Scaling-Up Goat Based Interventions to Benefit the Poor:

A Report by the International Goat Association based on the IGA/IFAD Knowledge Harvesting Project, 2011-2012

Written by Beth A. Miller, Jean-Paul Dubeuf, Jean-Marie Luginbuhl, and Juan Capote

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1. Executive Summary

Goats have been part of rural livelihoods for millennia, and have been instrumental in poverty reduction in resource poor areas. They thrive in nearly all ecosystems, including harsh, frigid and arid ones and can be handled easily. Since goats require less space and feed than cattle, they can be owned even by the landless. They are integrated into complex livelihood systems, and are "multifunctional" by providing milk, meat, manure, cash, savings and status, and often have social or religious uses. The poor are more likely to own goats than cattle, so support for goat-keeping can be a valuable entry point into poor communities to end poverty and hunger.

The "Knowledge Harvesting Project on Goats" by IGA/IFAD from 2011-2012 systematically investigated the suitability of goat value chains for lifting people out of poverty and improving food security. The dairy, meat and fiber value chains for goats all demonstrate significant return on investment, even for producers with limited initial assets, provided that technical training, community organization, supportive policies, and gender and social equality are addressed. The lessons learned support scaling-up goat investments, and provide useful guidelines for the process.

Goat projects can advance all eight Millennium Development Goals, especially the eradication of extreme poverty and hunger, since even the very poor can own goats. Also, goat ownership can help empower women, and the goat project is a good opportunity to build men's support for increased opportunities for their wives and daughters in commercial goat production.

Goats have been overlooked in national agriculture strategies and by donors, but this is now changing. Government planners have associated goats with "backwardness" and "environmental destruction," yet specific goat interventions may be the exact key to reach the poor who depend on them. Public resources such as rangelands and water need to be managed by the

stakeholders, including the poor and marginalized.

Goat projects must be sustainable and equitable before they can be scaled up to larger programs, which include many projects under a single management entity. Successful goat projects promote the following for poor producers, especially women, ethnic minorities and other marginalized groups.

a) Access to services (training, technology, inputs, health and financial services)

b) Access to and sustainable management of goats and the natural resource base

c) Improved management, inclusiveness and skills of community-based producer organizations

d) Access to markets (for milk, meat and fiber) through strong organizations

e) Pro-poor and pro-women policy changes

Scaling-up goat interventions is used here to mean expanding a proven model to impact more people over a regional, national or global area. The model must be robust enough to build community institutions, and lead to self-management of producer groups who can negotiate along the entire value chain, while allowing for local variation and experiences. Partnerships are essential and there must be selection criteria to ensure common values, standards, and a "theory of change."

Drivers for scaling-up are champions, ideas, catalysts and incentives, models and accountability (Hartmann 2008). IGA and IFAD are long standing champions for goat based development to benefit the poor.

This study reveals many successful solutions for delivering services, increasing production, expanding markets and improving the policy environment for smallholder goat producers. The Venezuela project demonstrates innovative water and land management to provide better goat grazing. In Kenya, farmers with tiny landholdings could raise high producing dairy goats in zero grazing units. Majorera goats from the Canary Islands were selected for high milk production under harsh conditions, and were introduced to Senegal to improve genetics. In Turkey, the collaboration between the Ministries of Agriculture and Forestry will allow pastoralists to gain access to valuable pastures. Paravets or village guides were trained in Kenya, India and Mozambique to provide animal health care in remote areas.

Building strong community organizations around goat production is essential In Tajikistan, women formed groups to add value to cashmere fiber through knitting retail products rather than selling wholesale to processors. In Nepal, small village groups organized into federations to coordinate purchase of inputs and to sell goats in lots to traders. In Mexico, producers organized

a group to take advantage of strong local demand for goat milk in the production of "*dolce de leche"* and to negotiate for better prices and policies.

The "Certification of Geographical Origin" or Designation of Origin (DO increases the value of goat products. In Argentina, the government recognized the Nuequen DO after 5 years of consultations with smallholders and NGOs. In Morocco, meat from goats that graze the Argan trees near Essouria also has a recognized and appreciated flavor, and a certified label of origin will improve marketing. In Turkey there is interest in official designation of origin for its small ruminant cheese produced in pastoralist communities.

Improving the policy environment can help producers to access training, markets and inputs. In Kenya, Farm Africa nurtured good working relations with local politicians, and established contacts with AU-IBAR and the East African Community to support regional coordination and harmonization of animal health regulations. The Government of Argentina passed a "Goat Law" in 2006 which creates space for producers, processors, traders, retailers and regulators to meet and negotiate for mutually beneficial policies, and to ensure access to pasture by farmers. The Government of Brazil uses its national social protection program, "Fome Zero" (No Hunger) to purchase goat milk directly from organized groups of producers in poor and marginal areas, and to process and distribute it to needy families.

The imGoats Project piloted Innovation Platforms for the goat meat value chain in India and Mozambique, which bring together all stakeholders to establish common interests, and remove obstacles to improved trade. The project helped producers organize and demand better prices through economies of scale by selling goats in lots rather than individually.

The case studies all document how profitable goat investments can be in a variety of settings and value chains. Financial data was collected and analyzed for feasibility and likely impact after scaling-up. Annual net income before labor costs without the intervention is around US $100-150 for Kenya, Nepal, India and Tajikistan, where flocks are small and goat production is integrated into diverse livelihood strategies. After the goat intervention, annual net income before labor costs rises to US $240-340 per family in Nepal, India and Tajikistan, and $600 in Kenya.

In Argentina, Brazil, Mexico, Morocco and Venezuela, goat production is the main income generating activity. Net income before labor costs rises from US $1,000 per family to US $2,000-11,500 after the intervention. Interventions in technical training for goat production, group organization, market linkages and policy changes can raise people out of poverty and improve environmental management.

The IGAD/IFAD project provides evidence to support scaling-up goat-based interventions, and identifies appropriate pilots, models and best practices, to help governments and development

actors make good decisions. Pro-poor and pro-women policies and research will help producers realize more benefit from their goat assets, while improved training in small ruminants and smallholder production will improve extension. Scaled up goat projects with rigorous monitoring will allow continuous learning to alleviate poverty and eradicate hunger.

2. Acronyms used

AU-IBAR	Africa Union Interafrican Bureau for Animal Resources
BRAC	Bangladesh Rural Advancement Committee
BMGF	Bill and Melinda Gates Foundation
CAHW	Community Animal Health Worker
CBO	Community-based organization
CoP-PPLP	Community of Practice for Pro-Poor Livestock Policies
DO	Designation of Origin
FAO	Food and Agriculture Organization of the United Nations
FA	Farm Africa
FGD	Focus Group Discussions
GO	Government Organization
HI	Heifer International
MDG	Millennium Development Goals
NGO	Non-governmental organizations
OFDA	Office of Foreign Disaster Assistance
SA-PPLPP	South Asia Pro-Poor Livestock Policy Programme
USAID	United States Agency for International Development

3. Introduction

Goats have been part of rural livelihoods for millennia, and have been instrumental in poverty reduction in resource poor areas. They thrive in nearly all ecosystems, including harsh, cold and arid ones and can be handled easily. Because goats require less space and feed than cattle, they can be owned even by those with little or no land. They are integrated into complex livelihood systems, and are "multifunctional" by providing milk, meat, manure, fiber, hides, cash, savings and status, and often are valued for their social or religious uses.

The "Knowledge Harvesting Project on Goats" by IGA/IFAD from 2011-2012 systematically investigated the suitability of goat value chains for lifting people out of poverty and improving food security. The dairy, meat and fiber value chains for goats demonstrate the likelihood of significant return on investment, even for producers with limited initial assets, as long as the need for technical training, community organization, gender and social equality and a supportive policy environment are addressed. Well-designed development projects using goats advance all eight Millennium Development Goals, and will be important to the post 2015 development agenda to end hunger and malnutrition. The lessons learned from these case studies support scaling-up goat investments, and provide useful guidelines.

The dairy, meat and fiber value chains for goats demonstrate the likelihood of significant return on investment, even for producers with limited initial assets.

Scaling-up is increasingly imperative to impact large numbers of people, and manage scarce development resources efficiently. The challenge for large-scale programs is to maintain focus on the small-scale producers, while managing an increasingly complex group of actors, and facilitating behavior change within institutions as well as on farms. It also requires an increased engagement with government institutions. Good development is community based, which may create conflict if politicians and bureaucrats oppose shifting power to the grassroots if they do not believe that local communities can manage money and projects effectively (Binswanger 2009).

Goats have been overlooked in national and international agriculture strategies and also by donors, but this is now changing. Government planners have associated goats with "backwardness" and "environmental destruction," yet specific goat interventions may be the exact key to reach the poor who depend on them. Public resources such as rangelands and water must be managed by the stakeholders, including the poor and marginalized. Traditional management can be improved while respecting the values and experiences of the local people, using participatory techniques and building on indigenous knowledge. Because goats are often managed by women, they are likewise "invisible," since livestock data are usually collected from male heads of households, who tend to overlook smaller animals kept by women. Livestock experts in government or development agencies may not recognize the existing or potential contributions of goats to livelihoods and food security.

Government planners have associated goats with "backwardness" and "environmental destruction," yet specific goat interventions may be the exact key to reach the poor who depend on them.

Success is empowering men and women to manage their own development and to make choices that lead to desirable outcomes. Raising incomes is a necessary but not sufficient result of a development investment. An underlying cause of poverty often is social exclusion based on ethnicity, gender, and location, which limits accumulation or use of assets, and must be understood and addressed. Goats provide an excellent entry point into marginalized communities because they are valued by the poor. An implementing agency can use them as an incentive to help organize small-scale producers to improve their technical, social and political skills, as well as increase food and income.

Goats can be an especially important tool for empowering women, who are generally disadvantaged compared to the men of their own class and ethnicity. Gender discrimination is a cause of poverty, and deepens existing poverty (Kabeer 2003). Because goats are often undervalued, women may be able to own or manage goats with minimal interference from their menfolk. Although women seldom own land they often independently own small livestock, such as goats in West Africa (Okali 1986). However, men may claim ownership of traditionally women's crops and livestock (and livestock products) when production is commercialized and markets formalized (Njuki and Sanginga 2011) Projects that protect and increase women's use of income have the strongest impacts on child nutrition and welfare (Smith 2003). Because women's time is a constraint on all agricultural activity, labor- and time-saving investments improve outcomes in goat focused projects (Rota 2010).

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Successful and sustainable development takes time. Men and women in transition from subsistence to market economies have a huge and often painful learning curve, as they shift from sharing or bartering assets and using social capital, to exchanging money for goods and services. Many institutions necessary for successful development, such as government entities, community based organizations and the private sector do not yet have pro-poor or pro-women orientation or policies. Adequate time and incentives are needed to encourage the cultural and behavioral changes for individuals and institutions to adapt and work together. Scaling-up is a long haul process, taking over five to 10 years to develop transparent and accountable organizations that can institutionalize the successful results achieved through pilots (UNDP 2013). Investments in institutional reform are essential for sustainable impact.

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Existing value chains usually favor the better off who tend to be better organized, so a key objective for goat projects must be the development of strong farmer organizations as well as pro-poor and pro-women policies regarding markets, sanitary standards, taxes, financial and non-financial incentives and enforcement. Farmer organizations need the political skills to develop allies and supporters, and the space to meet with and influence policy makers, with evidence to support their positions.

4. Background

Livestock development historically has had a cattle bias, and has been poorly coordinated with crops, human nutrition, poverty reduction or sound environmental management (Steinfeld 2006), but this scenario is starting to change. Goats are more important to the poor than larger animals, so they can have a greater impact on reducing poverty. In rural areas, there is a high correlation between the ownership of goats and poverty. Goats are found in the drier, more fragile and less-favored environments, which have a high incidence of poverty (Devendra 2013). Goat rearing is also characterized by a greater involvement of women (SA-PPLPP 2014) compared to cattle, but this can change as the activity becomes more profitable. Poorer households which have fewer cattle are more dependent on small ruminants than their wealthier neighbors, making diseases and losses of them relatively more costly and potentially devastating (Perry 2009).

Cattle continue to receive the bulk of research and development funding for livestock. In 2002, ILRI expended over 80% of its resources at research targeted at cattle and less than 20% at other species. As goats are relatively more important to the livelihoods of the rural poor, investments in goat health, productivity and sales can have greater impact on poverty alleviation (ILRI 2002).

As goats are relatively more important to the livelihoods of the rural poor [compared to cattle], investments in goat health, productivity and sales can have greater impact on poverty alleviation (ILRI 2002).

In the countries of the Southern African Development Community (SADC), cattle numbers have remained constant during the last 20 years, but goat numbers are steadily increasing because of their high reproductive rate, adaptability to various habitats and their relatively low production cost compared to cattle. Goat populations recover more quickly after population crashes and households are able to rebuild goat herds faster than cattle herds. Climate change and its associated economic instability exacerbate the vulnerability of the poor, so investments that increase the value of their goat assets increase their resilience to shocks.

Restocking programs after natural or political disasters have distributed goats because of their lower cost and rapid reproduction. Humanitarian organizations have funded goat projects to improve household nutrition. Research institutions have tested new breeds or nutritional interventions, which often show improved production under controlled conditions. Nevertheless, funding to learn the long-term impact, including social and environmental effects, has not been available for these piecemeal goat projects.

The 2011-2012 IGA/IFAD Knowledge Harvesting study examined a significant number of projects implemented by many types of organizations. Non-governmental humanitarian agencies such as Farm Africa in Kenya and Heifer International in Nepal led partnerships with local governments and NGOs. Partnerships between public authorities, local NGOs, research institutions and goat producer associations are seen in the case studies from Tajikistan, Morocco, Argentina, Brazil, Venezuela, Mexico, Senegal, India and Turkey.

4.1. *What makes a good goat project?*

Projects must be sustainable and equitable before they can be scaled up to larger programs. A program is defined here as many projects under a single management entity with common accountability standards but local flexibility. Successful projects using goats share the same characteristics as any other good project: adequate planning, monitoring and evaluation that enables learning by the people impacted and the organization(s) implementing it. Although the need for these features is well documented, they are not always found, either from inadequate funding, lack of time or skill by planners, or a narrow focus on production.

These case studies demonstrate that pro-poor and pro-women goat projects need to promote the following:

- Access to services such as training, technology, inputs, health and financial services
- Access to and sustainable management of livestock and natural resources
- Improved management, inclusiveness and skills of community-based producer organizations
- Access to markets through strong organizations
- Pro-poor and pro-women policy changes

Strategies built on understanding attitudes and behaviors of the men and women operating throughout the value chains will enhance success. It is especially important that biases about women and ethnic minorities are recognized and addressed so they can participate and benefit from all project interventions.

The livestock sector in general, and the goat sub-sector in particular, is often isolated from other development partners, making market development for smallholders difficult. There has been little interest in policy until very recently. Historically, goat projects tended to focus on the technical aspects of production to the exclusion of social, political or food security elements, but technology-centric solutions alone are inadequate to solving the problems of the poor (Dijkman 2009) (FAO 2009). Technical training on feeding, breeding, health and management of goats is necessary but not sufficient for success.

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Goat production is rarely the only livelihood activity of poor men and women, so the larger context from the farming system to global economy will affect the project. Preplanning data include the economic, social and political environment so priorities and potential bottlenecks are clear. The key lesson from all successful goat projects is to understand the people participating, and to invest in their capacity to make decisions, as well as introducing technical interventions with the goats.

4.2. *Project Planning Tools*

There are many good tools for community based livestock project management which integrate local issues with regional or national trends. The Goat Value Chain Toolkit was developed through the IGA/IFAD project as a resource for ensuring adequate attention to all nodes along the chain, and to maximize benefits to small-scale producers. Highly detailed tools such as Sustainable Livelihoods Models may be too cumbersome for each small project, but a large-scale program justifies a significant investment in understanding the farming systems, cultural norms and variations of attitudes and behavior, and the external policy and trade environment. There is always a balance between gathering useful data, and practical use of time, but a minimum pre-planning report should include poverty incidence and education across ethnicity, age and gender lines, as well as livelihoods strategies, transport and infrastructure, and the policy environment. Social status of women and men can be estimated from data such as age at first marriage (UNDP 2013), ratio of men to women in leadership in producer groups and government, and analysis of ownership and decision-making within the family. The underlying cause of poverty must be examined so that existing social bias can be addressed, or the projects may reinforce existing inequality. Plans need to be adapted to the particularities of each community, but background data on public policies, markets or behaviors must inform each local plan.

The Nepal case study on meat goats used many methods of data collection throughout the val-

ue chain, including household surveys, key informant surveys, focus group discussions (FGD), stakeholder meetings and workshops, direct observation and checklist surveys from farmers groups, traders, meat retailers and consumers. This combination of quantitative and qualitative information is called Q Squared or Q2, and is essential for meaningful interpretation of data (Behrman, et al. 2012)

Data collection to inform planning can start with United Nations, World Bank and national databases and literature reviews on poverty, education and livestock markets, and confirmed or updated with site visits and interviews. The imGoats/India project relied on outdated poverty maps, so many of the participants were not especially poor by local standards. Therefore, focus group discussions as well as interviews with other NGOs or agencies in the area can help understand the local situation (Maarse 2013).

The focus groups with men and women are an especially important way to understand how ideas such as "own" or "decide" are understood in local settings, to avoid mistaken assumptions about behavior and motivations (Hillenbrand 2012). For example, in Bangladesh, men and women agreed that household decisions should be made jointly by husbands and wives together. When asked if they would respect their wives' opinions if they were different from theirs, however, most husbands said no. Therefore, decision-making was called "joint" but in reality the wife was expected to agree with her husband's decision (HKI 2011).

4.3. *Accountability*

Accountability systems ensure that money is spent as planned (outputs) and that impact is assessed and improved (outcomes), with good communication and coordination between producers, processors, consumers, policy makers and donors. Self-monitoring by the community means that data will be used where they are most needed. Monitoring is required to ensure that poor women and men benefit from the goat projects so that the better off do not capture all of the benefits (Pretty 2008).

Evaluations during a project should enable adjustments to the implementation plan, by addressing unexpected obstacles. Donors demand evaluations to know that their money has had the desired impact, but the most valuable use is for communities to learn about themselves. Unfortunately most evaluations are sent to the funder, and not used by the implementer or the community. Both the Heifer and Farm Africa teach communities to manage their projects and resources, which include a culture of deliberate evaluation and self-improvement.

Governmental institutions such as extension services may be threatened by evaluations, and staff may feel pressure to falsify results to keep their jobs or funding. Institutional cultures which punish poor performance rather than seek solutions need meaningful reform starting from the top. There can be a long learning curve for conservative institutions to reward risk-taking and innovation rather than obedience.

5. Scaling-up: drivers and spaces

Scaling-up goat interventions is used here to mean expanding a proven model to impact more people over a regional or national area. The model must be robust enough to build community institutions, and lead to self-management by producer groups who can negotiate along the entire value chain, while allowing for local variation and experiences. Partnerships are essential and there must be selection criteria to ensure common values, standards, and a "theory of change." If local livestock oriented partners do not have the capacity to guide the communities through institution building, environmental management or gender equality, additional training and policies may be needed, or additional partners recruited.

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Hartman and Linn's analytic model for scaling-up is useful for the goat sector. They note that a large-scale program can reach more people with better impact than scattered projects where each discovers the steps for success. Furthermore, institutional reforms must be implemented across sectors, and scaled up initiatives require cross-sectoral linkages. Institutional reforms, such as training, transport and incentives for extension staff will have long-term benefits (Hartman and Linn 2008).

Scaling-up is a political process, and political support is necessary from the beginning. Empowering the poor to organize and demand services or transparency may antagonize those who benefit from the status quo. Powerful interests may try to appropriate the money or resources or new organizations. Development is about changing behavior among individuals and institutions alike, and resistance must be anticipated and planned for (ARD 2012).

5.1. Drivers

Drivers for scaling-up are champions, ideas, catalysts, and incentives (Hartman and Linn 2008). Champions are influential, respected and persistent individuals or groups, who are at the table with decision makers and willing to remind them about the ultimate goal.

The International Goat Association (IGA) has been the global champion for using goats to benefit humankind since 1982. Through its network of scientists, development practitioners, and the private sector, IGA has been an advocate for goats in development, and also a network for sharing evidence to inform policies, project designs and markets. Member institutions such as Farm Africa and Heifer International have international visibility to highlight the benefits of goats to

the poor, and all members can share successful innovations with each other. IGA is organized through Regional and Country directors, ensuring communication across the globe on all goat related topics. Respected leaders such as Warren Foote, Jean Boyazoglu, David Sherman, Christie Peacock, Rosalee Sinn and Adel Abul Naga have insisted that goats be included in the development agenda despite initial resistance.

IFAD has been a champion of goat-based development through support for goat projects on the ground, and the process of learning from them. This Knowledge Harvesting report promotes increased use of goats to reach very poor farmers as part of integrated development interventions.

