integrated crop-livestock system is part of the answer for sustainable intensification. In western Canada we have moved our production towards more specialized farming systems since the 1970's with less than successful results. Our crop production is done by one segment of the agricultural industry, livestock reproduction is another segment and livestock feeding and finishing is done mainly by large enclosed feedlot systems. There is limited integration between these systems.

Our production systems are continually under stress from high costs of production. We believe that one solution to those problems is to integrate livestock back into our cropping systems to achieve benefits from each of the systems working together. I believe this would be a key part of the strategy for feeding our expanding population.

- What have we learned about integrated crop-livestock systems since the 1980's? Please describe innovative crop-livestock systems that you are familiar with (please remember to let your readers know the geographic/agroecological area that you are referencing).

We have been addressing some of the energy related costs of production in our cropping systems and working to rely less on fossil fuel based energy sources. With this objective we are now working towards developing systems which will include cover crop production with legumes as at least part of the cover crop blend. In our temperate climate in western Canada we try to produce these cover crops as a whole season crop and need a financial return on this crop. We are using livestock to graze the cover crop to give us that economical return. The biomass from these cover crops is not entirely grazed and the nutrients are left for subsequent crops. Another important part of this equation is the rotational grazing system that we are using to harvest the cover crops. This system ensures that we are establishing a healthy plant during the production year which will improve the soil health as well as increase our nutrients stored as organic material in the soils. This also reduces the amount of time that the livestock are kept in an enclosed feeding area which will reduce the energy required in the total feed uptake in the feedlot. The biggest benefit from this system is the reduction in commercial nitrogen for crop production while maintaining yields that we are experiencing following the legume production.

- What are the key benefits that arise from these systems? economically, environmentally, and socially? From a production standpoint, what are the gains in terms of functional biomass, multiple purpose production?

The key benefits achieved from this system are:

1. Reduced need for commercial fertilizer (economic and environmental benefits)
2. Reduction in the time required to feed and finish the livestock in the feedlot system (economic, environmental and social benefits)
3. Animal waste remains in the field where it is beneficial to soils (economic, environmental and social benefits)
4. Reduced capital expenditures in farm equipment

- How are these innovations being scaled up? What are the mechanisms for sharing knowledge (Farmer Field Schools, Farmer Cooperatives, Farmer interest groups or associations)?

These innovations are being scaled up in a modest way by innovative farm producers who are interested in modifying their farm production management. There has been limited uptake from the farming public in western Canada as this technology is being extended at a time when the economic returns to a livestock enterprise are depressed.

This technology is being extended to farm producers in field schools, workshops and working with farm groups.

- What are the key constraints to implementing integrated crop-livestock systems? What about constraints to scaling up/out?

One of the key constraints to the adoption of new technology in western Canada is the support programs put in place to assist farm producers. These programs do a lot to support the status quo in our production systems. This results in less innovative thinking and a resistance to adopting new technology which may involve additional management and possibly additional risk.

Another constraint to implementing an integrated crop-livestock system in western Canada is high labour costs. These systems do involve additional labour and management. Western Canadian farms have increased in size and have felt the need to specialize to make use of limited management and labour.

- How best do we integrate these sustainable intensive production systems into a landscape scale approach?

What we require to expand the adoption of sustainable intensive production systems:

1. modify our farm economic support systems to reward innovation
2. Increase public emphasis on research, education and innovation
3. Additional research and extension of the benefits of this integration

a. Soil health benefits
b. Water quality benefits
c. Livestock health benefits

Lindsay Coulthard
Farm and Extension Manager,
Manitoba Zero Tillage Research Association
Brandon Office: 204-729-8838
Farm Office: 204-725-3939
Cellular: 204-825-7878
email: <mailto:mztra@mts.net> mztra@mts.net

Contribution 43, from Celso Ayala Vargas at INIAF, Bolivia

-----Original Message-----
From: Celso Ayala Vargas [mailto:celsoayalavargas@hotmail.com]
Sent: Sat 2/6/2010 4:10 AM
To: Crop-Livestock
Subject: Contribution de Celso Ayala Vargas INIAF Bolivia

Estimados colegas.

