Jump-starting smallholder farmer participation in markets:
Forage-based animal feeds for on-farm pork and poultry production and the feed industry

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Challenge

Women and children, who often tend animals, rarely benefit from a growing market demand for livestock products. Smallholder farmers typically produce pork and poultry for home consumption. Despite these monogastric animals accounting for 76% of the meat consumption increase in developing countries (Delgado, et al., 2001; Bruinsma, 2003), large-scale operations dominate the market. Such trends are anticipated to continue with smallholder livestock production being further marginalized (Allen, 2003; Upton, 2004).

Purchased animal feeds could enable farmers to expand poultry and swine production, however, household funds are typically insufficient, or feed is expensive, distant, or simply unavailable. Moreover, smallholder farmers rarely have the market information and experience required to negotiate and obtain fair prices for their products.

Opportunity

Research and development efforts by CIAT and partners have demonstrated that forage legumes can be produced in a wide range of market and farm conditions. Both grains and leaves can be processed for use in feed rations that provide essential protein, energy, minerals, vitamins and pigments required by monogastric animals.

In addition, many legumes grow well in areas prone to drought and low soil fertility where the majority of resource-poor farmers live. Forage legumes are of particular interest as they fix nitrogen, thereby contributing to system sustainability (Schultze-Kraft and Peters, 1997; Shelton, et al. 2005).

Which forage and how?

Research has identified key factors that affect the use and marketing of forages:

1.Nutritive quality of forages

2.Convenient on-farm management and financial viability

3.Post-harvest organizational requirements to engage with the private sector

Table 1 presents some forage materials with high potential for monogastric feeding, illustrating key characteristic in comparison with traditionally used feeds.

Table 1. Forage characteristics (nutritive and farm management)

	Feed/Nutrition Characteristic							Management and Production							Post-Harvest			
	Forage: grain-root-tuber/Leaf	*In vitro* digestibility	Protein and amino acids	Energy	Anti-nutritive compounds	Voluntary intake	Annual/ Perennial *	Drought tolerance	Adapted to low fertility soil	Time to plant maturity	Months harvest : grain/leaf	Yield: Grain	Yield: Leaf	Leaf loss (rot, drop)	Continuity of production	Potential mechanize harvest	Heat treatment (grain)	Grinding & cutting
Maize	G/L						A				5/4							
Cassava	R/l						A/p				6?	n/a						
Sweet Potato	T/l						A				4?	n/a						
Soy	G/h		+				A				5/-							
Vigna unguiculata	G/L		+				A				3/2							
Mucuna pruriens	g/L						A				5/4					?		
Lablab purpureus	g/L						A/p				5/4						?	
Cratylia argentea	L						P				-/2	n/a					n/a	
Desmodium velutinum	L						P				-/2	n/a					n/a	
Centrosema pascuorum	L						A				-/4	n/a					n/a	
Stylosanthes guianensis	L						P				-/4	n/a				?	n/a	
Centrosema molle	L						P				-/4	n/a				?	n/a	
Morus alba	L						P				-/	n/a		?	*	?	n/a	
Arachis pintoi	L						P				-/5	n/a			*	?	n/a	n/a
Cajanus cajan	G/L						A/p				6/5							
Clitoria ternatea	L						P				-/4	n/a					n/a	
Trichanthera gigantea	L						P				-/3	n/a					n/a	
Centrosema brasilianum	L						P				-/4							
Canavalia brasiliensis	g/L				?	?	A/p				-/4						n/a	

Legend

	superior/preferable
	medium/acceptable/required
	inferior/undesirable

Column notes

Upper-case letter = primary use/product
Lower-case letter = secondary use/product
+/- = High amino acid quality / Deficiencies in amino acids
? = unknown
n/a = not applicable

Vision of success

To address the diverse production and market contexts of smallholder farmers, the project distinguishes three end-uses of the forage legumes:

1. On-farm use: Farmers grow high-protein legumes for feeding poultry and pigs, thereby enhancing production for household consumption and local market sales. Less-wealthy smallholders can raise smaller animals because (a) the animals have low investment costs, and (2) feed purchases will no longer jeopardize household cash flows. Smallholder livestock holders become livestock producers, i.e., move from subsistence to market-oriented production.

2. Forages for local sale: Smallholder farmers produce and sell legume-based high-protein feeds to neighboring farmers or in local markets. Since farmers may cultivate forage legumes even if they have no animals, this option also benefits farmers with few available resources.

3. Sales to the feed industry: Farmers produce legume grains and leaf meals at a quantity and quality required to compete with imported feed ingredients such as soybean meal. Training enhances organization and business skills so that farmers negotiate fair contracts with feed companies.

Important financial, technical, and organizational considerations increase with market involvement (Table 2).

Table 2. Considerations for legume introduction, use and commercialization

Financial and technical	Organizational
<u>On-farm production and use</u> Quality - with respect to other feeds Quantity - continuity of supply Competition from other feed sources Price & availability (local market) Compatibility with farm assets and management strategy Costs: Production and establishment Transportation Cash flow: expenditures and income Seasonal labor requirements Required treatments (e.g. heating, cutting)	Membership in farmer organization (access to new technologies and/or extension services)
<u>Small-scale farmer enterprises</u> *The above considerations plus:* Quality- grades and standards Quantity - continuity of supply, minimum supply Small-scale enterprise establishment and management Banking and legal arrangements	Experience in: Farmer enterprise Contract farming Marketing Management of cooperatives and associates
<u>Industry-linked production and sales</u> *The above considerations plus:* Efficiencies of Scale	Experience in: Negotiation

Research for development process

The approach emphasizes the co-development with farmers and project partners of forage-based technologies and markets. To ensure the sustainability of outcomes, participants will co-analyze suitable forage legumes, co-develop competitive feed mixtures, and co-identify effective organizational structures and procedures for product marketing.

The principles of farmers producing forages for monogastrics and the feed industry are applicable in many rural contexts (Latin America, Asia and Africa).

Building on past success

In Central America, the approach of co-researching with farmers has proved effective in technology adoption (CIAT, 2004). Collaborative research can be considered slow at first, but participation rapidly grows and endures with the proof of concept. At the end of the proposed project, approximately 300 farmers are expected to be participating. Within six years, 5000 farmers will likely increase their feed and animal production.

Bottom-line

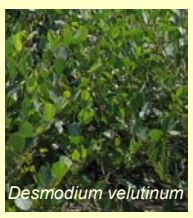
Coordinated investments in research, policy and development efforts are needed to enable smallholder farmers to competitively participate in feed and animal product markets.


Vigna unguiculata (Cowpea)


Canavalia brasiliensis


Stylosanthes guianensis


Lablab purpureus


Desmodium velutinum


Centrosema molle