5.1.1. Ideas

The goat case studies reveal a multitude of ideas for sustainable pro-poor livestock models, including natural resource management, production services, producer organizations, markets, and policies.

a. **Access to and sustainable management of livestock and natural resources, especially land and water.**

The Venezuela case in the semi-arid northwestern states of Lara and Falcon demonstrates innovative water and land management initiatives to improve goat nutrition. The pilot project invested in water catchments for forage production, which allowed producers to raise fewer numbers of higher producing animals in confinement, protecting the environment from overgrazing. In Kenya, land holding and crop production had been decreasing, so raising dairy goats in zero grazing units permitted those with very small plots of land to participate, while increasing soil fertility through manure fertilization.

Forestry officials are often hostile to goat production, and may restrict goat grazing in public land or forests. Several of the case studies showcase improved relations between Forestry Departments and goat producers, resulting in both environmental protection and improved goat nutrition. In Rajasthan, India, restricting entry of animals into forest areas was common. Now livestock keepers are allowed to lop and take home specific quantities of fodder to keep their goats fed. The case study from Turkey describes the new collaboration between the Ministries of Agriculture and Forestry, after decades of Forestry's efforts to eliminate goat keeping in forests. The increase in forest fires made officials aware of the value of pastoralist goat management, so the new government goat project includes technical support to work with pastoralists to improve their goat production.

The increase in forest fires made officials aware of the value of pastoralist goat management, in Turkey.

b. **Access to services (training, technology, inputs, health and credit)**

Improved technology can include improved genetics, varieties of forage or management systems like zero grazing. The Senegal case study describes the introduction of purebred Majorera goats from the Canarian island of Fuerteventura, which has a similar climate. The Majorera goats have been selected for high milk production but are hardy enough to thrive under Senegalese conditions. The research component compares the performance of the Canarian goats with the local goats under same conditions. Majorera goats were also distributed to local Fulani women's groups to increase their income generation from milk sales.

Farm Africa trains Community Animal Health Workers (CAHWs) to deliver animal health care in isolated rural areas in Kenya, unserved by veterinarians. It also developed a private sector model called "Sidai," which franchises animal health supplies and extension services (Sidai 2014).

Good ideas are often proposed by the farmers themselves. In India, GALVmed's Newcastle Disease Control Project [for poultry] supported Community Animal Health workers (CAHWs) to deworm and vaccinate poultry against Newcastle Disease in Odisha (formally Orissa) state. The women who raised the poultry also raised goats, and asked for goat health treatments and husbandry advice. The CAWHs then received training in both species by the NGO partners. Additional surveys across India and Africa revealed that most rural women who raise poultry also raise goats, yet government extension is not interested in either. Therefore, training women in both poultry and goat keeping improved their food security, and also raised incomes for the CAHWs, increasing the sustainability of the interventions (GALVmed 2012).

The government of China is actively supporting dairy goat development in Fuping County of Shaanxi Province with funding for research, genetics and scaling-up the size of individual farms (Schoenian 2009). Public investments in extension, milking machines and processing have been implemented.

c. **Access to markets, by supporting producer organizations and their integration into the value chain.**

The Nepal case study describes the transformation of many small self-help groups into multi-purpose cooperatives with hubs for live goat buyers. Women are required to be the representative of each participating family, to build recognition for women's importance in home-based ag-

riculture. The cooperatives can purchase inputs such as feed and medicine in bulk, and make them available for members, even in remote areas. These cooperatives are organized into larger producer federations, to achieve more influence in policy and market development.

In Tajikistan, the outdated government pricing system pays more for lower quality fiber. In response, women formed mohair goat producer groups, and then began to add value to cashmere fiber through knitting retail products rather than selling wholesale to processors. They are also developing their skills to lobby for government change in pricing and access to rangeland.

"Certification of Geographical Origin" or "Designation of Origin" (DO) is used in three of the case studies to increase the value of goat products and expand markets. In Argentina, the government recognized the Neuquén DO after 5 years of consultations with smallholders of North Neuquén Province, who raise the Neuquén Criollo Goat. The summer grazing area in the high altitudes of the Northern Range of Neuquén gives the kid meat a distinctive flavor that commands a premium price (Lanari 2009). It is now marketed successfully as Neuquén Chevito, in the nearby tourist region of Los Lagos. In Morocco, meat from goats that graze the Argan trees near Essouria also has a recognized and appreciated flavor. The producer organization "Association Nationale Ovine et Caprine" (ANOC) is working towards a certified label of origin, which will improve their marketing. In Turkey, producers are interested in official designation of origin for their small ruminant cheeses produced in pastoralist communities.

d. Pro-poor policy change and producer organizations

The imGoats Project piloted Innovation Platforms (IPs) for the goat meat value chain in India and Mozambique. An Innovation Platform creates space to bring together all stakeholders to establish common interests, and remove obstacles to improved trade (van Rooyen 2009). The project helped producers organize and demand better prices through economies of scale by selling goats in lots rather than individually.

The imGoats Rajasthan (India) case study demonstrates the improved interactions between the local, state and national officials and stake holders, as a result of the Innovation Platform. Policy issues include the ongoing shortages of veterinarians and vaccines, which are supposed to be provided by the government. The project trained community "field guides," which function as paravets, and as village promoters and representatives to the IPs.

Government policy can be an obstacle to successful goat keeping, but in Argentina and Brazil, laws to protect and promote goat production have been developed which are practical models for other countries. The Government of Argentina passed a "Goat Law" in 2006 which creates space for producers, processors, traders, retailers and regulators to meet and negotiate for mutually beneficial policies, and to ensure access to pasture by farmers.

In Argentina and Brazil, laws to protect and promote goat production have been developed which are practical models for other countries.

The Government of Brazil uses its national social protection program, "Fome Zero" (No Hunger) to purchase goat milk directly from organized groups of producers in poor and marginal areas, and to process and distribute it to needy families. Not only does this secure a market for the present, it introduces a new generation to goat milk, creating demand in the future (GoB 2014).

The Kenya case demonstrated the commercialization of goat milk markets, and addressed policy obstacles through good working relations with local politicians. Farm Africa worked with the African Union's Inter African Bureau of Animal Resources (AU-IBAR) and the East African Community to support regional coordination and harmonization of animal health regulations on goat vaccines, medicines and laboratory testing.

There are many other creative and useful ideas for including goats in development projects. Goat production is rarely the only livelihood activity in any farming system, so successful projects can build on other valued interventions in the community. The Helen Keller Institute (HKI) in Bangladesh developed its homestead food production (HFP) program initially through home gardens and nutrition education. A goat component was added to improve nutrition through animal source foods (ASF) and provide cash through sales. The model was so successful that is has been scaled up throughout Bangladesh, as well as Asia and Sub-Saharan Africa (Iannotti 2009).

Many successful projects build on the complementarity of goat and crop production. In Nigeria, a pilot project introduced simple new technology for transforming cassava waste into goat feed, increased the growth rate and health of the goats, and helping to commercialize production (Fuller 2011). In Tanzania, ILRI is developing a goat-cassava-sweet potato extension package in which improved goats are fed by-products of new varieties of cassava and sweet potatoes, and goat manure is used to fertilize the crops (Saghir, et al. 2012).

"One Health" approaches human and animal health as intrinsically linked, and needing improved coordination. The "ROSA" project in Morocco began by training women in remote areas in improved care for both children and goat kids through good sanitation, nutrition, appropriate vaccination and early treatment for respiratory infections and diarrhea. Because women in the conservative rural Ouarzazate province cannot travel far, or interact easily with men, the goat experts (all women) come to the village or even the home to provide advice. ROSA has grown into a women's cooperative for small scale livestock production. It is so successful that it receives more requests than the female livestock extension agents, all volunteers, can handle (Kanoubi 2012).

5.1.2. Ideas become models through testing and refinement

The IGA/IFAD study identified several programs with standardized processes to ensure quality, while maintaining a community focus. Models suitable for scaling-up shift the focus from technology to the institutions that deliver and support the goat innovations (farmer organization, service provision, and markets).

The Heifer International Model was developed in the 1990's based on 50 years of grassroots livestock development, and uses livestock "loans" as a tool for community development (Aaker 2007). Farmers must attend training and join a community group to receive one or several goats "on loan," which are "paid back" by giving offspring to new members of the group. Heifer uses "appreciative inquiry" to build on the strengths and culture of the community, rather than focusing exclusively on needs or deficits. The Farm Africa Model for Dairy Goats develops local capacity to coordinate and extend services (veterinary care, breed improvement and inputs) through farmer organizations and private service providers (Peacock 2007), avoiding dependency on government services.

Models suitable for scaling-up shift the focus from technology to the institutions that deliver and support the goat innovations (farmer organization, service provision, and markets).

Models cannot be mistaken for blueprints, so adjustments must be made for new situations, reporting needs and communication. Strong community development requires trained facilitators, who in turn can train local animators or leaders. This "social capital" is often overlooked in both budgeting and cost benefit analysis, especially in the short term. However, long term impact requires strong community organizations, so goat investments that omit building institutional capacity run a higher risk of failure. Often local NGO's can provide training and backstopping, but it cannot be learned from a book, and requires resources and monitoring.

5.1.3. Catalysts and Incentives

External and internal catalysts can drive farmers to try new ideas, while a robust monitoring and evaluation (M&E) system encourages learning from experience. External catalysts can be human and environmental pressures, such as population growth, competition for land and water, degradation of natural resources, decline of farm size, climate change, and natural and human-based disasters. Increased demand from urbanization and rising incomes can inspire innovation for improved quantity and quality in production, and sound environmental management.

Natural and human disasters drive demand for goats, which reproduce faster and are hardier than cattle. The best goat restocking projects work with established groups that select recipients, and organize training to improve health, production and marketing. Unfortunately, most restocking projects do not continue data collection after the project ends, so impact is unknown. For example, in Zambia the USAID Office of Foreign Disaster Assistance (OFDA) distributed 2,000 goats from 2010 to 2012 in Kazungula and Sesheke districts, through Land O'Lakes International Development Division. The goal of the project was to improve food security in areas devastated by flooding, drought, and cattle losses from CBPP (Contagious Bovine Pleuro Pneumonia). During the 8 month project, demand for goats was strong, but when it ended, no further data were collected (LOL-IDD 2014).

Conversely, a goat restocking project after a drought in Mali, implemented by Norwegian Church Aid, continued even during fighting near Goa in 2012-2013. Each community had elected a four person committee to distribute goats based on vulnerability, which continued to function both in refugee camps and after refugees returned. Project officials attributed success to the pastoralist tradition of supporting each other, development of community based organizations, and the trust that the committee inspired (Diallo 2011).

During Liberia's Civil war, refugees living in camps in Guinea learned to raise dairy goats in confinement, which was new to them. They developed a taste for goat milk, and brought back an interest and knowledge of dairy goat keeping. The local NGO VOISED-Africa provided dairy goats and training when the refugees returned to Liberia (Miller 2009).

In Venezuela, rangeland degradation, limited water, and losses from goat diseases, inspired producers to join the project, which also commercialized production. In Kenya, dairy goats are an attractive alternative to crop based livelihoods when farm size and crop yields decline, due to human population pressure and climate change.

The imGoats project in India and Mozambique demonstrates that donors can be the catalyst to expand goat value chains. Small-scale farmers kept goats to store wealth, in the absence of banks and other reliable financial systems, but only sold individual goats when cash was needed. The project organized markets which increased profits for enterprising and commercially oriented farmers.

Cell phones have become a catalyst for more transparent markets. Farmers with real time knowledge of markets can negotiate better prices and retain more of the value of their goats. All types of information can be shared more easily, including consultations with veterinarians for livestock technicians or CAHWs.

Information exchange is a key catalyst for new ideas. IFAD's Community of Practice for Pro-Poor Livestock Development (http://www.cop-ppld.net/) and the South Asia Pro-Poor Livestock Policy Programme (http://sapplpp.org/) are online networks for development practitioners to share experiences and best practices. Although not limited to small ruminants, both networks provide an easy means to access formal and informal documentation about technical aspects of goat production (feeding, breeding, health and management), marketing, processing and policies to ensure voice and benefits to the socially marginalized. These networks also expand contacts between individual with expertise, which is "social capital" for development institutions.

Resource-poor farmers cannot afford to invest time and effort without seeing some tangible benefit early on, which ensures the buy-in from the community, the government, and other stakeholders (IFPRI 2012). Monitoring for early results allows the implementing agency to verify the model, and if necessary, to adapt the approach. Heifer International distributes pregnant does to farmers, so that lactation and therefore milk or kid sales can begin quickly, building enthusiasm.

Incentives are internal catalysts. A key driver of sustainability is profit to the goat producer and other participants in the value chain. The IGA/IFAD study documents how profitable goat investments can be in a variety of settings and value chains.

Financial data from the IGA/IFAD case studies were analyzed for feasibility and likely impact after scaling-up. Pre- production, production and processing activities for each country were calculated, resulting in annual net income before and after the intervention, as well as projected values over 10 years, including Internal Rate of Return (IRR) and the Net Present Value (NPV).

Annual net income before labor costs without the intervention is around US $100-150 for Kenya, Nepal, India and Tajikistan, where herds are small and goat production is not the main livelihood. Net income before labor costs is over US $1,000 per family for Argentina, Brazil, Mexico, Morocco and Venezuela.

After the goat intervention, annual net income before labor costs rises to US $240-340 per family (Nepal, India and Tajikistan) and to US $2,000-11,500 per family (Argentina, Brazil, Mexico, Morocco and Venezuela). In Kenya, it increased to US $600 per family.

Annual net income from goats (before labor costs) rose from US $100-150 for Kenya, Nepal, India and Tajikistan, before the intervention, to US $240-340 per family in Nepal, India and Tajikistan, and $600 in Kenya.

In Argentina, Brazil, Mexico, Morocco and Venezuela, goat production increased annual net income (before labor costs) from US $1,000 per family, to US $2,000-11,500 after the goat intervention.

Although the cost of investment included some collective assets (improved bucks, cooling tanks, carding machines and minor infrastructure) the main intervention in these case studies was technical assistance, which is relatively inexpensive compared to other interventions. The third highest Internal Rate of Return (IRR) is Brazil where the only intervention is technical assistance.

This financial analysis is a useful first step for understanding the powerful potential for improving livelihoods with goat based interventions. Further refinements in the economic model could include the social capital which producers bring to their projects, and which can increase as their institutions become stronger. In addition to financial and social capital, a complete livelihoods analysis includes physical, natural and human capital. Social capital is especially important for producers in transition from subsistence to commercial economies, and should not be lost as money increases in importance. Experience has shown the rural population is not a collection of isolated, atomized individuals with only individual interests, but is made of families and communities with both shared and personal preferences, abilities and influence (C. Okali 2011).

For example, the initial financial analysis for goat production in Mozambique noted that although most producers keep livestock for cash income, they do not behave as "formal" producers (Technoserve 2009). Nonetheless, the project proceeded with the assumption that they would change their behavior automatically when market opportunities were available, but this did not occur. Therefore, assumptions about human behavior and "theories of change" matter, especially during the transition from subsistence to market economies.

Models to capture social capital in veterinary economics do exist and should be used because they provide greater insight into the process of overcoming poverty and improving nutritional outcomes (Rushton J. 2003). Other useful models are "behavioral economics" which incorporate cultural preferences or pressures to better predict successful interventions. Gendered economic models are necessary because although the household is essentially a collaborative endeavor, men and women do not share information, resources, benefits or responsibilities uniformly or equitably.

The rural population is not a collection of isolated, atomized individuals with only individual interests (C. Okali 2011).

Community Animal Health Worker (CAHW) or Paravet programs also depend on financial incentives and reliable supply chains. Training local people to provide services in remote areas can dramatically increase access to animal health care, yet most programs fold once the donor leaves. Farm Africa's successful CAHW program includes realistic prices to provide an income to service providers, and regular refresher courses (Peacock 2007).

Non-financial incentives for producers include goat shows, prizes, competitions, and field trips to farms in other districts, as seen in the imGoats and Morocco case studies. Budgets should re-

flect the transportation costs, and recognize that financial impacts may not be seen for several years.

Within households, each person contributing to the goat enterprise must have an incentive for work. If husbands appropriate the goat generated income, wives may have little incentive to continue with the increased work load, and production or quality may decline. Although many project M&E systems use the household as the unit of analysis, it is necessary to gather data from both men and women, as well as the old and young, to understand household dynamics which impact overall success (Njuki and Sanginga 2013). The Nepal Meat Goat project illustrates the importance of holding "gender training workshops" for men, to sensitize them to women's contribution to the goat enterprise through their labor, and their need for cash to take care of the family.

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5.1.4. Accountability

Scaled up programs are more complex than community projects, and different stakeholders have different information needs. Accountability is the other side of incentives; how does the implementer know if there are problems that need solving? To whom can the community appeal if promised services have not been delivered? What if there are unintended negative social or environmental impacts?

Many development organizations collect data to send to the donor. It can take time and incentives for a culture of honest self-assessment to flourish, and requires a committed donor who is also a partner to the process.

Staff in government, research and animal health services need training and incentives to work with goats and with poor men and women. Participation and respect for small-scale farmers is rarely an institutional principle in university programs in animal science, veterinary medicine, research or advisory services. Changes in institutional culture must be incremental and rewarded. Staff accountability may include questions during yearly evaluations, public recognition, travel, merit pay, surveys of end users, and opportunities to train others.

5.2. Creating Space to Grow

5.2.1. Fiscal and financial space

Scaled up development programs involving goats require more up front funding than many individual small programs because of the need to invest in long-term institutional strengthening. Coordinated donor support for "mainstreaming" the right policies and institutional mechanisms for agriculture, rural development, and nutrition can lead to more efficient use of resources in the long run (Hartman and Linn 2008). Therefore, the program also needs a longer time frame to see results.

Poverty-reducing agricultural markets for smallholders require, "simultaneous and complementary investments in all links in the supply chain" (Poulton 2006). The need for complementary investments from different market participants makes each individual investment highly risky, as its success depends on the investment decisions of other players. Innovation Platforms to coordinate the participants is essential, but takes time, money and leadership, as seen in the imGoats case studies.

The massive financial resources required to scale up successful goat programs will need to come from private sector investment to mobilize private-public partnerships (PPPs). The models in the IGA/IFAD study are profitable and describe engagement with the governments to create the enabling environment.

Small-scale goat producers need credit and other financial services to expand their goat businesses and pay for services, where commercial banks do not consider them viable clients. One solution is to include a microcredit or revolving credit component in the project design. Another is to collaborate with an existing microfinance institution in an area where people are investing in goats, to ensure good technical advice for production and marketing to protect the goat investments. For example, The Grameen Bank's approach was integrated into IFAD's smallholder poultry production model (SHPPM) in Bangladesh.

5.2.2. Political space

Farmer organizations need to be strong and inclusive, and able to demand a seat at the table to promote pro-poor and pro-women goat policies. Alliances and support must be built before negotiations to pass favorable policies. Politicians want to be seen helping large numbers of people, so the more farmers or value chain actors who demand a certain policy, the better the chances of approval. Organized groups of farmers or federations of cooperatives create "political capital" that gets the attention of politicians with the power to approve or ignore demands.

"Scaling-up is a political process, so solutions that are "second-best" from a technical perspective may have to be promoted to gain political support" (Hartman and Linn 2008). Donors and project implementers need to agree beforehand about which program elements are non-negotiable. While benefits to the better off are necessary to assure their support, it cannot be at the further expense of the poor.

In Africa, male politicians think of goats as shameful for those who cannot afford cattle so they have been unwilling to fund goat based interventions. Improved livestock data collection that includes informal as well as formal markets shows the current and potential contribution of goats to development.

Engagement with political leaders requires reliable data as well as good diplomatic skills. For example, in Africa, male politicians think of goats as shameful for those who cannot afford cattle so they have been unwilling to fund goat based interventions. Therefore, better livestock data collection is necessary that includes informal as well as formal markets, and in the case of goats, intentionally identifying animals owned by women as well as men. This way, strong arguments can be made for investing in goats to reach the poorest and most marginalized of rural inhabitants, as done by Farm Africa (Peacock 2007).

5.2.3. Policy space

Lack of an appropriate policy framework is one of the main causes of failures of scaling-up. Yet, when there is space for input from small-scale producers and positive policies result, scaling-up often happens effectively. For example, under the Brazil's *Fome Zero* policy framework, a national social protection program was implemented with fresh goat milk purchased by the government and distributed to needy families. The policy took years to develop, and required an effective coalition of producers, researchers, NGOs and politicians.

An Innovation Platform is a forum for participatory identification and implementation of a competitive production system to reduce transaction costs along the value chain (van Rooyen 2009), and to develop pro-poor and pro-women policies to support a goat intervention. Innovation Platforms need skilled facilitation, which in turn requires ongoing training and backstopping. In very authoritarian cultures it may be challenging to build trust or assertive speaking among hierarchical social groups. Understanding and promoting policy and institutional change depends on the underlying capacities for change, which depend on the quality of relationships among actors in a sector (Otte, et al. 2012). If Innovation Platforms can strengthen these relationships, then there is a greater chance of implementing pro-poor policies.