Con mucho respeto, pido disculpas por no poder traducir mis opinones al ingles, pero para mi es mas facil escribir en mi idioma.

En principio debo indicar que el termino de "intensificación de los sistemas", requiere de un analisis mucho mas profundo para su denominación, esto porque los sitemas productivos dependen del contexto en cual se quiera describir dentro del contexto mundial, en Bolivia existen sistemas productivos agricolas, sistemas productivos pecuarios, y sistemas productivos mixtos, esto depende mucho en que ecosistema en el cual nos ubiquemos, pero no solo exsiste la complejidad del cultivo o la producción ganadera, sino que en ella intervienen otros componenetes, como los biologicos (microorganismos), los componenetes, económicos, sociales y culturales. En la actualidad la producción intensiva es una derivación de estos sistemas y justamente su intensificación es denominada como producción moderna (monocultivos). Esta claro que es necesario incrementar la producción de alimentos para el 2050, pero no es necesario destruir los sistemas de producción, por eso antes de poder intervenir en ellos, se necesita realizar estudios minuciosos para cada uno de sus componentes y asi de esta manera pensar en un futuro su intensificación del conjunto de sus componentes.

En este momento en nuestro país temos el modelos de producción intesiva, como el cultivo de la soya, que por sus caracterisiticas esquilmantes, estan dejando grandes tierras erosionadas, y en producción la gandera, la intensificación significa el incremento de alimentos balanceados, donde muchos de sus ingredientes compiten con la alimentación humana y si continua creciendo el auge de los biocombustibles que tipo de intensificación llegaremos a tener?. Por eso es necesario hablar con mucho detenimiento sobre la intensificación de los sistemas productivos. En la ganderia de los rumiantes son quienes se encargaran de convertir las praderas nativas en carne o leche, los mismos que son el sustento de millones de personas?. Si intensificacamos estos rubros requeriremos muchos alimentos para los animales,lo que tambien intensificara la producción agrícola, que es la consecuencia de la dependencia tecnologica actual, los sitemas productivos en la actualidad sobre todo se amantienen en los países en vias de desarrollo, y por que esto no han entrado en el ritmo de la producción intensiva?. Es justamente por que los pueblos originarios son quienes manejan ese concepto del equilibrio productivo con la naturaleza.

Son algunas de las cuestionantes que planteamos, antes de emprender con un terminologia, que a la larga puede afectar el concepto mismo de los sistemas de producción.

Un saludo cordial.
Atte.

Celso Ayala Vargas
INSTITUTO NACIONAL DE INNOVACIÓN
AGROPECUARIA Y FORESTAL - BOLIVIA

Contribution 44, from Andrew MacMillan, ex-FAO, Italy.

-----Original Message-----
From: Andrew MacMillan [mailto:andrew.macmillan@alice.it]
Sent: Sat 2/6/2010 9:06 AM
To: Crop-Livestock; Crop-Livestock-L@mailserv.fao.org
Subject: RE: Week 1 -- Some Reflections

Dear Moderator,

What we seem to be seeing from many of this week's contributions is that, left to themselves, farmers in most parts of the world integrate livestock and crops in one way or another in their farming systems. They gain the benefits that come from recycling of nutrients (including the maintenance of a high level of organic matter in the soil, a source of fuel and even of building materials); the stability of income that comes from a diverse range of products, and, for subsistence farmers, a generally nutritious diet, and even a source of garments); and, in many cases, an important supply of power that greatly increases the performance of human labour.