The Nepal case study shows how regular meetings built trust among consumers, traders and producers. Before these meetings, producers distrusted traders, whom they accused of harmful

behaviors such as kicking animals to lower their value, while traders thought that farmers demanded unjustifiably high prices, and required too many visits to buy a goat. Improved communication led to better functioning markets and increased income for both producers and traders.

In Venezuela, the local governments started to develop policies for enabling smallholder goat production, which still need to be finalized and enforced. The Mexico case study concludes that a communication platform between government, private processors, and farmers about policies, payments and enforcement would increase producers' benefits from goat interventions. This would require stronger farmer organizations, and perhaps an external driver like a donor, and political will, as seen in the Argentina and Brazil case studies.

Because existing value chains generally favor the better off and the larger scale producers, new policies must be developed regarding access to common resources like rangeland and water, transparent pricing, premium prices for quality, competition with subsidized imports, phyto-sanitary regulations and protection from monopolistic processing, storage, and trading systems. For example, the improvement in milk marketing rules by the government of Kenya favored the investment in a pilot farmer-owned goat milk processing plant by FARM-Africa which enlarged the milk market opportunities for producers. The Tajikistan case study illustrates the importance of legally protecting producers' access to grazing land, as well as the need for premium prices to be paid for higher quality products. Outdated pricing systems discourage quality production, and destroy markets.

The Senegal case study revealed that imported milk powder produced with subsidies undermined prices for local goat milk producers. In Nepal, meat goat producers had to compete with producers from India who enjoyed subsidized loans for their goat enterprises. In Venezuela, there is no incentive to produce clean milk because the price paid remains the same.

Goat milk is generally higher in fat and protein than cow's milk, so processors can make more cheese or other products from the same volume. When payment is based on liquid milk volume rather than butterfat content, one of the main advantages of goat's milk is lost, while processors gain extra resources. Testing for fat content at the time of sale to a collector or processor discourages producers from adding water to milk, which lowers quality. A premium price for cleaner milk with fewer coliform bacteria creates a strong incentive for improved quality, and also benefits the processor and the final consumer.

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Phyto-sanitary regulations of animal source foods are necessary to protect public health, yet they can be used to prevent the poor from participating in or having access to markets. Policies

in developing countries show a systematic bias towards industrialization and concentration, favoring large- over small-scale operators (Otte, et al. 2012). In East Africa, restrictive regulations on the informal milk trade were in place, but the Kenya Dairy Board (KDB) finally embraced the informal sector as legitimate participants in shaping policy and regulations, after much NGO pressure. Ugandan and Tanzanian policy makers remain hostile to the informal milk market, which is the main outlet for goat milk producers (Kurwijila 2011).

Pro-poor networks such as the Community of Practice for Pro-Poor Livestock Development (http://www.cop-ppld.net/) and the South Asia Pro-Poor Livestock Policy Programme (http://sapplpp.org/) provide examples of policies from around the world which can serve as models in new locations.

Pro-poor policies such as improved rural infrastructure, price transparency, market access and inclusion of small-scale producers in policy development are necessary (Otte, et al. 2012). Pro-poor policies are not necessarily pro-women, so gender gaps need to be addressed as well, such as women's longer work day, lower social status, weaker property rights, and lower levels of education.

To ensure women's voice in policy making, many developing countries have adopted the "one third" system of reserving a minimum of one third of the seats in any decision making forum for women, including local and regional boards, producer unions, and government. It is important for women to participate as leaders not just in community groups, but in higher levels of organization such as producer federations and Innovation Platforms. Implementing agencies must prove their trustworthiness and organize safe transport for women so they can get permission to travel.

For small community based projects, investments in policy reform may seem irrelevant, because most small ruminant production is outside the formal sector (McSherry and Brass 2007). However, scaling-up goat-based interventions will require a substantial change in customary and legal frameworks for asset ownership and management (Heffernan 2014 forthcoming).

5.2.4. **Organizational and Institutional space**

Scaling-up is about shifting focus from pro-poor production or marketing technologies (forage production or "designation of origin") to the institutions which support them across a large geographical area, and can continue after withdrawal of donor funding. The necessary institutions in developing countries, such as government, producer groups, research and educational faculty, need strengthening to meet these responsibilities. Institutional capacity building must be at all levels and include both "hardware" (infrastructure, facilities and equipment) and "software" (management and technical knowledge) to provide services to all members of the communities.

Smallholder institutions need improved organizational management and a process to generate funding to operate. They must assist their members to commercialize production, and build on existing social capital and community trust, without deepening existing gender or ethnic inequalities. Community-based institutions that can aggregate into "apex" or national organizations can achieve economies of scale to acquire inputs or sell products, provide services, and influence policy-makers. For example, the Tajikistan model organizes the goat producers and spinners into groups allowing for a critical mass of production and access to markets in the US and Europe

Change in behavior is part of all innovation, including institutional capacity building. Scalability of an innovative goat model depends on project staff understanding the behavioral changes needed, and the leadership capacity of the implementing agency. If effective large-scale implementation of new innovations implies greater capabilities than those currently existing, then there is no way around investing in systems and organizations (ARD 2012).

Chronically marginalized smallholders are often inexperienced in dealing with distant markets and government officials. Adequate time and training is necessary to develop strong, socially cohesive and equitable, business-oriented and profitable smallholder institutions which can confidently negotiate with buyers, exporters, and policy makers. It is possible, as seen in the Heifer Nepal Case study.

a) **Government institutions**

Scaled up goat programs require engagement with government agencies to facilitate policies and activities during implementation and beyond. Many government ministries, and well as established project administrators, exhibit deeply embedded authoritarian cultures (deHaan 1997). Government staff in many developing countries are not always rewarded for efficient service. They are often poorly paid and may not necessarily be promoted on merit or held accountable for poor performances (LID 1999). Strategies to improve extension include increased budget for transportation and training in Zambia, cooperation with universities, as seen in Senegal, and self-funded services through producer groups as seen with Farm Africa in Kenya.

The Goat Law in Argentina in an innovative strategy to direct resources to poor goat producers. It was passed in 2006, as a result of two years of consultations and workshops with smallholders, government and research institutions, and producer organizations. The Ministry of Agriculture is the coordinator at the national level, with a commission composed of government officers and producer representatives, which distributes funds based on the total goat population. A similar commission operates at the provincial level, and distributes grants, subsidies and credits to approved projects (Maria Rosa Lanari, INTA-Bariloche, personal communication).

Brazil's "Fome Zero" is an example of social and agricultural ministry cooperation. The Food Acquisition Program (PAA) of the Ministry of Social Development (MSD) is part of the federal government. It provides funds for states to purchase goat milk from approved small family farmers in the Northeastern states of Bahia, Pernambuco, Paraíba, Rio Grande do Norte and Ceará. The milk is processed and distributed to food insecure families (GoB 2014). The program demands good relations between state and federal institutions. When different political parties controlled the two areas, payments to goat milk producers were disrupted. Government purchase of goat milk quotas has been essential for the survival of small scale producers in Brazil, but it also raises the question of dependency and sustainability.

b) **Research institutions and universities**

Research institutions invest time and money developing technical innovations to improve goat production. They often manage development projects to test their ideas, but often too little effort is devoted to link research results with practical implementation so impact on poor producers is limited (Gündel 2001).

Past goat development and research programs have focused, almost exclusively, on genetic improvement to increase productivity. There have been very few livestock improvement programs that focus on improving management. Therefore, few projects have raised the skills of farmers to take advantage of the new breeds, or developed reliable health care networks (Peacock 2007).

Research organizations reward staff for the number of scientific papers they publish rather than on the impact of their research on the poor, so scientists have little incentive to invest in participatory, client-led research that would result in the development of more appropriate technology for the poor. (LID 1999). For example, the Small Ruminant Collaborative Research Support Program (SR-CRSP) which developed the Kenya Dual Purpose Goat (KDPG) was successful for the professional careers of the scientists who published papers, but today no KDPGs can be seen. The end of donor support effectively terminated the entire program (Okeyo 2000).

Research institutions such as EMBRAPA in Brazil have been successful in improving goat production in the smallholder sector, and also in influencing policy. Universities, NGOs and government agencies have cooperated to bring improved genetics and management to goat producers in Northeastern Brazil.

The 1992 UN Conference on Environment and Development in Rio de Janeiro led to an increased interest in environmentally friendly agriculture that has become known as "agroecology," the interdisciplinary scientific study of cultural and agricultural practices from farm plot to entire ecosystems. It focuses less on technical interventions and more on social or organizational improvements (Pretty 2008). The study of the ecology of the entire food systems, encompassing ecological, economic and social dimensions, enables better resource management and ensures

adequate nutrition for the human population. It is also a tool to breakdown the "silos" or sectoral divisions between livestock, agronomy, nutrition, sociology and economics (Wezel 2009).

Agroecology has particular relevance for goat production, as goats may be the only livestock that can support the people who live in fragile or harsh ecosystems. These communities are often the most impoverished and marginalized from political power, and goat interventions with good natural resource management can ensure their survival. Nevertheless, "agroecological approaches" are more often found in NGO projects, rather than research or government ones, because of the difficulty in crossing sectoral lines in institutions.

Differences in institutional budgets and cultures have discouraged cooperation and coordination among sectors in both government and research. They also may be in competition for funding or recognition, and rapid staff turnover can limit institutional bridges. Students at universities tend to be funneled into their respective disciplines without much exposure to peers, faculty, and professionals in other departments, limiting the broad perspectives needed for successful scaled up programs (von Braun 2011).

Many livestock professionals have become adept at community development, but learned participatory practices through NGOs during their careers, rather than during formal education. Veterinary schools in developing countries continue to emphasize the health of larger animals such as cattle and buffalo, or providing services to large scale producers (LID 1999). Makerere Veterinary Faculty in Uganda is a leader in training its new veterinarians to be agents of development, through sociology modules to improve services to resource-poor men and women, and their livestock (Hill 2009).

5.2.5. **Partnership space**

Partnerships between diverse agencies and organizations are needed to manage the complexity of large scale goat interventions, because no existing organization can have the staff or skills to reach all of the target areas. Partnerships widen the reach of the program, but there are challenges from mixing different organizational cultures. For example, partners from the private sector may be accustomed to defining success in financial terms only, whereas research institutions may prioritize animal production, extension may count up the numbers of farmers who attend training, and nutrition agencies look at changes in the rate of child stunting.

One key to success is to limit the number of partners to no more than four, to ensure realistic blending of cultures and effective communication. Another strategy is to map out a common understanding of poverty and a theory of change. Private sector agents often assume that poverty is an individual's lack of money, whereas development workers are accustomed to linking social and technical change. All partners must have common and realistic assumptions about human behavior, and collect data to support their assumptions.

For example, Heifer International's Theory of Change focuses on capacity building, social capital, and empowering women (Aaker 2007). During the scaling-up of its model of smallholder dairy production and marketing in the East Africa Dairy Development Program (EADD), the new partner organizations did not discuss their assumptions about poverty and gender. Baseline and monitoring data revealed that dairy incomes were rising but accruing to the men only, because processors sent the monthly dairy check to the head of household, usually a man. The partners and their staff did not recognize and address gender difference within the family or cooperative. Additional activities to allow women access to family income were added but significant time was lost (Mutinda 2011). A second phase of the project has gender equality as an explicit objective with activities, budget and indicators for monitoring. The funder, the Bill and Melinda Gates Foundation, recognized that scaling-up is complex, and time is needed for the donor as well as the partner institutions to learn from their own experiences.

The private sector can be an important partner in scaled up livestock programs, to ensure financial sustainability. Successful models include "social entrepreneurs" such as the Bangladesh Rural Advancement Committee (BRAC), which harness the power of the market to generate both income and social justice. BRAC supports poultry and dairy cow projects in Bangladesh which bundle technical training, inputs such as feed or live chicks and marketing, with services provided to groups, or to "the door." Even poor women or those living in "purdah" (seclusion) can participate and generate income, and this model can be adapted for goat value chains (BRAC 2011).

5.2.6. **Cultural space**

One of the pre-requisites allowing for scaling-up of a model is its cultural acceptability. For example, in some societies or among some ethnic groups drinking goat milk is a taboo, so it would be inappropriate to attempt a dairy goat project there. However, cultures are constantly changing, so current attitudes must be continually examined, rather than relying on assumptions. For example, upper caste Hindus do not consume meat, but many dietary practices are not followed as strictly as in the past. Goat meat is now a valuable commodity in India and Nepal.

However, in India it can be difficult to find veterinarians willing to work with meat goat producers, or to inspect slaughterhouses because of the prevalent vegetarian ideology among highly trained professionals, who are usually Brahmin (highest caste). It is also difficult to attract government attention and support for meat producing livestock activities.

Because discrimination against women is widespread, they may find that they are not welcome in public spaces or at the decision-making table. In Tajikistan, it is difficult to find women with the high technical, managerial and business skills that are required to become spinners or group leaders. They may face restrictions in mobility and in interactions with men. More time must be invested finding women candidates and preparing them for leadership positions.

Goat development modes must adjust to each new location to ensure outreach to ethnic minorities and other marginalized groups. Effective training must be in the local language, which often means hiring indigenous extension workers. Trainers may need to discuss women's participation with the men first, to ensure their support. Childcare, short lessons and materials with pictures rather than words (for preliterate groups) can also increase women's participation.

5.2.7. Learning space

A strong accountability system is especially important for large scaled up programs, so that lessons about what does and does not work can be used for continuous improvement. For example, Heifer International country programs budget for yearly meetings for representatives of each project, where both successes and failures are shared. Although all participants want to be respected for their successes, the safe space to learn from setbacks builds confidence, accelerates learning, and establishes realistic goals.

Successful projects can be models to other donors and farmers in an area. For example, a farmer group working with imGoats in Rajasthan, India, discovered that when women sold their goats, they either purchased land or invested in the education of their daughters. They noted that when the man has to spend money, his preference is still for boys to be educated, but a mother gives equal treatment to her daughters (imGoats 2012).

Communities of Practice can be live or online spaces where best practices can be shared, or advice exchanged. The CoP-PPLP and SA-PPLPP provide a huge amount of information, but online discussions tend to be limited, because there is no one common language. Also some institutional cultures discourage public sharing of anything but successes. Budgets for live interactions for farmers, project staff and researchers are important ways to build enthusiasm, develop "social capital" and improve learning.

6. What are the most serious likely obstacles and risks, and what can be done to mitigate them?

Successful scaling-up takes significant time, money and oversight, so the donor, government and implementing agencies need to be able to count on each other to make and keep commitments. A minimum of 10 years is needed to impact institutional cultures, or develop alternative institutions. Large scale programs with complex value chains tend to focus on technical or market investments, especially if they are led by technical managers, so planning processes must require data and activities to promote positive social and institutional impact.

6.1. Government Priorities and Prejudices

Historically, governments in developing countries have prioritized crops and the commercial farming sector, because of powerful local elites and vested interests of decision-makers. Furthermore, the small-scale livestock production system in general has been considered backward, un-productive and inefficient, or shameful, even leading to adverse policies (e.g. sedentarization of mobile pastoralists). Livestock are now associated with greenhouse gases and zoonotic diseases.

IFAD, IGA and other institutions must unite to advocate for the benefits from goat investments to governments and the delivery of goat extension and health services to small scale producers. This IGA/IFAD report should be shared and discussed, with funding agencies so each country can learn from its own experience. Donors can influence research institutions by funding technical innovation with goats that have the greatest chance of impacting the poor.

6.2. Technical advisory services, markets and inputs

Appropriate technology and advisory services are the backbone of successful goat projects. Producers need relevant and timely information on feeding, breeding, health and management. They also need access to financial services to fund investments in productivity, access to inputs, and a market for their products.

Good technical advice is not enough if the recommended inputs such as feeds, medicines and health services are not locally available, in small units or reasonably priced. IFAD's Smallholder Poultry Production Model (SHPPM) in Bangladesh consists of a poultry production and marketing chain, with linked enterprises for production, inputs & supplies, credit, and extension services. Even women living in purdah (seclusion) can participate since inputs and products are available at the doorstep.

Technical interventions introduced in the wrong sequence can fail. For example, improved genetics can increase milk or meat or fiber production in goats, but they bring the most benefits after community groups have formed, feeding and labor issues addressed, and transport to markets organized. The introduction of breeding farms alone to provide improved genetics benefit the better off the most, and rarely impact the poor. Nor will producers be willing to shift time and money to goats, at the expense of staple crop production. The shift from subsistence to commercial production may expose them to volatile food market prices and increased food insecurity (Moti Jaleta 2009), so commercialization must proceed slowly to minimize risk.

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Inputs such as feed or improved bucks may be subsidized as an incentive to join a project or improve management, but can be notoriously difficult to end, and can be appropriated for political purposes. For example, Malawi's fertilizer subsidies boosted maize production, but the better off tended to benefit more, because they often have easier access, and the price is the same for all buyers. Voucher systems can focus subsidies to those most in need, which improves performance (Chirwa 2013).

A long standing obstacle to commercialization of smallholder dairy production in developing countries is dumping of subsidized milk powder, which undermines markets for local producers. For example, in Senegal, the Fulani women's group could not sell their fresh goat milk at a competitive price in urban markets because the government prioritizes cheap milk powder from the EU to keep urban food inexpensive. The Brazilian model of government purchases of fresh milk, and distributing it to the needy requires close management but leads to better outcomes for all sectors of society. Other countries impose taxes on imports produced with subsidies to level the playing field.

6.3. Communication and Cultural Assumptions

Scaled up programs involve multiple actors and activities, so the quality of communication can determine outcomes. Electronic and mobile phone communication can bridge physical distances, but may not be reliable or available in some areas. An explicit process for sharing reports and updates is essential, as in a process for interpreting and then using that information. The communication process must be routinely improved based on experiences from the community to the partners, donors and government. The budget must cover physical meetings, to ensure that participants develop positive relationships.

Multiple institutions have different cultures for making decisions and handling setbacks, as well as assumptions about causes of poverty and satisfactory outcomes. The partners must make these differences visible, and then reach a common working model. Novelty and resistance may slow down implementation, so diligent monitoring, with training and backstopping is important.

Scaled up programs that cross sectors can be challenging. For example, experts in goat production may not be accustomed to working with political and market actors, as well as nutrition and gender experts. IFAD now uses chronic child malnutrition (height for age measurements) as an indicator of impact, because increased production or income does not automatically lead to better child health. Traditional livestock workers may be unfamiliar with this metric, and may need to work with new partners.

The imGoats project started with the assumption that small scale goat keepers had both the skills and desire to commercialize if markets were more convenient. The smallholder population turned out to be more diverse than expected, and some functions of goats were invisible to outsiders, such as their value as social capital through gifts and sacrifices (Hendrickx 2013). Subsistence producers rely on goats to store their wealth, and will not sell them until viable alternatives are available and accessible, such as village banks. They also need to have a minimum size goat herd before they can risk selling any animals. Technical advisors may assume that poor producers prioritize breeds that will increase production, when in fact they may prefer goats that simply survive harsh conditions with minimal purchased inputs (FAO 2012).

Subsistence goat producers survive by avoiding risk. Commercialization brings new risks, from dependence on purchased inputs or coordinated actions, to inflation and money losing its value. Commercial production and reliance on cash to purchase food may increase food insecurity when food prices are volatile. If commercialization shifts goat generated income to husbands, and traditionally women are ashamed to ask for money for food, child nutrition and health will decline. Without quick increase in production, farmers cannot accept the risks inherent in new breeds, inputs, or technologies.

One way to minimize the damage from mistaken assumptions is to start small with pilot projects, and build on lessons learned at each step. The donor must be patient and willing to accompany the implementing organizations and producers over their learning curve. Large-scale programs can lead to large-scale mistakes.

Many local implementing partners are accustomed to a passive role in carrying out activities listed by the donor, and will not add or adjust the plan even if there are obvious oversights. For example, in India the imGoats project had an objective to lift people out of poverty, and although the implementing agency had excellent tools to identify the poor in the community through wealth ranking, these were not used because they were not specified in the contract (Maarse 2013).

The Innovation Platform is a useful strategy to address starting assumptions and ensure good communication during successful scaling-up. When value chain actors have antagonistic or biased attitudes towards each other, markets do not work well. This cannot be addressed unless there is a safe place to air their perspectives and find solutions, as seen in imGoats, Rajasthan.

6.4. Tools and skills for project management

Large programs need a system for planning and approving projects, rather than replicating identical plans in each new location. The planning process requires skilled facilitators so each com-

munity can assess its own environmental and social context. The budget must include "training of facilitators" because new staff may not have the needed skills. Local community based leaders such as the "field guides" in the imGoats projects may need years of assistance to become adept at sharing information, suggestions and outcomes with their constituencies, especially when farmer groups are still in the process of getting established (Hendrickx 2013).

Some data collection tools may take too long to be useful. Good baseline information is important for measuring impact, but if too complex they can take years to plan, implement and interpret. Preplanning should include a literature search on both production and culture, interviews with peer organizations, and then small group meetings in target communities to verify or change assumptions. The monitoring system needs to focus on "who needs to know what, and why" to limit unduly cumbersome and expensive surveys. A combination of quantitative and qualitative data (Q2), and the institutional will to interpret and share information leads to continuous learning and improvement.

A common mistake in data collection is to regard each household as a homogeneous unit, which can hide gendered impacts such as increasing women's workload in managing goats, or shifting control of income to their husbands. Solutions include specific objectives and activities for empowering women to ensure that training is woman friendly, workloads are shared, and men are supportive of women's need for income, as seen in the Nepal case study.

Selection criteria for participants need some standardization to ensure that the poor will benefit. Requirements such as land ownership can exclude the very poor or women, but distributing free goats without any qualifications, limits success. For example, following an earthquake in Central Java, a goat-based aid program provided "goat credit" to groups of farmers, but did not include any technical training. A year and a half later, only those farmers with previous experience with goats had successfully repaid their credit (Budisatria 2013).

A scaled up goat program should harmonize the conflicting standards currently seen, with many small and disorganized goat projects. Sometimes goats are distributed on credit, at subsidized cost, or for free, as are vaccines and other health inputs, and feed or supplements. Scaled up programs reduce confusion and costs through elimination of unsustainable practices like distribution of goats without requiring training or joining a group. It is never appropriate to provide free goats, however tempting this may be to humanitarian organizations. What is received for free is never valued and looked after in the same way as when a payment is made, however modest (Peacock 2007).

6.5. Weak community institutions

It is most effective to work with farmer groups rather than with individuals, but poor goat pro-

ducers rarely have strong community institutions. If producer groups are already present, they may not include the resource poor, the women, the landless, ethnic minorities, or those with low or no caste. They may need outside facilitation to form institutions that represent the whole group and to join with similar groups to develop political influence, and develop service and market hubs to exploit economies of scale. The Nepal case study documents the steps leading from small self-help groups, to larger cooperatives and finally to federations of cooperatives to influence policy, prices and services.

A frequent obstacle to long-term project success is dependence on donors or government support, which can come to an end. If the community institution is strong, and the marketplace is level, the members will be able to continue and expand their goat enterprises.

6.6. Too short time frame

The time frame for a goat project must be realistic for both implementation and to see impact. For example, Land O'Lakes in Liberia has a 3 year grant (2011-2014) from the United States Department of Agriculture (USDA) to restock 21,000 goats and develop the goat meat value chain, to replace depleted livestock from its Civil War from 1989 to 2003. Although goats reproduce quickly, training and value chains take a long time to design and implement, especially in places where organized markets are rare. Hopefully impact data will be collected for several years after the project ends. (LOL-IDD 2014).

Much of Heifer Nepal's success comes from a long-term presence, in Nepal and other countries. Projects are funded for a minimum of five years and much longer in many cases, with older projects assisting newer ones. The East Africa Dairy Development project is funded by the Bill and Melinda Gates Foundation (BMGF) for 10 years.

6.7. Climate change

Climate change is already impacting the poorest livestock keepers, who live in the most marginal areas, and are most dependent on goats for their livelihoods. In Mexico, land is becoming more arid, increasing the areas where goats are the only livestock that can thrive. The need for improved and scaled up goat interventions is becoming more urgent. Climate change will affect breed selection, with hardier indigenous breeds having advantages in harsher climates. For example, in East Africa, Maasai communities are now restocking the red Maasai hair sheep, a parasite resistant breed nearly lost due to subsidies in the 1970s for crossbreeding with more productive but less drought tolerant Dorper sheep (Omore 2014).

7. Conclusions

Successful development programs focus on people, and the goats and other activities are the means to improve their livelihoods and welfare. Goats make an excellent entry point into poor communities, and their relatively low cost means that more people can participate in goat-based activities. Goat projects can help reach the Millennium Development Goals (MDGs), especially the eradication of extreme poverty and hunger, because even the very poor can own goats. The MDG deadline is 2015, and although extreme poverty has been reduced around the world, this has not translated into adequate progress regarding hunger, child mortality, access to primary education, reproductive healthcare, and sanitation (IFPRI 2013).

The post-2015 development agenda will focus on the elimination of hunger and under-nutrition globally by 2025. Goat interventions will be particularly useful, because they can be targeted to the very poor, especially women, which will increase impact on family nutrition and health, if they can continue to control the income that the goats generate.

A goat project is a good opportunity to build men's support for increased opportunities for their wives and daughters. Goat income in the hands of women is more likely to be spent on education for children, especially daughters; health care which reduces child mortality, and improved family nutrition, which increases resistance to infectious disease such as HIV/AIDS and malaria. Women's health improves when they enjoy higher social status and become more confident. Knowledge of goat reproductive health can help them understand their own bodies, and good sanitation improves both human and animal health.

Improved goat management leads to enhanced environmental quality as well as increased production, especially in the marginal areas where most of the rural poor live. A large-scale goat program is an excellent opportunity for previously isolated sectors such as agriculture, nutrition, environmental sustainability, and human and animal health to work together and achieve common goals.

The IGA/IFAD Knowledge Harvesting study adds to the evidence that the very poor can successfully participate in goat value chains as long as adequate policies, processes, infrastructure and institutions are in place. Scaled up programs involving goats must be designed and monitored to lead to benefits to all members of the household, and to the resource-poor people in the value chain. All development interventions are complex, and outcomes from even well planned projects cannot be guaranteed. A well-managed program linking technical and social interventions using goats increases the chances of people leaving poverty behind and enjoying a food secure future.

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Business assessment and Cost Benefits analysis

for Pro-Poor Small Ruminant Development

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Business Assessment and Cost-Benefits Analysis for Pro-Poor Small Ruminant Development, based on the IFAD-IGA cases studies

1. Methodology for the business assessment

To complement the technical and socio-economic information gathered through the knowledge harvesting exercise, the case studies were subjected to a simplified financial feasibility analysis. Data was gathered from documents and qualified informants, using basic templates. Pre-production, production and processing activities for each country were analyzed separately. Net benefits were subsequently aggregated to an appropriate scale, so as to account for collective investments.

For goat production systems, the representative unit of production is the herd or flock with an average number of mature goats, with a one year cycle. The most appropriate unit of production is the one that allows relevant producers to estimate income and production costs, in their natural context. Once defined, the unit of production determines the way data is collected and analyzed for each activity. The most appropriate cycle is the one that better reflects the natural periods of operation and harvest or product generation. Crops have clearly defined cycles, whereas livestock production systems have continuous input-output dynamics

Income items, inputs, labor tasks and investments vary depending on the activity assessed. Value chains associated with goat production involve pre-production activities, production activities and processing/ marketing activities. Pre-production activities include livestock breeding, input provision and pasture/ feeds production. Production activities involve goat production for meat, milk and meat combined; and meat and fiber. Processing activities involve kid/goat slaughtering, retail butchering, milk processing and fiber processing.

The following cases were used for this analysis:

- Argentina kid/fiber production and processing
- Brazil goat milk production
- Mexico goat milk production and processing
- Kenya goat milk production
- Morocco Argan kid production and processing
- Nepal goat production
- India goat meat production
- Tajikistan kid/fiber production and processing
- Venezuela goat milk production and processing

Annex 1 contains Tables 1-8 with summarized information on features and results of the analyzed illustration cases. More detailed analysis is in Annex 2.

Table 1 presents the major features of each case, including pre-production, production and processing activities, and the financial impact with and without the intervention. Products, services and inputs were assessed at market prices. Same product prices and unitary costs were applied to situations with and without interventions, unless changes in product quality (and other product features) were observed or foreseen. Pre-production activities such as livestock breeding included service fees or sale of

breeding stocks, and inputs included forage, concentrates and by products and equipment to maintain and manage breeding stocks. Key parameters for goat production systems included flock size (does and bucks), fertility and reproductive rate, mortality rate (for kids and adult animals), weaning rate, replacement of breeding stock, daily milk production and lactation period, annual fiber production and weight of sold kids/goats.

For each activity, income and costs were estimated and converted in USD values, at the exchange rate prevailing when data was collected, for with and without interventions. Values were estimated per unit of production per cycle, including income, operation costs (inputs and labor), net income before labor costs, net income considering labor cost, and labor generated (person/days either family labor or remunerated labor). The value of investments associated with each activity, were also estimated in USD values with and without intervention. Information gathered included costs of investment items, economic life, residual value and annual reserve to replace investments at the end of economic life. Tables 2 and 3 present the above-mentioned financial estimates without intervention. Tables 4 and 5 present the same financial estimates with intervention. Finally, incremental values were calculated, subtracting without intervention figures from with intervention figures. Incremental results were estimated for: net income before labor costs, net income considering labor costs, and net income considering both labor costs and annual reserve to replace investments. Net income before considering labor costs is the indicator that better reflects the income available for consumption, since labor is often an in-kind contribution. When labor is well remunerated, rural wages often only cover basic needs. Tables 6 and 7 present these incremental financial results. Tables 2, 4 and 6 present results at project or aggregate level, depending on interventions. Tables 3, 5 and 7 present average results per family involved.

To estimate conventional financial feasibility indicators, incremental figures were projected for a period of 10 years. Residual value of investments was estimated at the end of the 10-year evaluation period. Incremental net income flows allowed for estimation of the Internal Rate of Return (IRR) and the Net Present Value (NPV) considering an annual discount rate of 12 %. A gradual process was assumed to move from the situation without intervention to the situation with intervention. The period to achieve values with intervention varies from 3 to 5 years. In general, a conservative period of 5 years was assumed, unless herd projections and gathered evidence support shorter periods – the later applies to illustrative cases for Nepal and India. Table 8 presents a summary of the above-mentioned financial feasibility indicators.

It is important to emphasize that estimated results are for illustrative purposes. Even though data was gathered from specific cases, some adjustments were made based on data from other country cases. Some input and labor items were simplified when the value was not substantial. In some case, labor costs were estimated using minimum wages applicable to unskilled or rural labor (published in websites).

Finally, a sensitivity analysis was conducted for the key factors of the businesses assessed within each illustration case. In essence, switching values were calculated for critical factors – switching values are those which reduce the expected NPV close to zero and thus the IRR close to 12 %. Table 8 also presents a summary of such switching values.

2. Summary of business assessment results

As shown in Table 1, the best intervention scale involves groups of 200-250 families with flocks (ranging from 120 to 334 families). Interventions for Nepal and India are of a significantly larger scale (from 3000 to 140,000 families) since they mainly foresee distribution of goats to increase flock sizes in shorter periods, so as to improve food security of poor households. The case of Morocco also considers a sizable scale since extension support is coupled with a sizable investment in slaughtering facilities for a well-known goat production region, which lacks such services. The case of Venezuela essentially represents business plans of two families, assisted by an extension agency under a project for arid land development. However, around 1,650 family rural businesses were also supported with this development project.

As shown in Table 3, annual net income before labor costs without intervention ranges from USD 100-3,000 per family. Net income is around USD 100-150 for Kenya, Nepal, India and Tajikistan – relatively low due to the small flock size per family. Therefore, income for goat production contributes partially to family survival. Net income before labor costs is over USD 1,000 per family for Argentina, Brazil, Mexico, Morocco and Venezuela. Productive labor generated follows a pattern similar to net income, ranging from 50-90 person/days per year (Argentina, Brazil, Kenya, Nepal, India and Tajikistan) to 160-320 person/year per year (Mexico, Morocco and Venezuela).

As shown in Table 5, annual net income before labor costs with intervention ranges from USD 240-340 per family (Nepal, India and Tajikistan) to 2,000-11,500 per family (Argentina, Brazil, Mexico, Morocco and Venezuela) – Kenya is between previous ranges with USD 600 per family. Productive labor generated ranges from 50-180 person/days per year (Argentina, Brazil, Kenya, Nepal, India and Tajikistan) to 230-810 person/year per year (Mexico, Morocco and Venezuela). Even though the small ruminant interventions bring about a substantial income increase, income per family is still insufficient for survival.

As shown in Table 7, incremental annual net income before labor costs ranges from USD 120-210 per family (Nepal, India and Tajikistan) to 850-8,000 per family (Argentina, Brazil, Mexico, Morocco and Venezuela), with Kenya between the previous ranges with USD 440 per family. Incremental productive labor generated ranges from 0-50 person/days per year (Argentina, Brazil, Kenya, Nepal, India and Tajikistan) to 80-500 person/year per year (Mexico, Morocco and Venezuela). Incremental net income before labor cost is 70-230% relative to net income without intervention. Consequently, there is great potential to increase productivity and value added on the existing production systems in all cases.

As shown in Table 8, IRR and NPV estimates per family follow a pattern somewhat different to incremental net income figures. NPV per family ranges from USD 100-220 (India, Tajikistan and Venezuela) to 2,000-5,200 (Brazil, Mexico and Morocco) – Nepal, Kenya and Argentina are between previous ranges with USD 360-530. IRR ranges from 12-16% (Argentina, India and Venezuela) to 54-72% (Kenya and Tajikistan) – Brazil, Mexico, Morocco and Nepal are between previous ranges with 24-41%. These results imply that the potential returns are proportionally greater in cases like Kenya and Tajikistan, where investment needed to bring about expected net income increases are proportionally less compared to case like Argentina, India and Venezuela. Even though Kenya and Tajikistan foresee investments on collective assets (genetically improved bucks, cooling tanks, carding machines and minor infrastructure) the main intervention is technical assistance, which are relatively inexpensive compared to other interventions – the third highest IRR is Brazil where the intervention is only technical assistance.

In addition, Table 8 also presents the switching values or proportional changes of critical factors, which would result in financial feasibility indicators below acceptable levels. Argentina, Brazil and Venezuela are very sensitive to proportionally small price reductions of milk and milk processed products (1-6%). Tajikistan is also sensitive to price reductions of fine fiber exported to USA/EU (8%). The other cases are

more resilient to such price reductions (37-50%). Brazil, Kenya, Mexico and India are moderately resilient to reductions in milk productivity (17-53%).

Last but not least, Table 8 includes the number of families with flocks to be involved in the analyzed interventions. In this regard, Venezuela and Argentina are quite sensitive to reduction in scale of interventions. The Venezuela case involved a small number of families. In turn, Argentina requires a minimum number of flocks providing fiber to a common processing unit. The base scenario is close to the minimum scale for these interventions. In contrast, Brazil, Kenya, Mexico, Morocco, Nepal and India can drastically reduce the scale of intervention (from 74 to over 90%) and still be financially feasible.

Annex – **Summary of illustrative cases (for each case, separate available calculation sheets were performed to support analysis)**

Table 1: Summary of illustrative cases: major activities, scale and type of interventions

Country	Value chain segment	Products - services	Unit of Production	Number of Units of production	Investment			
					Infrastructure	Equipment	Livestock	Technical Assistance
Argentina	Pre-Production							
	Production	Kids and fiber	Flock	250	x			x
	Processing	Dehaired cashmere	Unit	1	x	x		x
Brazil	Pre-Production							
	Production	Milk and kids	Flock	250				x
	Processing							
Kenya	Pre-Production	Breeding	Station	1	x		x	x
	Production	Milk and kids	Flock	200				x
	Processing					x		x
Mexico	Pre-Production	Breeding	Center	1	x			x
	Production	Milk and kids	Flock	120		x		x
	Processing							
Morocco	Pre-Production							
	Production	Argan kids	Flock	1,444				x
	Processing	Slaugthering	Facility	1	x	x		x
Nepal	Pre-Production							
	Production	Kids	Flock	138,000			x	x
	Processing							
India	Pre-Production							
	Production	Milk and kids	Flock	2,990			x	x
	Processing							
Tajikistan	Pre-Production							
	Production	Kids and fiber	Flock	334				x
	Processing	Processed mohair	Unit	1	x	x		x
Venezuela	Pre-Production	Forage	Plot	2		x		x
	Production	Milk and kids	Flock	2				x
	Processing	Cheese and milk jam	Unit	2	x	x		x

Table 2: Summary of illustrative cases: financial results without intervention at aggregate level

Country	Value chain segment	Products - services	Unit of Production	Number of Units of production	Aggregate results without intervention				
					Livestock (adult goats)	Investment Value	Net income before labor	Net income with labor	Labor (p/days)
Argentina	Pre-Production								
	Production	Kids and fiber	Flock	250	94,250	1,799,844	296,781	11,625	23,063
	Processing								
	Aggregate				94,250	1,799,844	296,781	11,625	23,063
Brazil	Pre-Production								
	Production	Milk and kids	Flock	250	4,500	1,767,099	386,958	142,111	16,656
	Processing								
	Aggregate				4,500	1,767,099	386,958	142,111	16,656
Kenya	Pre-Production								
	Production	Milk and kids	Flock	200	800	86,053	30,000	11,084	9,213
	Processing								
	Aggregate				800	86,053	30,000	11,084	9,213
Mexico	Pre-Production								
	Production	Milk and kids	Flock	120	4,800	1,783,903	267,379	135,979	18,600
	Processing								
	Aggregate				4,800	1,783,903	267,379	135,979	18,600
Morocco	Pre-Production								
	Production	Argan kids	Flock	1,444	72,200	9,743,564	3,438,857	3,039,748	371,429
	Processing								
	Aggregate				72,200	9,743,564	3,438,857	3,039,748	371,429
Nepal	Pre-Production								
	Production	Kids	Flock	138,000	414,000	59,853,360	18,503,040	6,611,942	6,296,250
	Processing								
	Aggregate				414,000	59,853,360	18,503,040	6,611,942	6,296,250
India	Pre-Production								
	Production	Milk and kids	Flock	2,990	14,950	1,633,426	351,048	194,419	136,419
	Processing								
	Aggregate				14,950	1,633,426	351,048	194,419	136,419
Tajikistan	Pre-Production								
	Production	Fiber	Flock	334	3,340	49,645	32,188	4,100	15,392
	Processing								
	Aggregate				3,340	49,645	32,188	4,100	15,392
Venezuela	Pre-Production								
	Production	Milk and kids	Flock	2	90	31,900	3,753	1,061	289
	Processing	Cheese and milk jam	Unit	2		6,744	3,248	68	342
	Aggregate				90	38,644	7,001	1,129	631

Table 3: Summary of illustrative cases: financial results without intervention at family level

Country	Value chain segment	Products - services	Unit of Production	Number of Units of production	Aggregate results without intervention				
					Livestock (adult goats)	Investment Value	Net income before labor	Net income with labor	Labor (p/days)
Argentina	Pre-Production								
	Production	Kids and fiber	Flock	1	377	7,199	1,187	47	92
	Processing								
	Aggregate				377	7,199	1,187	47	92
Brazil	Pre-Production								
	Production	Milk and kids	Flock	1	18	7,068	1,548	568	67
	Processing								
	Aggregate				18	7,068	1,548	568	67
Kenya	Pre-Production								
	Production	Milk and kids	Flock	1	4	430	150	55	46
	Processing								
	Aggregate				4	430	150	55	46
Mexico	Pre-Production								
	Production	Milk and kids	Flock	1	40	14,866	2,228	1,133	155
	Processing								
	Aggregate				40	14,866	2,228	1,133	155
Morocco	Pre-Production								
	Production	Argan kids	Flock	1	50	6,748	2,381	2,105	257
	Processing								
	Aggregate				50	6,748	2,381	2,105	257
Nepal	Pre-Production								
	Production	Kids	Flock	1	3	434	134	48	46
	Processing								
	Aggregate				3	434	134	48	46
India	Pre-Production								
	Production	Milk and kids	Flock	1	5	546	117	65	46
	Processing								
	Aggregate				5	546	117	65	46
Tajikistan	Pre-Production								
	Production	Fiber	Flock	1	10	149	96	12	46
	Processing								
	Aggregate				10	149	96	12	46
Venezuela	Pre-Production								
	Production	Milk and kids	Flock	1	45	15,950	1,876	531	145
	Processing	Cheese and milk jam	Unit	1		3,372	1,624	34	171
	Aggregate				45	19,322	3,501	565	316

Table 4: Summary of illustrative cases: financial results with intervention at aggregate level