Various pressures associated with "modernization" of agriculture have, instead of building on the advantages of intensifying crop-livestock integrated systems, undermined them. These include the separation of "agriculture" from "animal husbandry" in higher education, research and extension, and increasing moves towards specialization within each of these areas; the promotion of inorganic fertilizers as the principal source of nutrient replacement (to the neglect of not only manures but also biological nitrogen fixation); the replacement of animal traction by mechanized systems, adapted usually to a narrow range of cropping systems and benefiting from "scale"; a tendency for a concentration of farm land in ever larger units; and, perhaps, most of all, the relative managerial simplicity of "specialization", especially as the scale of operations increases. Subsidy policies, often related to a few products, have contributed to the "narrowing" of farming systems

At the root of many of the changes that have been taking place in the "modernization" of agriculture over the past 60 years has been the extent to which the direction of innovation in farming has been driven so strongly by the potential commercial advantages that it offers to the corporate suppliers of inputs. There has been, as a consequence, gross under-investment in the improvement of farming systems in ways that minimize the use of purchased inputs - towards, for instance, raising soil organic matter content through mulches, manures, composts, intercropping and rotations; improving soil structure to allow for better water infiltration and retention; stimulating soil bacterial activity to increase nutrient availability; harnessing biological nitrogen fixation processes; integrated pest management processes; diversifying systems to increase resilience to climatic change processes and other shocks (including market shocks and pest related shocks); improving the efficiency of draft animal traction systems (and hand tools). For similar reasons, there has been gross under-investment in improving even fertilizer formulations to raise nutrient efficiency use, and innovations in spraying techniques that have led to better distribution of pesticide applications have been kept off the market. (Conservation Agriculture systems interestingly have gained strong corporate support, at least to the extent that they are herbicide-dependent).

At the same time, the adjustments in marketing arrangements that have come with the growth of super-markets throughout the world and direct contracting for delivery of large quantities highly standardised products, have increased pressures towards specialization.

What is particularly interesting is that so much innovation in crop-livestock system integration referred to in this week's discussion comes from inventive farmers (who have taken it upon themselves to spread the word) rather than formal research systems.

Hopefully a progressive rise in fossil fuel prices, the growing threats and uncertainties posed by climate change processes, including incentives to reduce greenhouse gas emissions, concerns over the degradation of scarce farmland and water resources through the use of non-sustainable farming practices, the widening gap between rich and poor, the presence of over a billion hungry people in the world, and another 2 billion malnourished, and so on, will begin to set new directions towards sustainable agricultural intensification on small and large-scale farms that will take full advantage of the many potential benefits that come from more integrated approaches to farming systems and ones that harness and reinforce many of the "ecological" processes that have been so seriously ignored in recent years. But this will require policies that create incentives for innovation that are "in the public good", rather than leave the direction of change in farming to be set largely by corporate interests - a point made very clearly by the International Assessment of Agricultural Knowledge, Science and technology Development http://www.agassessment.org/

Andrew MacMillan

Contribution 45, from Bob Boddey at Embrapa, Brazil

-----Original Message-----
From: bob [mailto:bob@cnpab.embrapa.br]
Sent: Sat 2/6/2010 6:08 PM
To: Crop-Livestock
Cc: Eduardo Campello; Segundo Urquiaga; Bruno; Claudia Pozzi Jantalia; Sérgio Miana de Faria; Alexander Resende
Subject: Contribution for theme 1

I have been traveling this week so I am rather late with my contribution. I hope the moderators will forgive and include this in their first week’s theme. I have only had time to glance at the other contributions

I think I need to divide my comments into two types of farming: The large mechanized operations and the resource-poor farmer.

In Brazil the Integration of Crop Livestock on medium to large size properties in the Cerrado region is advancing with great success. Typically farmer use 4 years of cropping followed by a similar period of planted pasture (mainly Brachiaria spp.). The tradition amongst cattle ranchers in most of Brazil has been to take advantage of

nutrients in ash from burning off native vegetation (deforestation) or one or two years of cropping where fertilizers are added. BUT it is very unusual for ranchers to apply fertilizers to their pastures and this has resulted in huge areas (30 to 40 Mha perhaps) in the Cerrado of degraded pastures. However, Brachiaria is a pasture grass which is extremely productive with modest nutrient inputs and the residual nutrients from a few years of cropping can form very productive pastures. Continuous cropping in the Cerrado with good management under no till seems to maintain soil organic matter (SOM) levels close to the original levels, so from the point of view of the soil resource we can regard the system as sustainable. Some years ago the crops were managed principally with conventional tillage and loss of SOM was apparent but there is some data which suggests that in the 4 years cropping followed by 4 years pasture, the pasture phase allowed recovery of the SOM levels. However, today the system being increasingly adopted is cropping under no-till followed by pasture also implanted with direct drill (no till). These data on SOM levels come from the long term experiment at the Embrapa Cerrado Centre and managed by Lorival Vilela and his colleagues, who have already posted a few comments.

My preoccupation with SOM levels should not be regarded a great interest in carbon credits, but SOM is not being lost, and under good NT ICL systems, SOM levels will almost certainly increase for some years. The increase in SOM means that the soil resource is being used in a sustainable fashion. But these systems rely on chemical fertilization and skilled management. In the Cerrado there are many landowners who have access to the resources and knowledge base and it is almost inevitable if soybean, maize and beef prices remain favorable, that the area under these systems will increase. The impact is incredibly favorable compared to the present land use (misuse) of degraded pastures which are compacted, restrict water infiltration, and in advanced cases the soil is liable to wind or hydric erosion.

A very large proportion of small holders all over the tropics and sub-tropics already use integrated crop/livestock systems. But these systems are rarely sustainable. To preserve the soil resource the replenishment of nutrients removed must come from industrially produced fertilizers. There have been romantic ideas that one can use the dung and urine from cattle to fertilize crops. Of course this is possible, but you need many hectares (10 to 50 depending on the quality of the pasture) of pasture to produce animal wastes sufficient to provide one ha with, for example, sufficient nutrients for a reasonable maize crop.

But while fertilizer alone can help to maintain nutrient reserves, frequent tillage, be it with a hand hoe, or an animal- or a tractor-drawn plough will lead to the eventual reduction in SOM levels, loss of soil structure, lower crops yields etc., and eventually leading to erosion and soil loss. FAO has recognized this in their drive to promote no-till agriculture for small holders in the tropics. Apart from the plough, the great enemies of maintenance of SOM are fire (burning off of residues), or use of residues for fuel, and the consumption of crop residues by livestock. To adopt Conservation Agriculture as FAO defines it, requires the use of no-till and the maintenance of crop residues to protect the soil surface, apart from diversifying crop rotations. The use of fire to clear land for planting is almost universal. The best alternative is herbicide, but many small holders do not have access to this. Furthermore, the tradition is so strong, that a lot of farmer participation in successful trials will be needed for this change of practice. The other major constraint is the almost universal use of crop residues as

fodder. Often the crop residues are of low forage value, but in the absence of other sources, they are the only feed available. It is here that one of our teams at Embrapa Agrobiologia has a suggestion. We have a strong team here who work on using fast-growing legume trees to recover degraded areas. The use of these tree seedling which are inoculated with both selected rhizobium and endo mycorrhzal fungi allows there vigorous growth in totally degraded soils. Many smallholders will have areas (often sloping) which are useless for cropping or pasture as they are degraded or even eroded. These areas can be used to grow these trees. Many species provide forage, and also firewood and some species can be planted as live fence posts. I think this contributes towards an answer to the first question posted by the Moderators (Contribution 30).

"Some of the most interesting new approaches to the on-farm integration are the intensified systems emerging in Brazil where Conservation Agriculture (minimum soil disturbance with crop residues left on the soil surface, plus crop rotations) is being linked to livestock production systems as pastures are sown and incorporated as part of the rotation. The biology of what is being learned and applied in Brazil could be applied to smallholders in Africa and elsewhere, but there are issues of controlling the grazing of livestock in the smallholders systems. "What solutions are being found to protect some of the crop residues? Is living fence a good option? Is applying alley cropping and/or using wire- or tree-fencing the perimeter an option? How can one optimize the management?"