Country	Value chain segment	Products - services	Unit of Production	Number of Units of production	Aggregate results with intervention				
					Livestock (adult goats)	Investment Value	Net income before labor	Net income with labor	Labor (p/days)
Argentina	Pre-Production								
	Production	Kids and fiber	Flock	250	94,250	2,695,313	442,206	157,050	35,826
	Processing	Dehaired cashmere	Unit	1		87,400	70,452	67,899	204
	Aggregate				94,250	2,782,713	512,658	224,949	36,030
Brazil	Pre-Production								
	Production	Milk and kids	Flock	250	4,500	2,405,491	1,000,063	621,844	25,729
	Processing								
	Aggregate				4,500	2,405,491	1,000,063	621,844	25,729
Kenya	Pre-Production	Breeding	Station	1		5,400	1,494	1,132	91
	Production	Milk and kids	Flock	200	800	108,224	115,774	92,418	11,375
	Processing								
	Aggregate				800	113,624	117,269	93,550	11,466
Mexico	Pre-Production	Breeding	Center	1		56,600	24,897	10,128	343
	Production	Milk and kids	Flock	120	7,680	2,530,423	605,636	474,236	27,166
	Processing								
	Aggregate				7,680	2,587,023	630,533	484,364	27,509
Morocco	Pre-Production								
	Production	Argan kids	Flock	1,444	79,420	10,826,149	6,320,342	5,921,233	371,429
	Processing	Slaugthering	Facility	1		725,666	89,280	20,504	8,979
	Aggregate				79,420	11,551,815	6,409,622	5,941,737	380,407
Nepal	Pre-Production								
	Production	Kids	Flock	138,000	1,104,000	136,752,877	47,255,340	35,364,242	6,296,250
	Processing								
	Aggregate				1,104,000	136,752,877	47,255,340	35,364,242	6,296,250
India	Pre-Production								
	Production	Milk and kids	Flock	2,990	23,920	3,461,737	724,023	567,394	136,419
	Processing								
	Aggregate				23,920	3,461,737	724,023	567,394	136,419
Tajikistan	Pre-Production								
	Production	Kids and fiber	Flock	334	3,340	49,645	32,188	4,100	15,392
	Processing	Processed mohair	Unit	1		5,648	69,218	19,336	44,970
	Aggregate				3,340	55,293	101,406	23,436	60,362
Venezuela	Pre-Production	Pasture	Plot	2		13,512	2,098	400	183
	Production	Milk and kids	Flock	2	90	40,233	5,578	1,079	484
	Processing	Cheese and milk jam	Unit	2		17,107	15,460	6,498	963
	Aggregate				90	70,851	23,136	7,977	1,630

Table 5: Summary of illustrative cases: financial results with intervention at family level

Country	Value chain segment	Products - services	Unit of Production	Number of Units of production	Aggregate results with intervention				
					Livestock (adult goats)	Investment Value	Net income before labor	Net income with labor	Labor (p/days)
Argentina	Pre-Production								
	Production	Kids and fiber	Flock	1	377	10,781	1,769	628	143
	Processing	Dehaired cashmere	Family	1		350	282	272	1
	Aggregate				377	11,131	2,051	900	144
Brazil	Pre-Production								
	Production	Milk and kids	Flock	1	18	9,622	4,000	2,487	103
	Processing								
	Aggregate				18	9,622	4,000	2,487	103
Kenya	Pre-Production	Breeding	Family	1		27	7	6	0
	Production	Milk and kids	Flock	1	4	541	579	462	57
	Processing								
	Aggregate				4	568	586	468	57
Mexico	Pre-Production	Breeding	Family	1		472	207	84	3
	Production	Milk and kids	Flock	1	64	21,087	5,047	3,952	226
	Processing								
	Aggregate				64	21,559	5,254	4,036	229
Morocco	Pre-Production								
	Production	Argan kids	Flock	1	55	7,497	4,377	4,101	257
	Processing	Slaugthering	Family	1		503	62	14	6
	Aggregate				55	8,000	4,439	4,115	263
Nepal	Pre-Production								
	Production	Kids	Flock	1	8	991	342	256	46
	Processing								
	Aggregate				8	991	342	256	46
India	Pre-Production								
	Production	Milk and kids	Flock	1	8	1,158	242	190	46
	Processing								
	Aggregate				8	1,158	242	190	46
Tajikistan	Pre-Production								
	Production	Kids and fiber	Flock	1	10	149	96	12	46
	Processing	Processed mohair	Family	1		17	207	58	135
	Aggregate				10	166	304	70	181
Venezuela	Pre-Production	Pasture	Plot	1		6,756	1,049	200	91
	Production	Milk and kids	Flock	1	45	20,116	2,789	540	242
	Processing	Cheese and milk jam	Family	1		8,553	7,730	3,249	482
	Aggregate				45	35,426	11,568	3,988	815

Table 6: Summary of illustrative cases: financial results with intervention at family level

Country	Value chain segment	Products - services	Unit of Production	Number of Units of production	Incremental results (with minus without intervention)				
					Livestock (adult goats)	Investment Value	Net income before labor	Net income with labor	Labor (p/days)
Argentina	Pre-Production								
	Production	Kids and fiber	Flock	1	-	3,582	582	582	51
	Processing	Dehaired cashmere	Family	1		350	282	272	1
	Aggregate				-	3,931	864	853	52
Brazil	Pre-Production								
	Production	Milk and kids	Flock	1	-	2,554	2,452	1,919	36
	Processing								
	Aggregate				-	2,554	2,452	1,919	36
Kenya	Pre-Production	Breeding	Family	1		27	7	6	0
	Production	Milk and kids	Flock	1	-	111	429	407	11
	Processing								
	Aggregate				-	138	436	412	11
Mexico	Pre-Production	Breeding	Family	1		472	207	84	3
	Production	Milk and kids	Flock	1	24	6,221	2,819	2,819	71
	Processing								
	Aggregate				24	6,693	3,026	2,903	74
Morocco	Pre-Production								
	Production	Argan kids	Flock	1	5	750	1,995	1,995	-
	Processing	Slaugthering	Family	1		503	62	14	6
	Aggregate				5	1,252	2,057	2,010	6
Nepal	Pre-Production								
	Production	Kids	Flock	1	5	557	208	208	-
	Processing								
	Aggregate				5	557	208	208	-
India	Pre-Production								
	Production	Milk and kids	Flock	1	3	611	125	125	-
	Processing								
	Aggregate				3	611	125	125	-
Tajikistan	Pre-Production								
	Production	Kids and fiber	Flock	1	-	-	-	-	-
	Processing	Processed mohair	Family	1		17	207	58	135
	Aggregate				-	17	207	58	135
Venezuela	Pre-Production	Pasture	Plot	1		6,756	1,049	200	91
	Production	Milk and kids	Flock	1	-	4,166	912	9	97
	Processing	Cheese and milk jam	Family	1		5,181	6,106	3,215	311
	Aggregate				-	16,103	8,067	3,424	499

Table 7: Summary of illustrative cases: incremental financial results at aggregate level

Country	Value chain segment	Products - services	Unit of Production	Number of Units of production	Incremental results (with minus without intervention) Livestock (adult goats)	Investment Value	Net income before labor	Net income with labor	Labor (p/days)
Argentina	Pre-Production								
	Production	Kids and fiber	Flock	250	-	895,469	145,425	145,425	12,763
	Processing	Dehaired cashmere	Unit	1		87,400	70,452	67,899	204
	Aggregate				-	982,869	215,877	213,324	12,967
Brazil	Pre-Production								
	Production	Milk and kids	Flock	250	-	638,392	613,105	479,733	9,073
	Processing								
	Aggregate				-	638,392	613,105	479,733	9,073
Kenya	Pre-Production	Breeding	Station	1		5,400	1,494	1,132	91
	Production	Milk and kids	Flock	200	-	22,171	85,774	81,334	2,163
	Processing								
	Aggregate				-	27,571	87,269	82,467	2,254
Mexico	Pre-Production	Breeding	Center	1		56,600	24,897	10,128	343
	Production	Milk and kids	Flock	120	2,880	746,520	338,256	338,256	8,566
	Processing								
	Aggregate				2,880	803,120	363,154	348,384	8,909
Morocco	Pre-Production								
	Production	Argan kids	Flock	1,444	7,220	1,082,585	2,881,485	2,881,485	-
	Processing	Slaugthering	Facility	1		725,666	89,280	20,504	8,979
	Aggregate				7,220	1,808,251	2,970,765	2,901,989	8,979
Nepal	Pre-Production								
	Production	Kids	Flock	138,000	690,000	76,899,517	28,752,300	28,752,300	-
	Processing								
	Aggregate				690,000	76,899,517	28,752,300	28,752,300	-
India	Pre-Production								
	Production	Milk and kids	Flock	2,990	8,970	1,828,311	372,975	372,975	-
	Processing								
	Aggregate				8,970	1,828,311	372,975	372,975	-
Tajikistan	Pre-Production								
	Production	Kids and fiber	Flock	334	-	-	-	-	-
	Processing	Processed mohair	Unit	1		5,648	69,218	19,336	44,970
	Aggregate				-	5,648	69,218	19,336	44,970
Venezuela	Pre-Production	Pasture	Plot	2		13,512	2,098	400	183
	Production	Milk and kids	Flock	2	-	8,333	1,825	18	194
	Processing	Cheese and milk jam	Unit	2		10,363	12,212	6,430	622
	Aggregate				-	32,207	16,134	6,847	998

Table 8: Summary of illustrative cases: incremental financial results at family level

Parameter	Swithing Values Argentina	Brazil	Kenya	Mexico	Morocco	Nepal	India	Tajikistan	Venezuela
Number of families	250	250	200	120	1,444	138,000	2,990	334	2
Internal Rate of Return	14%	41%	54%	24%	37%	24%	16%	48%	12%
Net Present Value per family	362	5,264	530	4,968	2,066	434	125	90	223
Critical factors:									
Price of kids	(2%)				(40%)	(37%)	(44%)		(1%)
Price of milk		(6%)	(50%)	(38%)					
Price of fine fiber								(8%)	
Price of standar fiber	(18%)							(44%)	
Price of milk jam									(1%)
Production of milk		(17%)	(53%)	(39%)			(22%)		
Goats per flock					(40%)	(13%)	(13%)		
Flocks involved	(6%)	(99%)	(97%)	(80%)	(74%)	(93%)	(88%)	(87%)	0%
Minimum no. flocks	*235*	*2*	*6*	*24*	*370*	*10,000*	*370*	*45*	*2*

Case study: Argentina - Neuquen - Improvement of Kid Meat and Fiber Production

Context: Project issues

Certificacion (DO) of the "Chivito" criollo Neuquen kid.
Development of the potentialities of the Neuquen breed for fiber.
Management of pastures (Goat law).
The project will be based initially on the 250 members of the Association fior the Chivitto crillo kid.

Main challenges

To improve prolificity and kid conformation.
To increase local sales (through linkages withtourism and skiing resorts).
To maintain goat keepers in the area.
To generate jobs for women (for sales of kids and possibly to sell cashmere).

Initial situation

Grazing from dry and low altitude ranges to semi-arid cold high ranges (2000-3000 mm).
Very extensive production systems.
Weak marketing organization.
Low valorization of the fiber potentialities.

Investments

Dehairing processing plant, including machinery and infrastructure.
Training and capacity building.
Infrastructures in range lands (Shelters, weels, fences)
Development of extension services and collective work of Association.

FLOCK

Activity: ***Kid and fiber production***

Production Unit: Average Flock

Situation	*Present*	*Expected*
Number of heads (female goats)	377	377
Number of heads (male goats)	38	38
Adult mortality	10%	10%
Adult discard rate	20%	20%
Discarded goats	83	83
Fertility rate	60%	70%
Number of kidding goats	226	264
Number of kids per kidding	1.4	1.4
Number of kids born	316	370
Cashmere per goat per cycle (kg)	-	0.13
Proportion of cashmere combed	0%	50%
Proportion of cashmere sheared	0%	50%
Weaning rate	65%	85%
Number of weaned kids	205	315
Number of kids for replacement of adult goats	113	113
Number of kids sold	92	202
Liveweight of female sold (kg)	39	39
Liveweight of male sold (kg)	64	64
Liveweight of sold kid (kg) - less than 6 months old	6	8
Labor time required for Cashmere combing (minutes/goat)	-	120
Labor time required for Cashmere shearing (minutes/goat)	-	10

Production Cycle: One Year

Situation	Present	Expected
Number of cycles per year	1	1

Income per Average Flock per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Cashmere combed	Potential	Kg combed	-	24.5	-	7.50	-	184
Cashmere sheared to dehair	Potential	Kg combed eq.	-	24.5	-	7.50	-	184
Kids sold	Middleman	Head	92.0	202.0	16.63	18.75	1,530	3,788
Adult goats sold	Middleman	Head	83.0	83.0	2.13	2.50	176	208
TOTAL							1,706	4,363

Inputs per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Supplementary feeds	Government	Head	-	166.0	-	12.50	-	2,075
Health treatments	Local provider	Head	415.0	415.0	1.25	1.25	519	519
TOTAL							519	2,594

Labor per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Flock care	Own Family	Person/day	91.3	91.3	12.50	12.50	1,141	1,141
Communal care of bucks	*Castronero*	Head	1.0	1.0	16.63	18.75	17	19
Cashmere combing	Own Family	Person/day	-	47.1	12.50	12.50	-	589
Cashmere shearing	Own Family	Person/day	-	3.9	12.50	12.50	-	49
TOTAL							1,141	1,141

	Present	Expected
Net Income before Labor Cost per Average Flock per Year	1,187	1,769
Net Income considering Labor Cost per Average Flock per Year	47	628
Labor generated per Average Flock per Year (Person/day)	92	143

FIBER DEHAIRING

Activity: Cashmere dehairing

Production Unit:Processing Unit

Situation	Present	Expected
Supplying Families	-	250
Cashmere collected (kg)	-	6,126
Dehaired cashmere / combed cashmere ratio	-	67%
Cashmere processed per person/day of labor (kg)	-	30

Production Cycle:One Year

Situation	Present	Expected
Number of cycles per year	-	1

Income per Processing Unit per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Dehaired Cashmere	Potential	Kg	-	6,126.3	-	22.50	-	137,841
TOTAL							-	137,841

Inputs per Processing Unit per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Cashmere opportunity cost	Local Flocks	Kg	-	6,126.3	-	7.50	-	45,947
Other inputs	Local provider	Kg	-	6,126.3	-	3.50	-	21,442
TOTAL							-	67,389

Labor per Processing Unit per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Processing	Local Labor	Person/day	-	204.2	-	12.50	-	2,553
TOTAL							-	2,553

	Present	Expected
Net Income before Labor Cost per Processing Unit per Year	-	70,452
Net Income considering Labor Cost per Processing Ur	-	67,899
Labor generated per Processing Unit per Year (Person/day)	-	204

INVESTMENT

Production Units:

	Present	Expected
Flocks served	250	250
Processing Unit	-	1

Investment on Average Flock - Present Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Female Goats	Own Family	Head	94,250	16.6	1,566,906	-	-	-	-
Male Goats	Own Family	Head	9,500	16.6	157,938	8	2	20,188	17,219
Infrastructure	Own Family	Flock	250	300.0	75,000	5	-	-	15,000
TOTAL					1,799,844				32,219

Investment on Average Flock - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Female Goats	Own Family	Head	94,250	18.8	1,767,188	-	-	-	-
Male Goats	Own Family	Head	9,500	18.8	178,125	8	3	23,750	19,297
Infrastructure	Own Family	Flock	250	3,000.0	750,000	20	-	-	37,500
TOTAL					2,695,313				56,797

Investment for 250 goat keepers - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Dehairing machinery	Project	Unit	1	45,000	45,000	20	4,500	4,500	2,025
Infrastructure	Project	Unit	1	25,000	25,000	20	-	-	1,250
Technical assistance	Project	Month	24	725	17,400				
TOTAL					87,400				3,275

PRESENT NET INCOME

Present Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Kid and fiber production	-	1,187	250	1	296,781
-	-	-	-	-	-
					296,781

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Kid and fiber production	-	47	250	1	11,625
-	-	-	-	-	-
					11,625

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	**(20,594)**

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Kid and fiber production	-	92	250	1	23,063
-	-	-	-	-	-
					23,063

EXPECTED NET INCOME

Expected Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Kid and fiber production	-	1,769	250	1	442,206
-	-	70,452	1	1	70,452
					512,658

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Kid and fiber production	-	628	250	1	157,050
-	-	67,899	1	1	67,899
					224,949

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	**164,877**

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Kid and fiber production	-	143	250	1	35,826
-	-	204	1	1	204
					36,030

Expected incremental results

Increase in Annual Net Income before Labor Costs	215,877
Increase in Annual Net Income considering Labor Costs	213,324
Increase in Annual Net Income considering Labor Costs and Annual Reserve to replace Inves	185,471
Increase in Employment Generated (Person/days)	12,967
Number of Participating Families	250
Per-Family Increase in Annual Net Income before Labor Costs	864
Per-Family Increase in Annual Net Income considering Labor Costs	853
Per-Family Increase in Annual Net Income considering Labor Costs and Annual Reserve	742
Per-Family Increase in Employment Generated (Person/days)	52

SENSITIVITY

Approximative IRR &NPV

Year	-	1	2	3	4	5	6	7	8	9	10
Start-up curve		20%	40%	60%	80%	100%	100%	100%	100%	100%	100%
Incremental Annual Flows	(982,869)	42,665	85,330	127,995	170,659	213,324	213,324	213,324	213,324	213,324	213,324
Residual value											686,938
Net Flows	(982,869)	42,665	85,330	127,995	170,659	213,324	213,324	213,324	213,324	213,324	900,262

IRR	**14%**
Aggregate NPV	**90,514**
Families	**250**
NPV per family	**362**

Switching Values

Critical Factors	Unit	Without Project	With Project			Without Project	With Project			% Change
			Minimum	Base	Min/Base		Minimum	Base	Min/Base	
Kids' sale price	Head	16.63	18.75	18.75	1.00	16.63	18.30	18.75	0.98	(2%)
Dehaired cashmere price	Kg	-	22.50	22.50	1.00	-	18.50	22.50	0.82	(18%)
Fertility rate	%	60%	70%	70%	1.00	60%	69%	70%	0.99	(1%)
Weaning rate	%	65%	85%	85%	1.00	65%	84%	85%	0.99	(1%)
Supplying Families	Flock	250	250	250	1.00	235	235	250	0.94	(6%)

Case study: Brazil - Nort-East - Intensification of Goat Milk Production

Context: Project issues

Milk collected in cooling tanks of producers' association and packaged to supply school feeding program
A very small part of the milk is processed in: *dolce de leite* (or cooked milk jam), cheese , yogurt and butter
Production systems are based on complementary grazing of the «Caatinga» Biome *(in 10 years with 6 NGO)*

Main challenges

Difficulty to motivate the breeders to adopt improved technology
Scarce alternatives for milk surplus of government social programs
Limited cash available to breeders

Initial situation

During droughts, farmers burn cacti to eliminate thorns and feed their flocks
With excessive rains, negative effects such as parasitism affect flocks
There is no shepherd and the goats come back by themselves to the farm every day for feeding
There is an network of extension, training and innovation transfer but limited coverage in the N-East

Investments

Extension program with clear indicators to increase extension outreach to improve production technology
Market promotion of goat products in better-off southern states

Scenarios for the future

Future development of infrastructure as dairy units, milk tanks, slaughter houses and parks to gather kids
Contribute to gradually contain rural exodus of young farmers

FLOCK

Activity:Goat milk production

Production Unit:Average Flock

Situation	Present	Expected
Goats	18	28
Bucks	1	2
Adult mortality	8%	8%
Adult discard rate	20%	20%
Discarded goats	4	6
Fertility rate	80%	80%
Number of milking goats	14	22
Number of kids per kidding	1.5	1.5
Number of kids born	21	33
Milk produced per goat per day (lt)	0.80	1.25
Milking period (days)	180	200
Abortion and kid mortality	17%	8%
Number of weaned kids	17	30
Number of kids for replacement of adult goats	5	8
Number of kids sold	12	22
Liveweight of goats sold (kg)	30	30
Liveweight of bucks sold (kg)	42	42
Liveweight of sold kid (kg)	10	12
Labor time required for milking (minutes/lt)	5	5

Production Cycle:One Year

Situation	Present	Expected
Number of cycles per year	1	1

Income per Average Flock per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Goat milk produced	Processing	Lt	2,016.0	5,500.0	0.64	0.64	1,284	3,504
Kids sold	Local Butcher	Kg Liveweight	120.0	264.0	7.35	7.35	882	1,940
Adult goats sold	Local Butcher	Kg Liveweight	120.0	180.0	5.29	5.29	635	953
							2,801	6,396

Inputs per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Concentrate for milking goats	Local provider	Kg	420.0	1,980.0	0.25	0.25	103	485
Mineral salt	Local provider	Kg	218.9	357.5	0.61	0.61	133	217
Forage	Local provider	Kg	12,626.0	21,017.4	0.08	0.08	947	1,576
Health treatments	Local provider	Head	36.0	60.0	1.96	1.96	71	118
							1,253	2,396

Labor per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Flock care	Own Family	Person/day	45.6	45.6	14.70	14.70	671	671
Goat milking	Own Family	Person/day	21.0	57.3	14.70	14.70	309	842
							979	1,513
Net Income considering Labor Cost per Average Flock per Year							568	2,487
Labor generated per Average Flock per Year (Person/day)							67	103
							Present	Expected
Net Income before Labor Cost per Average Flock per Year							1,548	4,000