I think there is great potential for these trees to help provide solutions to the factors limiting adoption of CA by smallholders. It should be emphasized that we are not talking about any trees, they must be fast-growing legumes and they must be inoculated at least with rhizobium (the team has strains for over 20 species). However, a great deal of work is required in the field to look at the barriers to adoption and the acceptance by farmers of such a technology. I will be posting more information on these trees on our website http://www.cnpab.embrapa.br/pesquisas/cycling.html. There is already an article on the use of these trees to recover degraded areas: http://www.cnpab.embrapa.br/pesquisas/fast-growing-legumes3.html

Bob Boddey, Nutrient Cycling group, Embrapa Agrobiologia,
(bob@cnpab.embrapa.br)

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Robert M. Boddey,
Research Scientist,
Embrapa Agrobiologia,
Km 47, Caixa Postal 75.505,
Seropédica, 23890-000,
Rio de Janeiro,
Brazil.

Phone (Work) +55-21-3441-1568
Phone (Home) +55-21-2682-1427
Fax +55-21-2682-1230
Cell Phone: 21-8703-1411

Contribution 46, from Martin Entz in Manitoba, Canada

-----Original Message-----
From: Martin Entz [mailto:mentz@cc.umanitoba.ca]
Sent: Sat 2/6/2010 6:48 PM
To: Crop-Livestock
Subject: Crop-livestock integration

Dear Colleagues,

While I did not have the chance to provide input into the crop-livestock discussion, I very much appreciated reading what others had to say. This was an amazing opportunity to learn from others.

For me, one of the important themes was to not only have integrated production systems, but also integrated thinking - something that has suffered due to our hyperspecialization (in Canada anyway).

Best wishes and thank you

Martin Entz

Dr. Martin H. Entz
Professor of Agronomy and Cropping Systems
Department of Plant Science
University of Manitoba
Winnipeg Canada

visit my website: http://www.umanitoba.ca/outreach/naturalagriculture/

Contribution 47A, from Roberto Peiretti at APPRASID, Argentina

-----Original Message-----
From: Ing. Agr. Roberto A. Peiretti [mailto:sdrob@idi.com.ar]
Sent: Sat 2/6/2010 6:49 PM
To: Crop-Livestock
Cc: Crop-Livestock-L@mailserv.fao.org
Subject: Forestry and Crops-Cattle Grazing and cereal crops in commercial large scale agriculture

Dear Amir:

Just at the end of week 1 period, I am sending some pictures of good examples of agroecosystems parcelized allocation according to its production capacity (grazing on the bottom land and crops at the better soils).

Both activities are perfectly integrated and maximizing the efficiency of use of the available resources not only from the agroecological standpoint if not also from the economic standpoint. Crops are been developed under the No Till and MOSHPPA principles as well as pastures improved by No Tilling into the natural sod of the bottom lands.

Most of these pictures are from my friend and colleague Gabriel Carballal from AUSID Uruguay (Uruguayan No Till farmers association).

I will divide in three emails to avoid them to be electronically heavy. You can resend whichever of them you feel appropriate to illustrate the ideas and principles stated on my first contribution of this week.

This first are containing pictures of integration of forestry with cereals and grazing into the forestry area (cattle is not seen on this pictures but they are down there). Cereals and or oilseed crops like soy in the best lands, improved pastures on the lowlands and forestry in the low agricultural quality lands. All of them for large scale commercial agriculture in this case.

The second mail will contain examples of small mostly subsistence farming operations of Northern Argentina and Paraguay

The third one will contain a short power point with examples of the advances of intercropping we are developing in Argentina in the central pampas area.

Regards

Roberto
AAPRESID
CAAPAS

Contribution 47B, from Roberto Peiretti at APPRASID, Argentina

-----Original Message-----
From: Ing. Agr. Roberto A. Peiretti [mailto:sdrob@idi.com.ar]
Sent: Sat 2/6/2010 6:55 PM
To: Crop-Livestock
Cc: Crop-Livestock-L@mailserv.fao.org
Subject: Small Farmers Examples of intercropping alley crops etc.

Dear Amir:

Here is the second mail.

Mandioca: This picture shows the No Tilled Cassava in Paraguay as an alley crop

Mucuna: This picture shows the intercropping of a legume into corn

Naranja poroto shows the alley crop of beans into orange plantation.