INVESTMENT

Activity:Goat milk processing

Production Units:	Situation	Present	Expected
	Average Flocks	250	250
	Extension service	1	1

Investment on Production Units - Present Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Female Goats	Own Family	Head	4,500	220.5	992,250	-	-	-	-
Male Goats	Own Family	Head	250	308.7	77,175	8	-	-	9,647
Flock facilities	Own Family	Flock	250	2,790.7	697,674	20	-	-	34,884
					1,767,099				44,531

Investment on Production Units - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	7,000	220.5	1,543,500	-	-	-	-
Bucks	Own Family	Head	500	308.7	154,350	8	-	-	19,294
Flock facilities	Own Family	Flock	250	2,790.7	697,674	20	-	-	34,884
					2,395,524				54,177

Investment for Common Use - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Technical assistance	Project	Month	30	332.2	9,967				
					9,967				-

PRESENT NET INCOME

Goat milk processing

Present Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
-	-	1,548	250	1	386,958
					386,958

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
-	-	568	250	1	142,111
					142,111

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	97,580

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
-	-	67	250	1	16,656
					16,656

EXPECTED NET INCOME

Expected Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
-	-	4,000	250	1	1,000,063
					1,000,063

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
-	-	2,487	250	1	621,844
					621,844

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	567,666

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
-	-	103	250	1	25,729
					25,729

Expected incremental results

Increase in Annual Net Income before Labor Costs	613,105
Increase in Annual Net Income considering Labor Costs	479,733
Increase in Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	470,086
Increase in Employment Generated (Person/days)	9,073
Number of Participating Families	250
Per-Family Increase in Annual Net Income before Labor Costs	2,452
Per-Family Increase in Annual Net Income considering Labor Costs	1,919
Per-Family Increase in Annual Net Income considering Labor Costs and Annual Reserve	1,880
Per-Family Increase in Employment Generated (Person/days)	36

SENSITIVITY

Approximative IRR &NPV

Year	-	1	2	3	4	5	6	7	8	9	10
Start-up curve		20%	40%	60%	80%	100%	100%	100%	100%	100%	100%
Incremental Annual Flows	(638,392)	95,947	191,893	287,840	383,786	479,733	479,733	479,733	479,733	479,733	479,733
Residual value											531,956
Net Flows	(638,392)	95,947	191,893	287,840	383,786	479,733	479,733	479,733	479,733	479,733	1,011,689
IRR	41%										
Aggregate NPV	1,315,884										
Families	250										
NPV per family	5,264										

Switching Values

Critical Factors	Unit	Without Project		With Project			Without Project		With Project		% Change
			Minimum	Base	Min/Base			Minimum	Base	Min/Base	
Goat milk price	Lt	0.64	0.64	0.64	1.00		0.64	0.60	0.64	0.94	(6%)
Kids' sale price	Kg LW	7.35	7.35	7.35	1.00		7.35	6.20	7.35	0.84	(16%)
Milk per goat per day	Lt	0.80	1.25	1.25	1.00		0.80	1.04	1.25	0.83	(17%)
Milking period	Day	180	200	200	1.00		180	167	200	0.84	(17%)
Abortion and kid mortality	%	17%	8%	8%	1.00		17%	26%	8%	3.25	225%
Flocks served	Flock	250	250	250	1.00		2	2	250	0.01	(99%)

Case study: Kenya - Intensification of Goat Milk Production

Project issues

Transform the lives of 120,000 poor families (720,000 people).
Project duration is 10 years with involvement of 6 local NGOs .

Main challenges

To develop the market of goat products.
To organize and promote development at regional level.

Initial situation

Low yield production (meat and milk) at local level.
Several nucleus of improved farms - efficiency of production system is proved.
Successful presence for many years of Farm Africa

Investments

Training and mentoring for NGO management.
Support and extension services.
Import of Toggenburg goats and breeding program to obtain 75% Toggenburg goats.
Goat milk processing plants.
Creation of breeding stations.

Scenarios for future

Market saturation.
Development of goat farms.

FLOCK

Activity: Goat milk production

Production Unit:

Average Flock		
Situation	Present	Expected
Number of goats	4	4
Number of bucks	1	1
Adult mortality	10%	5%
Adult discard rate	20%	20%
Discarded goats	1	1
Fertility rate	70%	70%
Number of milking goats	3	3
Number of kids per kidding	1.5	1.5
Number of kids born	5	5
Milk produced per goat per day (lt)	0.20	1.00
Milking period (days)	70	200
Abortion and kid mortality	17%	8%
Number of weaned kids	4	5
Number of kids for replacement of adult goats	1	1
Number of kids sold	3	4
Liveweight of goat sold (kg)	25	25
Liveweight of buck sold (kg)	40	40
Liveweight of kid sold (kg) - less than 6 months old	6	6
Labor time required for milking (minutes/lt)	5	5

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	1	1

Income per Average Flock per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Goat milk produced	Processing	Lt	42.0	600.0	0.50	0.50	21	300
Kids sold	Local Butcher	Kg Liveweight	18.0	24.0	3.00	3.76	54	90
Adult goats sold	Local Butcher	Kg Liveweight	25.0	25.0	3.00	3.00	75	75
							150	465

Inputs per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Concentrate for milking goats	Local provider	Kg	-	222.0	-	0.45	-	100
Veterinary service	Local provider	Head	-	9.0	-	2.00	-	18
Breeding centre fee	Centre	Flock	-	1.0	-	13.28	-	13
							-	132

Labor per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Flock care	Own Family	Person/day	45.6	45.6	2.05	2.05	94	94
Goat milking	Own Family	Person/day	0.4	6.3	2.05	2.05	1	13
							95	107

	Present	Expected
Net Income before Labor Cost per Average Flock per Year	150	334
Net Income considering Labor Cost per Average Flock per Year	55	227
Labor generated per Average Flock per Year (Person/day)	46	52

BREEDING STATION

Activity: Goat breeding station

Production Unit:

Station		
Situation	Present	Expected
Flocks serviced	-	200

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	-	1

Income per Station per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Fee	Flock owners	Unknown	-	200.0	-	13.28	-	2,656
							-	2,656

Inputs per Station per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Veterinary service	Local provider	Head	-	1.0	-	2.00	-	2
Forage	Local provider	Kg	-	730.0	-	0.05	-	37
Feeds	Local provider	Kg	-	135.1	-	0.45	-	61
							-	99

Labor per Station per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Breeding station care	Hired Labor	Person/day	-	91.3	-	3.97	-	362
							-	362

	Present	Expected
Net Income before Labor Cost per Station per Year	-	2,556
Net Income considering Labor Cost per Station per Year	-	2,194
Labor generated per Station per Year (Person/day)	-	91

INVESTMENT

Activity: Goat milk production

Production Units:

Situation	Present	Expected
Flocks served	200	200
Breeding station	1	1

Investment on Production Units - Present Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	800	75.0	60,000	-	-	-	-
Bucks	Own Family	Head	200	120.0	24,000	8	-	-	3,000
Flock facilities	Own Family	Flock	200	10.3	2,053	20	-	-	103
					86,053				3,103

Investment on Production Units - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	800	93.9	75,122	-	-	-	-
Bucks	Own Family	Head	200	150.2	30,049	8	-	-	3,756
Flock facilities	Own Family	Flock	200	10.3	2,053	20	-	-	103
					107,224				3,859

Investment for 200 Flock owners - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Toggenburg buck	Project	Unit	1	600.0	600	8	-	-	75
Cooling tanks	Project	Unit	1	1,000.0	1,000	20	-	-	50
Technical assistance	Project	Month	36	300.0	10,800				
					12,400				125

PRESENT NET INCOME

Present Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	150	200	1	30,000
Goat breeding station	Station	-	-	-	-
					30,000

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	55	200	1	11,084
Goat breeding station	Station	-	-	-	-
					11,084

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	7,981

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat milk production	Average Flock	46	200	1	9,213
Goat breeding station	Station	-	-	-	-
					9,213

EXPECTED NET INCOME

Expected Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	334	200	1	66,713
Goat breeding station	Station	2,556	1	1	2,556
					69,269

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	227	200	1	45,409
Goat breeding station	Station	2,194	1	1	2,194
					47,604

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	43,620

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat milk production	Average Flock	52	200	1	10,375
Goat breeding station	Station	91	1	1	91
					10,466

Expected incremental results

Increase in Annual Net Income before Labor Costs	39,269
Increase in Annual Net Income considering Labor Costs	36,520
Increase in Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	35,639
Increase in Employment Generated (Person/days)	1,254
Number of Participating Families	200
Per-Family Increase in Annual Net Income before Labor Costs	196
Per-Family Increase in Annual Net Income considering Labor Costs	183
Per-Family Increase in Annual Net Income considering Labor Costs and Annual Reserve	178
Per-Family Increase in Employment Generated (Person/days)	6

SENSITIVITY

Approximative IRR &NPV

Year	-	1	2	3	4	5	6	7	8	9	10
Start-up curve		20%	40%	60%	80%	100%	100%	100%	100%	100%	100%
Incremental Annual Flows	(33,571)	7,304	14,608	21,912	29,216	36,520	36,520	36,520	36,520	36,520	36,520
Residual value											13,960
Net Flows	(33,571)	7,304	14,608	21,912	29,216	36,520	36,520	36,520	36,520	36,520	50,480
IRR	54%										
Aggregate NPV	105,961										
Families	200										
NPV per family	530										

Switching Values

Critical Factors	Unit	Without Project	With Project		
			Minimum	Base	Min/Base
Goat milk price	Lt	0.50	0.50	0.50	1.00
Kids' sale price	Kg LW	3.00	3.76	3.76	1.00
Milk per goat per day	Lt	0.20	1.00	1.00	1.00
Milking period	Day	70	200	200	1.00
Abortion and kid mortality	%	17%	8%	8%	1.00
Flocks served	Flock	200	200	200	1.00

Without Project	With Project			% Change
	Minimum	Base	Min/Base	
0.50	0.25	0.50	0.50	(50%)
3.00	-	3.76	0.00	(100%)
0.20	0.47	1.00	0.47	(53%)
70	93	200	0.47	(54%)
17%	100%	8%	12.50	1150%
6	6	200	0.03	(97%)

Case study:Mexico - Comarca Lagunera - Improvement of Goat Milk Production

Context: Project issues

Initially 8000 famillies of poor small holders dedicated to produce milk in bad conditions.
Goat production have been modified to supply a milk processing industry for condense milk jam or fudge.
In the Comarca lagunera, there are 450 000 goats for 8 000 families.
This integration has been acheived by Development Research and non-systematic production support initiatives.

Main challenges

The management of range lands available without restriction.
Overgrazing
Lack of water
Lack to criteria for selection of bucks and prepubertal females in general
Seasonally of milk production in extensive system
Asymetry between breeders creates conflicts
Improve agro-enterprise management. Farmers able to use technical and economic data

Initial situation

Low productivity per goat
Low milk quality
Low number of milking goats
Bad carcass conditions of kids
Low amount of concentrates
Low control on the system by the farmer

Investments

Capacity and training equipment
Genetic Improvement Center for breeders in extensive system
Extension services

Scenarios for future

A larger proportion of breeders with with high production level
Flocks with increased number of heads.
Managment of breeding season according to local condition

FLOCK

Activity: Goat milk production

Production Unit:

Average Flock		
Situation	Present	Expected
Number of goats	40	64
Number of bucks	4	6
Adult mortality	5%	5%
Adult discard rate	20%	20%
Discarded goats	9	14
Fertility rate	85%	85%
Number of milking goats	34	54
Number of kids per kidding	1.5	1.5
Number of kids born	51	81
Milk produced per goat per day (lt)	1.000	1.144
Milking period (days)	180	210
Abortion and kid mortality	35%	35%
Number of weaned kids	33	53
Number of kids for replacement of adult goats	10	16
Number of kids sold	23	37
Liveweight of goat sold (kg)	40	42
Liveweight of buck sold (kg)	64	64
Liveweight of kid sold (kg) - less than 6 months old	8	8
Labor time required for milking (minutes/lt)	5	5

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	1	1

Income per Average Flock per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Goat milk sold	Urban Market	Lt	6,120.0	12,973.0	0.25	0.32	1,530	4,151
Kids fattened and sold	Local Butcher	Kg Liveweight	184.0	296.0	4.00	4.00	736	1,184
Adult goats sold	Local Butcher	Kg Liveweight	360.0	588.0	0.69	0.69	248	406
							2,514	5,741

Inputs per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Concentrate for milking goats	Local provider	Kg	510.0	1,458.0	0.35	0.35	180	515
Grazing land rental	Local provider	Flock	1.0	1.0	42.30	42.30	42	42
Health treatments	Local provider	Head	77.0	123.0	0.83	0.83	64	102
Breeding center fee	Center	Flock	-	1.0	-	9.29	-	9
							286	668

Labor per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Flock care	Own Family	Person/day	91.3	91.3	12.00	12.00	1,095	1,095
Goat milking	Own Family	Person/day	63.8	135.1	12.00	12.00	765	1,622
							1,095	1,095

	Present	Expected
Net Income before Labor Cost per Average Flock per Year	2,228	5,073
Net Income considering Labor Cost per Average Flock per Year	1,133	3,978
Labor generated per Average Flock per Year (Person/day)	155	226

BREEDING CENTRE

Activity: Goat Breeding Centre

Production Unit:

Centre		
Situation	Present	Expected
Flocks serviced	-	120

Production Cycle:

One Month		
	Present	Expected
Number of cycles per	-	12

Income per Centre per Month

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Fee	Flock owners	Unknown	-	120.0	-	9.29	-	1,115
							-	1,115

Inputs per Centre per Month

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Medicines and santiary inputs	Local provider	Month	-	1.0	-	30.77	-	31
Forage	Local provider	Ton	-	10.0	-	173.08	-	1,731
Feeds	Local provider	Bag	-	10.0	-	8.46	-	85
Electricity	Local provider	Month	-	1.0	-	76.92	-	77
Water	Local provider	Month	-	1.0	-	29.23	-	29
Gas	Local provider	Month	-	1.0	-	23.85	-	24
Fuel	Local provider	Month	-	1.0	-	153.85	-	154
							-	2,130

Labor per Centre per Month

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Centre maintenance	Hired Labor	Person/day	-	64.3	-	12.92	-	831
Dehorning and dehoofing	Hired Labor	Person/day	-	2.4	-	12.92	-	31
Control of serviced flocks	Hired Labor	Person/day	-	28.6	-	12.92	-	369
							-	1,231

	Present	Expected
Net Income before Labor Cost per Centre per Month	-	(1,015)
Net Income considering Labor Cost per Centre per Month	-	(2,246)
Labor generated per Centre per Month (Person/day)	-	29

INVESTMENT

Activity: Goat milk production
Production Units:

Situation	Present	Expected
Flocks served	120	120
Breeding Center	-	1

Investment on Average Flock - Present Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Female Goats	Own Family	Head	4,800	160.0	768,000	-	-	-	-
Male Goats	Own Family	Head	480	256.0	122,880	8	44	21,197	12,710
Flock facilities	Own Family	Flock	120	2,790.7	334,884	20	-	-	16,744
Fences	Own Family	Plot	120	4,651.2	558,140	20	-	-	27,907
					1,783,903				57,362

Investment on Average Flock - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Female Goats	Own Family	Head	7,680	168.0	1,290,240	-	-	-	-
Male Goats	Own Family	Head	720	256.0	184,320	8	44	31,795	19,066
Flock facilities	Own Family	Flock	120	2,790.7	334,884	20	-	-	16,744
Fences	Own Family	Plot	120	4,651.2	558,140	20	-	-	27,907
Milking area	Project	Unit	120	1,357.0	162,840	20	-	-	8,142
					2,530,423				71,859

Investment for all Flock owners - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Centre structure	Project	Unit	1	32,000	32,000	20	-	-	1,600
Management facilities	Project	Unit	1	4,250	4,250	10	-	-	425
Office equipment	Project	Set	1	4,300	4,300	10	-	-	430
Laboratory equipment	Project	Set	1	9,850	9,850	10	-	-	985
Software	Project	Contract	1	6,200	6,200	10	-	-	620
					56,600				4,060

PRESENT NET INCOME

Present Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	2,228	120	1	267,379
Goat Breeding Centre	Centre	-	-	-	-
					267,379

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	1,133	120	1	135,979
Goat Breeding Centre	Centre	-	-	-	-
					135,979

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments 78,618

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat milk production	Average Flock	155	120	1	18,600
Goat Breeding Centre	Centre	-	-	-	-
					18,600

EXPECTED NET INCOME

Expected Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	5,073	120	1	608,726
Goat Breeding Centre	Centre	(1,015)	1	12	(12,182)
					596,544

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	3,978	120	1	477,326
Goat Breeding Centre	Centre	(2,246)	1	12	(26,951)
					450,374

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	374,456

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat milk production	Average Flock	226	120	1	27,166
Goat Breeding Centre	Centre	29	1	12	343
					27,509

Expected incremental results

Increase in Annual Net Income before Labor Costs	329,164
Increase in Annual Net Income considering Labor Costs	314,395
Increase in Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	295,838
Increase in Employment Generated (Person/days)	8,909
Number of Participating Families	120
Per-Family Increase in Annual Net Income before Labor Costs	2,743
Per-Family Increase in Annual Net Income considering Labor Costs	2,620
Per-Family Increase in Annual Net Income considering Labor Costs and Annual Reserve	2,465
Per-Family Increase in Employment Generated (Person/days)	74

SENSITIVITY

Approximative IRR &NPV

Year	-	1	2	3	4	5	6	7	8	9	10
Start-up curve		20%	40%	60%	80%	100%	100%	100%	100%	100%	100%
Incremental Annual Flows	(803,120)	62,879	125,758	188,637	251,516	314,395	314,395	314,395	314,395	314,395	314,395
Residual value											617,548
Net Flows	(803,120)	62,879	125,758	188,637	251,516	314,395	314,395	314,395	314,395	314,395	931,943
IRR	24%										
Aggregate NPV	596,157										
Families	120										
NPV per family	4,968										

Switching Values

Critical Factors	Unit	Without Project	With Project		
			Minimum	Base	Min/Base
Goat milk price	Lt	0.25	0.32	0.32	1.00
Kids' sale price	Kg LW	4.00	4.00	4.00	1.00
Milk per goat per day	Lt	1.000	1.144	1.144	1.00
Milking period	Day	180	210	210	1.00
Abortion and kid mortality	%	35%	35%	35%	1.00
Flocks served	Flock	120	120	120	1.00

Without Project	With Project			% Change
	Minimum	Base	Min/Base	
0.25	0.20	0.32	0.63	(38%)
4.00	-	4.00	0.00	(100%)
1.000	0.700	1.144	0.61	(39%)
180	128	210	0.61	(39%)
35%	100%	35%	2.86	186%
24	24	120	0.20	(80%)

Case study: Morocco - Development of Argan Kid Meat Production

Context: Project issues

Certification of the Argan kid and development of marketing the kids for urban market

Valorization of the specific dietetic and sensory quality of a kid fed within the argene tree area and nuts

Improvment of herd management with conservation of the Argane tree endaemic forect (used for Argan oil)

Improvment of hygienic conditions of slaughtering (veterinary control)

To develop complementary incomes to Argane tree industry (women working for crushing the nuts)

To organize selection and breeding of the local breed to improve

A project supported by the Essaouira Province Royal administration

Main challenges

Organizing complementarity between the development of Argane tree industry and goat raising (traditional but threatened)

Managing the flocks to prevent pasture and forest degradation due to frequent droughts

Developing a collective organization of breeders

To prevent «pirat» grazing by big transhumant, cow, camels and goat herds (political problem)

To convince local actors that argane tree industry and goats are compatible

Initial situation

Goat raising is a traditional activity and kids are sold to local butchers

A very structured and old collective organization of pasture management (agdal)

A «berber» population (Haha tribes) with a pastoral tradition

Livestock: 370 000 caprine heads in the Essaouira province (more than 1 million in the argane tree area)

A dynamic village Smimou: 85000 heads, 30 breeders

Investments

Certification and controls

Slaughtering facilities

Training

FLOCK

Activity: Argan kid meat production

Production Unit:

Average Flock		
Situation	Present	Expected
Number of goats	50	55
Number of bucks	4	5
Adult mortality	5%	5%
Adult discard rate	5%	5%
Discarded goats	3	3
Fertility rate	65%	65%
Number of kids per kidding	1.5	1.5
Number of kids born	49	54
Kid mortality	20%	5%
Number of weaned kids	39	51
Number of kids for replacement of adult goats	5	6
Number of kids fattened and sold	34	45
Liveweight of goat sold (kg)	23	23
Liveweight of buck sold (kg)	35	35
Liveweight of sold kid (kg)	13	13
Age at slaughtering (months)	8	6
Carcass weight over liveweight	62%	62%
Carcass weight of kid to slaughter	8	8

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	1	1

Income per Average Flock per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Kids fattened and sold	Local Butcher	Kg Carcass	272.0	-	8.06	-	2,192	-
Kids fattened and sold	Urban Market	Kg Carcass	-	360.0	-	8.86	-	3,191
Adult goats sold	Local Butcher	Kg Carcass	69.0	69.0	8.06	8.06	556	556
							2,748	3,747

Inputs per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Barley for kids	Local provider	Kg	220.5	291.6	0.46	0.46	102	134
Alig+Zegmouna	Local provider	Kg	220.5	291.6	0.35	0.35	76	101
Feedstuff for does	Local provider	Kg	300.0	363.0	0.46	0.46	138	167
Vaccination	Local provider	Head	103.0	114.0	0.50	0.50	52	57
Slaughtering fee	Local provider	Kg Carcass	-	360.0	-	0.39	-	141
							367	600

Labor per Average Flock pear Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Sheperd	Own Family	Person/Day	257	257	1.07	1.07	276	276
							276	276

	Present	Expected
Net Income before Labor Cost per Average Flock per Year	2,381	3,147
Net Income considering Labor Cost per Average Flock per Year	2,104	2,871
Labor generated per Average Flock per Year (Person/day)	257	257

SLAUGHTERHOUSE

Activity: Goat slaugther house

Production Unit:

Facility		
Situation	Present	Expected
Flocks supplying goats	-	1,444
Kids slaughtered	-	65,000
Carcass weight of kid to slaughter	-	8
Residual material per kid slaugthered	-	-

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	-	1

Income per Facility per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Fee for kids slaugthered	Flock owner	Kg Carcass	-	520,000.0	-	0.39	-	203,566
Residual material	Unknown	Kg	-	-	-	-	-	-
							-	203,566

Inputs per Facility per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Materials	Local provider	Slaugthered Head	-	65,000.0	-	0.39	-	25,376
Gas	Local provider	Million BTU	-	3,466.7	-	5.00	-	17,333
Electricity	Local provider	Kwh	-	18,448.5	-	1.41	-	26,000
Transport	Local provider	Trip	-	-	-	-	-	-
							-	68,709

Labor per Facility per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Operations	Hired Labor	Person/day	-	8,978.6	-	7.66	-	68,776
							-	68,776

	Present	Expected
Net Income before Labor Cost per Facility per Year	-	134,857
Net Income considering Labor Cost per Facility per Year	-	66,081
Labor generated per Facility per Year (Person/day)	-	

INVESTMENT

Activity: Argan kid meat production and processing

Production Units:

Situation	Present	Expected
Flocks supplying kids	1,444	1,444
Slaughter house	-	1

Investment on Average Flock - Present Situatio

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	72,222	115	8,299,818	-	-	-	-
Bucks	Own Family	Head	5,778	175	1,010,413	8	175	1,010,413	-
Facilities	Own Family	Flock	1,444	300	433,333	5	-	-	86,667
					9,743,564				86,667

Investment on Average Flock - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	79,444	115	9,129,800	-	-	-	-
Bucks	Own Family	Head	7,222	175	1,263,016	8	175	1,263,016	-
Facilities	Own Family	Flock	1,444	300	433,333	5	-	-	86,667
					10,826,149				86,667

Investment to serve 1444 Herders - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Slaughterhouse - Building	PMVCA	Unit	1	321,000	321,000	20	-	-	16,050
Slaughterhouse - Pen	PMVCA	Unit	1	5,400	5,400	10	-	-	540
Slaughterhouse - Lab	PMVCA	Unit	1	36,400	36,400	15	-	-	2,427
Slaughtering Equipment	PMVCA	Set	1	4,300	4,300	10	-	-	430
Informatic Equipment	PMVCA	Set	1	4,300	4,300	5	-	-	860
Furniture	PMVCA	Set	1	1,975	1,975	10	-	-	198
Training and TA	Project	Project	1	352,291	352,291	-	-	-	-
					725,666				20,504

PRESENT NET INCOME

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Argan kid meat production	Average Flock	2,381	1,444	1	3,438,857
Goat slaugther house	Facility	-	-	-	-
					3,438,857

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Argan kid meat production	Average Flock	2,104	1,444	1	3,039,748
Goat slaugther house	Facility	-	-	-	-
					3,039,748

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments 2,953,081

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Argan kid meat production	Average Flock	257	1,444	1	371,429
Goat slaugther house	Facility	-	-	-	-
					371,429

EXPECTED NET INCOME

Expected Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Argan kid meat production	Average Flock	3,147	1,444	1	4,546,121
Goat slaugther house	Facility	134,857	1	1	134,857
					4,680,978

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Argan kid meat production	Average Flock	2,871	1,444	1	4,147,011
Goat slaugther house	Facility	66,081	1	1	66,081
					4,213,093

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	4,105,922

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Argan kid meat production	Average Flock	257	1,444	1	371,429
Goat slaugther house	Facility	8,979	1	1	8,979
					380,407

Expected incremental results

Increase in Annual Net Income before Labor Costs	1,242,121
Increase in Annual Net Income considering Labor Costs	1,173,345
Increase in Annual Net Income considering Labor Costs and Annual Reserve to replace Inves	1,152,841
Increase in Employment Generated (Person/days)	8,979
Number of Participating Families	1,444
Per-Family Increase in Annual Net Income before Labor Costs	860
Per-Family Increase in Annual Net Income considering Labor Costs	812
Per-Family Increase in Annual Net Income considering Labor Costs and Annual Reserve	798
Per-Family Increase in Employment Generated (Person/days)	6

SENSITIVITY

Approximative IRR &NPV

Year	-	1	2	3	4	5	6	7	8	9	10
Start-up curve		20%	40%	60%	80%	100%	100%	100%	100%	100%	100%
Incremental Annual Flows	(1,808,251)	234,669	469,338	704,007	938,676	1,173,345	1,173,345	1,173,345	1,173,345	1,173,345	1,173,345
Residual value											1,250,918
Net Flows	(1,808,251)	234,669	469,338	704,007	938,676	1,173,345	1,173,345	1,173,345	1,173,345	1,173,345	2,424,264
IRR	37%										
Aggregate NPV	2,983,605										
Families	1,444										
NPV per family	2,066										

Switching Values

Critical Factors	Unit	Without Project	With Project		
			Minimum	Base	Min/Base
Number of goats	Head	50	55	55	1.00
Kids' sale price	Kg Carcass	8.06	8.86	8.86	1.00
Kid mortality	%	20%	5%	5%	1.00
Live weight of kid sold	Kg	13	13	13	1.00
Flocks supplying kids	Flock	1,444	1,444	1,444	1.00

Without Project	With Project			% Change
	Minimum	Base	Min/Base	
50	33	55	0.60	(40%)
8.06	5.30	8.86	0.60	(40%)
20%	39%	5%	7.80	680%
13	11	13	0.85	(15%)
370	370	1,444	0.26	(74%)

Case study:Nepal - Improvement of Goat Meat Production

Project issues

Goats form an integral part of the mixed crop/livestock farming system in Nepal.

There is high demand for goat meat, with consumption highest in urban centres.

There are 200 Indian traders operating the Kathmandu goat market.

The local goat marketing chain is undeveloped and there is no organised marketing on a commercial scale to meet the specific needs of markets.

Observations suggest that farmers are the price taker rather than price maker.

Main challenges

Project Goal: By 2016, importation of live goats is reduced by 30% and milk (from dairy cattle/buffalo) by 10% by involving 138,000 smallholders in value chain enterprises of goat and dairy for increasing their family income and nutrition level.

Initial situation

On an average, a typical farmer sells less than 2 goats annually.

Investments

The total project cost is estimated to be over USD 23 million. Heifer International is covering 75 % of the project cost and the remaining 25% will be leveraged through local government (VDC and DDCs), development partners (mainly PAF), Dairy industries and community organizations including SHGs and cooperatives.

FLOCK

Activity: Goat production

Production Unit:

Average Flock		
Situation	Present	Expected
Number of goats	3	8
Number of bucks	0.2	0.4
Adult mortality	5%	5%
Adult discard rate	20%	20%
Discarded goats	1	2
Fertility rate	50%	50%
Number of kidding goats	2	4
Number of kids per kidding	1.5	1.5
Number of kids born	3	6
Abortion and kid mortality	40%	20%
Number of weaned kids	2	5
Number of kids for replacement of adult goats	1	2
Number of kids sold	1	3
Liveweight of goat sold (kg)	25	25
Liveweight of buck sold (kg)	40	40
Liveweight of grown kids (kg)	25	25

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	1	1

Income per Average Flock per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Manure	Own Family	Ton	5.2	13.4	10.00	10.00	52	134
Kids sold	Middleman	Kg	25.0	75.0	4.12	4.12	103	309
Adult goats sold	Middleman	Kg	25.0	50.0	4.12	4.12	103	206
							258	649

Inputs per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Supplementary feeds	Local provider	Kg	260.6	577.8	0.15	0.15	39	87
Forage	Local provider	Ton	7.7	20.1	10.00	10.00	77	201
Health treatments	Local provider	Head	3.2	8.4	2.25	2.25	7	19
							123	307

Labor per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Flock care	Own Family	Person/day	45.6	45.6	1.89	1.89	86	86
							86	86

	Present	Expected
Net Income before Labor Cost per Average Flock per Year	134	342
Net Income considering Labor Cost per Average Flock per Year	48	256
Labor generated per Average Flock per Year (Person/day)	46	46

INVESTMENT

Activity: Goat production

Production Units:

Situation	Present	Expected
Flocks	138,000	138,000
Self Help Groups	-	690

Investment on Production Units - Present Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	414,000	103.0	42,642,000	-	-	-	-
Bucks	Own Family	Head	20,700	164.8	3,411,360	8	-	-	426,420
Infrastructure	Own Family	Flock	138,000	100.0	13,800,000	5	-	-	2,760,000
					59,853,360				3,186,420

Investment on Production Units - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	828,000	103.0	85,284,000	-	-	-	-
Bucks	Own Family	Head	55,200	164.8	9,096,960	8	-	-	1,137,120
Infrastructure	Own Family	Flock	138,000	100.0	13,800,000	5	-	-	2,760,000
					108,180,960				3,897,120

Investment for Common Use - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats distributed	Project	Head	276,000	103.0	28,428,000	-	-	-	-
Technical assistance	Project	Month	24,840	208.6	5,180,997				
					33,608,997				-

PRESENT NET INCOME

Present Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat production	Average Flock	134	138,000	1	18,503,040
					18,503,040

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat production	Average Flock	48	138,000	1	6,611,942
					6,611,942

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	3,425,522

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat production	Average Flock	46	138,000	1	6,296,250
					6,296,250

EXPECTED NET INCOME

Expected Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat production	Average Flock	342	138,000	1	47,255,340
					47,255,340

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat production	Average Flock	256	138,000	1	35,364,242
					35,364,242

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	31,467,122

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat production	Average Flock	46	138,000	1	6,296,250
					6,296,250

Expected incremental results

Increase in Annual Net Income before Labor Costs	28,752,300
Increase in Annual Net Income considering Labor Costs	28,752,300
Increase in Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	28,041,600
Increase in Employment Generated (Person/days)	-
Number of Participating Families	138,000
Per-Family Increase in Annual Net Income before Labor Costs	208
Per-Family Increase in Annual Net Income considering Labor Costs	208
Per-Family Increase in Annual Net Income considering Labor Costs and Annual Reserve	203
Per-Family Increase in Employment Generated (Person/days)	-

SENSITIVITY

Approximative IRR &NPV

Year	-	1	2	3	4	5	6	7	8	9	10
Start-up curve		25%	50%	75%	100%	100%	100%	100%	100%	100%	100%
Incremental Annual Flows	(81,936,597)	7,188,075	14,376,150	21,564,225	28,752,300	28,752,300	28,752,300	28,752,300	28,752,300	28,752,300	28,752,300
Residual value											69,648,600
Net Flows	(81,936,597)	7,188,075	14,376,150	21,564,225	28,752,300	28,752,300	28,752,300	28,752,300	28,752,300	28,752,300	98,400,900
IRR	24%										
Aggregate NPV	59,923,764										
Families	138,000										
NPV per family	434										

Switching Values

Critical Factors	Unit	Without Project	With Project		
			Minimum	Base	Min/Base
Number of goats	Head	3	8	8	1.00
Abortion and kid mortality	%	40%	20%	20%	1.00
Price of kids sold	Kg	4.12	4.12	4.12	1.00
Flocks served	Flock	138,000	138,000	138,000	1.00

Without Project	With Project			% Change
	Minimum	Base	Min/Base	
3	7	8	0.88	(13%)
40%	40%	20%	2.00	100%
4.12	2.6	4.12	0.63	(37%)
10,000	10,000	138,000	0.07	(93%)

FLOCK SIZE PROJECTION

		0	1	2	3	4	5	6	7	8	9	... 20
Stock												
Adult goats		**3**	5	6	7	8	8	8	8	8	8	8
Milking goats		2	3	3	4	4	4	4	4	4	4	4
Kids born		3	5	5	6	6	6	6	6	6	6	6
Kids alive		2	4	4	5	5	5	5	5	5	5	5
Changes												
Goats distributed		2	-	-	-	-	-	-	-	-	-	-
Kid mortality		1	1	1	1	1	1	1	1	1	1	1
Goats discarded (sold or consumed)		1	1	1	1	2	2	2	2	2	2	2
Kids sold or consumed		1	2	2	3	3	3	3	3	3	3	3
Female kids kept in flock		1	2	2	2	2	2	2	2	2	2	2
Annual growth of flock		**1.0**	**1.7**	**2.0**	**2.3**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**
Parameters												
Fertility rate		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Kids per kidding		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Annual mortality rate for kids		0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Annual discard rate for adult goats		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Proportion of kids sold or consumed		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Proportion of female kids ketp in flock		0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Source: Sample projection based on information provided by IGA and Heifer Intern

Case study: Rajasthan - Improvement of Goat Meat Production

Context: Project issues

A high and growing demand for goat meat.
The importance of traders.
Goats are mainly marketed for meat and skin in India.
Goat milk is mainly for auto consumption.
The importance of the market for muslim feasts.

Main challenges

Decreasing the mortality rate.
Improving the conformation of animals.
Improving the negociation capacity of the breeders and the selling price.
Managing the offer (animals are sold when cash is requested).
Develoing the local pure breeds.
Public veterinarian services (deworming and vaccination for PPR, enterotoxemia).

Initial situation

Low availability of fodder resources.
Low educational level of the breeders.
The small size of herds (often < 5 does).
The lack of supplies and services (limited vaccination and deworming).
A low input production system.
There are 33 local breeds identified.

Investments

Capacity building by creating a network of field guides and extension services.
Veterinarian services with the authorities.
Organization of the markets (through negociation with traders to weigh the animals).
Improving the market facilities.

FLOCK

Activity: Goat production

Production Unit:

Average Flock		
Situation	Present	Expected
Number of heads (female goats)	5	8
Number of heads (male goats)	1	1
Adult mortality	5%	5%
Adult discard rate	20%	20%
Discarded goats	1	2
Fertility rate	50%	50%
Number of kidding goats	3	4
Number of kids per kidding	1.5	1.5
Number of kids born	5	6
Milk per goat per cycle (lt)	0.40	0.60
Lactation period	140	168
Abortion and kid mortality	40%	20%
Number of weaned kids	3	5
Number of kids for replacement of adult goats	1	2
Number of kids sold	2	3
Liveweight of female sold (kg)	27	30
Liveweight of male sold (kg)	43	50
Liveweight of sold kid (kg) - less than 6 months old	6	10

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	1	1

Income per Average Flock per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Milk	Own Family	Lt	168.0	403.2	0.37	0.37	62	149
Kids sold	Middleman	Head	2.0	3.0	22.22	25.00	44	75
Adult goats sold	Middleman	Head	1.0	2.0	37.04	46.30	37	93
							144	317

Inputs per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Supplementary feeds	Local provider	Kg	70.0	268.8	0.19	0.19	13	50
Health treatments	Local provider	Head	6.0	9.0	2.22	2.78	13	25
							26	75

Labor per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Flock care	Own Family	Person/day	45.6	45.6	1.15	1.15	52	52
							52	52

	Present	Expected
Net Income before Labor Cost per Average Flock per Year	117	242
Net Income considering Labor Cost per Average Flock per Year	65	190
Labor generated per Average Flock per Year (Person/day)	46	46

INVESTMENT

Activity: Goat milk processing

Production Units:

Situation	Present	Expected
Flocks	2,990	2,990
Seld-help Groups	-	15

Investment on Production Units - Present Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	14,950	37.0	553,704	-	-	-	-
Bucks	Own Family	Head	2,990	37.0	110,741	8	37	110,741	-
Infrastructure	Own Family	Flock	2,990	324.1	968,981	5	130	387,593	116,278
					1,633,426				116,278

Investment on Production Units - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	23,920	46.3	1,107,407	-	-	-	-
Bucks	Own Family	Head	2,990	46.3	138,426	8	46	138,426	-
Infrastructure	Own Family	Flock	2,990	648.1	1,937,963	7	324	968,981	138,426
					3,183,796				138,426

Investment for Common Use - Expected Sit

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats distributed	Project	Head	5,980	46	276,852	-	-	-	-
Technical assistance	Project	Month	538	109	58,818				
					335,669				-

PRESENT NET INCOME

Present Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat production	Average Flock	117	2,990	1	351,048
					351,048

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat production	Average Flock	65	2,990	1	194,419
					194,419

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments 78,141

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat production	Average Flock	46	2,990	1	136,419
					136,419

EXPECTED NET INCOME

Expected Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat production	Average Flock	242	2,990	1	724,023
					724,023

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat production	Average Flock	190	2,990	1	567,394
					567,394

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	428,968

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat production	Average Flock	46	2,990	1	136,419
					136,419

Expected incremental results

Increase in Annual Net Income before Labor Costs	372,975
Increase in Annual Net Income considering Labor Costs	372,975
Increase in Annual Net Income considering Labor Costs and Annual Reserve to replace Inves	350,827
Increase in Employment Generated (Person/days)	-
Number of Participating Families	2,990
Per-Family Increase in Annual Net Income before Labor Costs	125
Per-Family Increase in Annual Net Income considering Labor Costs	125
Per-Family Increase in Annual Net Income considering Labor Costs and Annual Reserve	117
Per-Family Increase in Employment Generated (Person/days)	-

SENSITIVITY

Approximative IRR &NPV

Year	-	1	2	3	4	5	6	7	8	9	10
Start-up curve		33%	67%	100%	100%	100%	100%	100%	100%	100%	100%
Incremental Annual Flows	(1,886,040)	124,325	248,650	372,975	372,975	372,975	372,975	372,975	372,975	372,975	372,975
Residual value											1,605,741
Net Flows	(1,886,040)	124,325	248,650	372,975	372,975	372,975	372,975	372,975	372,975	372,975	1,978,716
IRR	16%										
Aggregate NPV	372,533										
Families	2,990										
NPV per family	125										

Switching Values

Critical Factors	Unit	Without Project	With Project		
			Minimum	Base	Min/Base
Number of goats	Head	5	8	8	1.00
Price of kids sold	Head	22.22	25.00	25.00	1.00
Milk per goat per day	Lt	0.40	0.60	0.60	1.00
Lactation period	Day	140	168	168	1.00
Abortion and kid mortality	%	40%	20%	20%	1.00
Flocks served	Flock	2,990	2,990	2,990	1.00

Without Project	With Project			% Change
	Minimum	Base	Min/Base	
5	7	8	0.88	(13%)
22.22	14.00	25.00	0.56	(44%)
0.40	0.47	0.60	0.78	(22%)
140	115	168	0.68	(32%)
40%	40%	20%	2.00	100%
370	370	2,990	0.12	(88%)

FLOCK SIZE PROJECTION

		0	1	2	3	4	5	6	7	8	9	... 20
Stock												
Adult goats		**5**	7	8	8	8	8	8	8	8	8	8
Milking goats		3	4	4	4	4	4	4	4	4	4	4
Kids born		5	6	6	6	6	6	6	6	6	6	6
Kids alive		3	5	5	5	5	5	5	5	5	5	5
Changes												
Goats distributed		**2**	-	-	-	-	-	-	-	-	-	-
Kid mortality		2	1	1	1	1	1	1	1	1	1	1
Goats discarded (sold or consumed)		1	1	2	2	2	2	2	2	2	2	2
Kids sold or consumed		2	3	3	3	3	3	3	3	3	3	3
Female kids kept in flock		1	2	2	2	2	2	2	2	2	2	2
Annual growth of flock		**1.0**	**1.4**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**
Parameters												
Fertility rate		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Kids per kidding		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Annual mortality rate for kids		0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Annual discard rate for adult goats		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Proportion of kids sold or consumed		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Proportion of female kids kept in flock		0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Source: Sample projection based on information provided by IGA and Heifer International

Case study: Tajikistan - Improvement of Mohair Production

Context: Project issues

Developing the access on high quality fiber market (mohair).