Regards

Roberto
AAPRESID
CAAPAS

Contribution 47C, from Roberto Peiretti at APPRESID, Argentina

-----Original Message-----
From: Ing. Agr. Roberto A. Peiretti [mailto:sdrob@idi.com.ar]
Sent: Sat 2/6/2010 7:12 PM
To: Crop-Livestock
Cc: Crop-Livestock-L@mailserv.fao.org
Subject: Intercropping in the Argentinean Humid Pampas

Dear Amir:

This is the last mail. It carries attached a short powerpoint showing the intercropping in ARGENTINA.

Regards

Roberto
AAPRESID
CAAPAS

Contribution 48, from Ricardo Ralisch at Londrina University, Brazil

-----Original Message-----
From: ricardo ralisch [mailto:ricardoralisch@gmail.com]
Sent: Sat 2/6/2010 9:24 PM
To: Crop-Livestock
Cc: Crop-Livestock-L@mailserv.fao.org
Subject: Re: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

Hi Friends,

Through the contributions we have seen the importance of this subject: Crop-livestock integration

My contribution will explore some points:

1- In tropical conditions it is possible to make money from the crop-livestock integration (CLI) with cover crops or inter crops;

2- In several climatically hard conditions, mainly with a dry season or wet and hot season, the best alternative to have a permanent cover crop is with live plants, instead of straw which is a good alternative for mild climates.

3- Live plant cover means roots which increases SOM (see Bob Boddey contribution n. 45), recycles nutrients, recovers soil structure and feeds the soil biological life.

4- The CLI induces the diversification of roots (again), micro, meso and macro fauna and flora, crops and plants, agricultural activity and output (which would mean more profit).

5- The CLI is a real way to agricultural sustainability.

In our studies, we have seen that this kind of roots effects to "plow" the soils are much better than to do it with machines; and with a good root distribution (and with cover crops), which is a central feature of the Conservation Agriculture, it is possible to reduce the negative soil impacts on agriculture.

For this reasons in some climatic and weather conditions, the CLI is best known solution for sustainable intensification.

Congratulations to all.

Regards,

Ricardo Ralisch
Universidade Estadual de Londrina
Agricultural mechanization; Farm system impacts; No-Till
Londrina city, Brazil

Contribution 49, from Ken Giller at Wageningen University, The Netherlands

-----Original Message-----
From: Ken Giller [mailto:ken.giller@gmail.com]
Sent: Sun 2/7/2010 11:06 AM
To: Crop-Livestock
Subject: Welcome to Week 1 (February 1-5) of the e-consultation on Integrated Crop-Livestock System for Development

Dear All,

I'd also like to thank the Moderators for a very educative and insightful week of contributions. There is a rich contribution of new technical and ecological approaches, and I hope that someone will take the time to summarise and bring together the contributions. I was pleased that some of the recent contributions (Bob Boddey, Frank Place etc) have raised the issues of resource constraints among smallholders for whom there are several competing goals and uses for crop residues in mixed crop-livestock systems, and where trees and herbaceous forages can play an important role. The

prioritization of crop residues for livestock feed was one of the main issues we raised in a recent review of the potential for conservation agriculture for smallholders in Africa (Giller et al., 2009) that raised considerable debate.

When we consider development pathways for smallholders, livestock can play a key role. My colleague Henk Udo in Wageningen and others refer to this as the 'livestock ladder' (see Udo et al, 2007) where incremental steps in a development pathway could be seen from chickens to small ruminants to cattle. We analyse a similar idea in the attached paper on smallholder crop-livestock systems in Western Kenya which I attach.

Thanks again for the stimulating debate and I look forward to the second week of interaction.

With best wishes to all,

Ken

Ken Giller
Professor - Plant Production Systems,
Wageningen University, P.O. Box 430
6700 AK Wageningen, The Netherlands
Street address: Building 107,
Droevendaalsesteeg 1,
6708 PB Wageningen
Tel: +31 317 485818
Fax: +31 317 484892
E-mail: ken.giller@wur.nl

Websites http://www.africanuances.nl/
http://www.seamless-ip.org/
http://www.competingclaims.nl/
http://www.pps.wur.nl/uk