Developing cashmere product marketing.

Main challenges

To improve fiber quality.

To develop dehairing process.

To support collective organization and capacity building for business entrepreneurship.

To contact buyers.

To improve production systems and goat nutrition.

To develop selection process for fiber angora goats.

Initial situation

Low specialization.

Weak marketing.

Investments

Capacity and training equipment.

Develop associations and marketing infrastructure.

Extension services.

FLOCK

Activity: Mohair production

Production Unit:

Average Flock		
Situation	Present	Expected
Number of heads (female goats)	10	10
Number of heads (male goats)	1	1
Adult mortality	10%	10%
Adult discard rate	20%	20%
Discarded goats	2	2
Fertility rate	60%	60%
Number of kidding goats	6	6
Number of kids per kidding	1.5	1.5
Number of kids born	9	9
Mohair per goat per cycle (kg)	1.50	1.50
Milk per goat per cycle (kg)	1.14	1.14
Lactation period	70	70
Weaning rate	65%	65%
Number of weaned kids	6	6
Number of kids for replacement of adult goats	3	3
Number of kids sold	3	3
Liveweight of female sold (kg)	27	27
Liveweight of male sold (kg)	43	43
Liveweight of sold kid (kg) - less than 6 months old	6	6
Labor time required for Mohair shearing (minutes/goat)	20	20

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	1	1

Income per Average Flock per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Mohair	Potential	Kg	16.5	16.5	8.40	8.40	139	139
Milk	Middleman	Kg	480.0	480.0	0.05	0.05	24	24
Kids sold	Middleman	Head	3.0	3.0	12.00	12.00	36	36
Adult goats sold	Own Family	Head	2.0	2.0	2.40	2.40	5	5
							203	203

Inputs per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Supplementary feeds	Local provider	Kg	27.3	27.3	0.61	0.61	17	17
Forage	Local provider	Kg	1,588.0	1,588.0	0.05	0.05	79	79
Health treatments	Local provider	Head	11.0	11.0	1.00	1.00	11	11
							107	107

Labor per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Grazing	Sheperd	Head/Month	29.7	29.7	1.11	1.11	33	33
Flock care	Own Family	Head/Month	45.6	45.6	1.11	1.11	51	51
Mohair fiber shearing	Own Family	Person/day	0.5	0.5	1.11	1.11	1	1
							84	84

	Present	Expected
Net Income before Labor Cost per Average Flock per Year	96	96
Net Income considering Labor Cost per Average Flock per Year	12	12
Labor generated per Average Flock per Year (Person/day)	46	46

MOHAIR PROCESSING

Activity: Mohair processing

Production Unit:

Processing Unit		
Situation	Present	Expected
Supplying Families	-	334
Mohair supplied (kg)	-	5,511
Fine wool for the US&EU market / Mohair wool obtained	0%	16%
Yarn for the Russian market / Mohair wool obtained	0%	28%
Wool for local traders / Mohair wool obtained	0%	28%

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	-	1

Income per Processing Unit per Yea

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Fine fiber for US&EU market	USA	Kg	-	881.8	-	130.00	-	114,629
Yarn for Russian market	Russia	Kg	-	1,543.1	-	13.60	-	20,986
Fiber for local traders	Local trade	Kg	-	1,543.1	-	8.40	-	12,962
							-	148,577

Inputs per Processing Unit per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Mohair collected	Local Flocks	Kg	-	5,511.0	-	8.40	-	46,292
Transport to US&EU&Russia	Local provider	Kg	-	2,424.8	-	10.00	-	24,248
Taxes and duties	Government	Kg	-	881.8	-	10.00	-	8,818
Customs	Government	Kg	-	881.8	-	10.00	-	8,818
							-	88,176

Labor per Processing Unit per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Dehairing fine fiber for US&EU	Local Labor	Person/day	-	10,581.1	1.11	1.11	-	11,737
Scouring fine fiber for US&EU	Local Labor	Person/day	-	881.8	1.11	1.11	-	978
Carding fine fiber for US&EU	Local Labor	Person/day	-	881.8	1.11	1.11	-	978
Spinning fine fiber for US&EU	Local Labor	Person/day	-	20,280.5	1.11	1.11	-	22,496
Scouring other fiber	Local Labor	Person/day	-	1,543.1	1.11	1.11	-	1,712
Carding other fiber	Local Labor	Person/day	-	1,543.1	1.11	1.11	-	1,712
Spinning other fiber	Local Labor	Person/day	-	9,258.5	1.11	1.11	-	10,270
							-	49,882

	Present	Expected
Net Income before Labor Cost per Processing Unit per Year	-	60,401
Net Income considering Labor Cost per Processing Unit per Year	-	10,518
Labor generated per Processing Unit per Year (Person/day)	-	44,970

INVESTMENT

Activity: Mohair production, processing and marketing

Production Units:

Situation	Present	Expected
Flocks involved	334	334
Processing units	1	1

Investment on Production Units - Present Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	3,340	12.0	40,080	-	-	-	-
Bucks	Own Family	Head	334	12.0	4,008	8	2	802	401
Infrastructure	Own Family	Flock	334	16.6	5,557	5	-	-	1,111
					49,645				1,512

Investment on Production Units - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	3,340	12.0	40,080	-	-	-	-
Bucks	Own Family	Head	334	12.0	4,008	8	2	802	401
Infrastructure	Own Family	Flock	334	16.6	5,557	5	-	-	1,111
					49,645				1,512

Investment for Common Use - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Carding machine	Project	Unit	1	2,000	2,000	20	200	200	90
Infrastructure	Project	Unit	1	3,000	3,000	20	-	-	150
Marketing support	Project	Month	12	417	5,000				
Technical assistance	Project	Month	36	41	1,458				
					11,458				240

PRESENT NET INCOME

Present Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Mohair production	Average Flock	96	334	1	32,188
Mohair processing	Processing Unit	-	1	-	-
					32,188

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Mohair production	Average Flock	12	334	1	4,100
Mohair processing	Processing Unit	-	1	-	-
					4,100

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	2,588

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Mohair production	Average Flock	46	334	1	15,392
Mohair processing	Processing Unit	-	1	-	-
					15,392

EXPECTED NET INCOME

Expected Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Mohair production	Average Flock	96	334	1	32,188
Mohair processing	Processing Unit	60,401	1	1	60,401
					92,588

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Mohair production	Average Flock	12	334	1	4,100
Mohair processing	Processing Unit	10,518	1	1	10,518
					14,618

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	12,866

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Mohair production	Average Flock	46	334	1	15,392
Mohair processing	Processing Unit	44,970	1	1	44,970
					60,362

Expected incremental results

Increase in Annual Net Income before Labor Costs	60,401
Increase in Annual Net Income considering Labor Costs	10,518
Increase in Annual Net Income considering Labor Costs and Annual Reserve to replace Inves	10,278
Increase in Employment Generated (Person/days)	44,970
Number of Participating Families	334
Per-Family Increase in Annual Net Income before Labor Costs	181
Per-Family Increase in Annual Net Income considering Labor Costs	31
Per-Family Increase in Annual Net Income considering Labor Costs and Annual Reserve	31
Per-Family Increase in Employment Generated (Person/days)	135

SENSITIVITY

Approximative IRR &NPV

Year	-	1	2	3	4	5	6	7	8	9	10
Start-up curve		33%	67%	100%	100%	100%	100%	100%	100%	100%	100%
Incremental Annual Flows	(1,886,040)	124,325	248,650	372,975	372,975	372,975	372,975	372,975	372,975	372,975	372,975
Residual value											1,605,741
Net Flows	(1,886,040)	124,325	248,650	372,975	372,975	372,975	372,975	372,975	372,975	372,975	1,978,716
IRR	16%										
Aggregate NPV	372,533										
Families	2,990										
NPV per family	125										

Switching Values

Critical Factors	Unit	Without	With Project		
		Project	Minimum	Base	Min/Base
Number of goats	Head	5	8	8	1.00
Price of kids sold	Head	22.22	25.00	25.00	1.00
Milk per goat per day	Lt	0.40	0.60	0.60	1.00
Lactation period	Day	140	168	168	1.00
Abortion and kid mortality	%	40%	20%	20%	1.00
Flocks served	Flock	2,990	2,990	2,990	1.00

Without	With Project			% Change
Project	Minimum	Base	Min/Base	
5	7	8	0.88	(13%)
22.22	14.00	25.00	0.56	(44%)
0.40	0.47	0.60	0.78	(22%)
140	115	168	0.68	(32%)
40%	40%	20%	2.00	100%
370	370	2,990	0.12	(88%)

Case study: Venezuela - Lara and Falcon - Intensification of Goat Milk Production

Project issues

Create the basic conditions for intensification of production systems.

Investments to build water catchments for communal use for animal/human consumption and fodder production.

Capitalize on farmers' interest in shifting their extensive production systems toward intensified production systems.

Take advantage of the opportunity of increasing demand for goat products.

Consolidate the experience of successful pilot projects through strategic outscaling of technologies.

Support appropriate policies for sustainable use of water catchments and native vegetation.

Improve marketing aspects that benefit goat producers and small farmers in general.

Main challenges

Dependency on unrestricted communal grazing of rangeland.

Poverty and lack of resources. Migration in search of other income generating - employment opportunities.

Limited negotiating power and poor organization of farmers

Lack of policies on: use of communal lands; product quality and safety; use of common water reservoirs.

Rangeland degradation for over-grazing

Livestock thievery

Initial situation

Lack of water for forage production. Goat production systems largely rely on native semi-arid vegetation.

There is a well developed road network which connet rural areas with urban centers in the two states.

The National Agricultural Research Institiute (INIA) has regional centers in each of the two states.

Two universities link with INIA technical assistance and education.

INIA developed models for goat production intensification to overcome natural constraints.

In extensive and semi-intensive goat systems, milk production averages 0.7 kg/doe/day for 210 days/year on average.

Goat milk is generally processed into white cheese in an artisanal manner.

Other products include: condensed milk jam, ricotta and yougurt and fresh milk.

Investments

On-farm investments include: flock and flock facilities, processing facilities and equipment, irrigation system

Communal investments include: water catchment and technical assistance.

FLOCK

Activity: Goat milk production

Production Unit:

Average Flock		
Situation	Present	Expected
Number of heads (female goats)	45	45
Number of heads (male goats)	2	2
Adult mortality	8%	8%
Adult discard rate	20%	20%
Discarded goats	9	9
Fertility rate	83%	83%
Number of milking goats	37	37
Number of kids per kidding	1.4	1.4
Number of kids born	52	52
Milk produced per goat per day (lt)	0.66	1.86
Milking period (days)	210	210
Abortion and kid mortality	36%	18%
Number of weaned kids	33	43
Number of kids for replacement of adult goats	13	13
Number of kids sold	20	30
Liveweight of female sold (kg)	28	28
Liveweight of male sold (kg)	40	40
Liveweight of sold kid (kg) - less than 6 months old	6	6
Labor time required for milking (minutes/lt)	5	5

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	1	1

Income per Average Flock per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Goat milk produced	Processing	Lt	5,128.2	14,452.2	0.81	0.81	4,174	11,763
Kids fattened and sold	Local Butcher	Kg Liveweight	120.0	180.0	3.25	3.25	390	585
Adult goats sold	Local Butcher	Kg Liveweight	252.0	252.0	2.35	2.35	592	592
							5,156	12,941

Inputs per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Concentrate for milking goats	Local provider	Kg	5,374.3	13,513.0	0.45	0.45	2,428	6,106
Other feeds	Local provider	Kg	-	3,085.7	-	0.40	-	1,238
Mineral salt	Local provider	Kg	23.5	23.5	0.19	0.19	4	4
Forage	Local provider	Bale	333.0	444.3	2.33	2.33	774	1,033
Forage	Own Farm	Bale	-	730.0	2.33	2.33	-	1,698
Health treatments	Local provider	Head	47.0	47.0	1.55	1.55	73	73
							3,280	10,152

Labor per Average Flock per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Flock care	Own Family	Person/day	91.3	91.3	9.30	9.30	849	849
Goat milking	Own Family	Person/day	53.4	150.5	9.30	9.30	497	1,400
							1,346	2,249

	Present	Expected
Net Income before Labor Cost per Average Flock per Year	1,876	2,789
Net Income considering Labor Cost per Average Flock per Year	531	540
Labor generated per Average Flock per Year (Person/day)	145	242

MILK PROCESSING

Activity: Goat milk processing

Production Unit:

Processing Unit		
Situation	Present	Expected
Flocks supplying milk	1	1
Milk produced (lt)	5,128	14,452
Proportion of milk processed into condensed milk jam	20%	80%
Milk processed into condensed milk jam (lt)	1,026	11,562
Condensed milk jam per lt of milk (gr)	235	235
Proportion of milk processed into cheese	80%	20%
Milk processed into cheese (lt)	4,103	2,890
Milk required per kg of cheese (lt)	7	7
Milk processed per person/day of labor (lt)	30	30

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	1	1

Income per Processing Unit per Year

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Condensed milk jam	Urban Market	Pack of 100 gr	2,410.0	27,170.0	0.93	0.93	2,242	25,274
Cheese	Local Market	Kg	586.1	412.9	8.14	8.14	4,770	3,361
							7,012	28,635

Inputs per Processing Unit per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Milk	Own Flock	Lt	5,128.2	14,452.2	0.81	0.81	4,174	11,763
Rennet	Local provider	Lt	5.7	4.0	10.47	10.47	60	42
Salt	Local provider	Kg	74.1	52.2	0.19	0.19	14	10
Sugar	Local provider	Kg	341.9	3,853.9	0.93	0.93	318	3,585
Spices	Local provider	Bag	57.0	160.6	1.40	1.40	80	224
Container	Local provider	Unit	2,531.0	28,529.0	0.07	0.07	177	1,990
Wrapping plastic	Local provider	Roll of 1500 m	0.2	1.8	40.70	40.70	7	74
Labels	Local provider	Unit	2,996.1	27,582.9	0.06	0.06	174	1,604
Gas	Local provider	Cylinder of 10 kg	34.0	385.0	1.00	1.00	34	385
Sanitizer	Local provider	Lt	28.5	80.3	11.36	11.36	324	912
Transport	Local provider	Trip	2.4	27.2	11.63	11.63	28	316
							5,388	20,905

Labor per Processing Unit per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Processing	Own Family	Person/day	170.9	481.7	9.30	9.30	1,590	4,481
							1,590	4,481

	Present	Expected
Net Income before Labor Cost per Processing Unit per Year	1,624	7,730
Net Income considering Labor Cost per Processing Unit per Year	34	3,249
Labor generated per Average Processing Unit per Year (Person/day)	171	482

FORAGE

Activity: Forage Production

Production Unit:

Average Plot		
Situation	Present	Expected
Irrigated area (ha)	-	1.0
Yield per cycle (bales per ha)	-	730

Production Cycle:

One Year		
Situation	Present	Expected
Number of cycles per year	-	1

Income per Average Family Plot per

Item	Market	Unit	Quantity		Unit Price		Total Income	
			Present	Expected	Present	Expected	Present	Expected
Forage	Own Flock	Bale	-	730.0	2.33	2.33	-	1,698
							-	1,698

Inputs per Average Family Plot per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Fuel for pomp	Local provider	100 lt	-	255.5	1.23	1.23	-	315
Oil for pomp	Local provider	Lt	-	108.0	2.56	2.56	-	276
Urea	Local provider	Kg	-	200.0	0.29	0.29	-	58
							-	649

Labor per Average Family Plot per Year

Item	Source	Unit	Quantity		Unit Cost		Total Cost	
			Present	Expected	Present	Expected	Present	Expected
Pasture care and cutting	Own Family	Person/day	-	91.3	9.30	9.30	-	849
							-	849

	Present	Expected
Net Income before Labor Cost per Average Family Plot per Year	-	1,049
Net Income considering Labor Cost per Average Family Plot per Year	-	200
Labor generated per Average Family Plot per Year (Person/day)	-	91

INVESTMENT

Activity: Goat milk processing

Production Units:

Situation	Present	Expected
Flocks supplying milk	2	2
Processing units	2	2
Average Plots	-	2

Investment on Production Units - Present Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	90	173.3	15,593	-	-	-	-
Bucks	Own Family	Head	4	355.8	1,423	8	94	376	131
Flock facilities	Own Family	Flock	2	2,790.7	5,581	20	-	-	279
Fences	Own Family	Plot	2	4,651.2	9,302	20	-	-	465
Processing facilities	Own Family	Unit	2	2,325.6	4,651	20	-	-	233
Refrigerator	Own Family	Unit	2	441.9	884	10	44	88	80
Stove	Own Family	Unit	2	465.1	930	10	47	93	84
Processing equipment	Own Family	Set	2	139.5	279	4	-	-	70
					38,644				1,341

Investment on Production Units - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Goats	Own Family	Head	90	255.8	23,023	-	-	-	-
Bucks	Own Family	Head	4	581.4	2,326	8	94	376	244
Flock facilities	Own Family	Flock	2	2,790.7	5,581	20	-	-	279
Fences	Own Family	Plot	2	4,651.2	9,302	20	-	-	465
Processing facilities	Own Family	Unit	2	2,325.6	4,651	20	-	-	233
Refrigerator	Own Family	Unit	2	441.9	884	10	44	88	80
Stove	Own Family	Unit	2	465.1	930	10	47	93	84
Processing equipment	Own Family	Set	2	139.5	279	4	-	-	70
Water storage tank	Own Family	Unit	2	1,162.8	2,326	20	-	-	116
Water pump	Own Family	Unit	2	3,488.4	6,977	10	349	698	628
Irrigation piping	Own Family	Mt	1,200	3.0	3,628	4	-	-	907
Pasture establishment	Own Family	Ha	2	523.3	1,047	4	-	-	262
Forage cutter	Own Family	Unit	2	930.2	1,860	4	93	186	419
					62,814				3,785

Investment for Common Use - Expected Situation

Items	Source	Unit	Quantity	Unit Cost	Total Cost	Useful Life	Salvage Unit Value	Salvage Total Value	Annual Reserve
Technical assistance	Project	Month	24	334.9	8,037	20			
					8,037				-

PRESENT NET INCOME

Present Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	1,876	2	1	3,753
Goat milk processing	Processing Unit	1,624	2	1	3,248
Forage Production	Average Plot	-	-	-	-
					7,001

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	531	2	1	1,061
Goat milk processing	Processing Unit	34	2	1	68
Forage Production	Average Plot	-	-	-	-
					1,129

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	(211)

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat milk production	Average Flock	145	2	1	289
Goat milk processing	Processing Unit	171	2	1	342
Forage Production	Average Plot	-	-	-	-
					631

EXPECTED NET INCOME

Expected Situation

Annual Net Income before Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	2,789	2	1	5,578
Goat milk processing	Processing Unit	7,730	2	1	15,460
Forage Production	Average Plot	1,049	2	1	2,098
					23,136

Annual Net Income considering Labor Costs

Activity	Production Unit	Net Income per Production Unit	Number of Production Units	Number of Cycles per Year	Total Annual Net Income
Goat milk production	Average Flock	540	2	1	1,079
Goat milk processing	Processing Unit	3,249	2	1	6,498
Forage Production	Average Plot	200	2	1	400
					7,977

Annual Net Income considering Labor Costs and Annual Reserve to replace Investments	4,192

Annual Employment Generated

Activity	Production Unit	Person/days per Production Unit	Number of Production Units	Number of Cycles per Year	Annual Labor (Person/days)
Goat milk production	Average Flock	242	2	1	484
Goat milk processing	Processing Unit	482	2	1	963
Forage Production	Average Plot	91	2	1	183
					1,630

Expected incremental results

Increase in Annual Net Income before Labor Costs	16,134
Increase in Annual Net Income considering Labor Costs	6,847
Increase in Annual Net Income considering Labor Costs and Annual Reserve to replace Inves	4,403
Increase in Employment Generated (Person/days)	998
Number of Participating Families	2
Per-Family Increase in Annual Net Income before Labor Costs	8,067
Per-Family Increase in Annual Net Income considering Labor Costs	3,424
Per-Family Increase in Annual Net Income considering Labor Costs and Annual Reserve	2,202
Per-Family Increase in Employment Generated (Person/days)	499

SENSITIVITY

Approximative IRR &NPV

Year	-	1	2	3	4	5	6	7	8	9	10
Start-up curve		33%	67%	100%	100%	100%	100%	100%	100%	100%	100%
Incremental Annual Flows	(32,207)	2,282	4,565	6,847	6,847	6,847	6,847	6,847	6,847	6,847	6,847
Residual value											(272)
Net Flows	(32,207)	2,282	4,565	6,847	6,847	6,847	6,847	6,847	6,847	6,847	6,575
IRR	12%										
Aggregate NPV	446										
Families	2										
NPV per family	223										

Switching values

All factors are close to critical values