ESAP Proceedings

Institutional arrangements and challenges in market-oriented livestock agriculture in Ethiopia

Proceedings of the 14th annual conference of the Ethiopian Society of Animal Production (ESAP) held in Addis Ababa, Ethiopia, September 5–7, 2006

Part I: Plenary Session

Ethiopian Society of Animal Production
P.O. Box 80019, Addis Ababa, Ethiopia

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Welcome Address

Dr. Tadele Dessie (ESAP presdent)

H.E.Dr. Abera Deressa,
State Minister, Ministry of Agriculture and Rural Development (MOARD)
Distinguished Invited Guests,

Representatives of:

- Farmers
- Pastoralists

Development practitioners,

Entrepreneurs,

Think-thanks,

Conference Participants,

Ladies and Gentlemen:

On behalf of the executive committee of the Ethiopian Society of Animal production (ESAP) in particular and the ESAP family in general, I feel deeply honored and overwhelmingly pleased when I welcome each and every one of you to this robust gathering of the 14th Annual Conference of our Society.

Ladies and Gentlemen:

Ethiopia is endowed not only with large but diverse livestock resources. However, Ethiopia is using its rich endowment to little advantage. For many years livestock production in Ethiopian- and indeed agriculture more generally was seen as a poor investment for development. But after years of being ignored, livestock issues are beginning to be put back on Ethiopia's development agenda. Livestock are being recognized as essential assets for livelihoods; as key to moving out of poverty; as a way into lucrative markets; as a source of forging exchange; as well as important cultural resources, social safety nets and means of saving.

Today, however, a new 'livestock revolution', fuelled by a massive growth in global demand for food of animal origin (milk, meat, eggs), is being hailed, with important development implications for developing world including Ethiopia. Market is in the center of this new revolution as it is demand driven.

Markets provide the vital link between activities along the value chain, and are often the driving force for the improvement of the production-to consumption linkages; these policies must be developed to specifically strengthen livestock markets in Ethiopia. Hence, constraints at various points along the value chin are a concern for producers, processors, traders, input providers and consumers alike.

In the past, the debate on the type of appropriate interventions for the improvement of livestock in Ethiopia was limited to technical innovations and local adoption to enhance production and

productivity. But very little attention was given to the policy and institutional issues that play a pivotal role in determining the overall success or failure of the sector.

Today, we all recognize that building effective policies and institutions are necessary first steps in strengthening innovation processes, tapping new commercial opportunities, and tackling the challenges facing the poor. This implies the need for closer examination of how existing policies, institutions and stakeholders interact, and how they influence the development of the livestock sector.

This issue is urgent because of Ethiopia's pressing need to increase production and value-addition to meet both domestic and global demand in a rapidly changing and highly competitive world. Currently there are indications that local demand for foods of livestock origin (e.g., milk, chevron, beef, mutton, etc) is increasing in urban centers, while new, global opportunities are expanding for similar products (e.g., beef, dairy, skin, and hides). These trends and several initiatives undertaken in response to these, present real opportunities for livestock producers, traders, processors, exporters and all others involved in the sector.

Ladies and Gentlemen:

It is being argued that Ethiopia can and should capitalize on its enormous wealth in livestock, gain access to new markets opening up in Asia and particularly the relatively affluent and nearby Middle East, and expand exports to Africa, Europe and North America. This could be the key to the much-needed growth impetus for agricultural economy. This positive vision is picked up by many recent global, continual, regional and national policy documents and initiatives.

Currently in Ethiopia a number of national livestock/agricultural development initiatives/ projects are being spawned that are worth mentioning:

1. A 20 year Livestock maser plan development is underway
2. Pastoralist Community Development Project (PCDP)
3. PLI
4. Ethiopian Dairy development project
5. Sanitary and Phytosanitary (SPS)
6. Ethiopian sheep and goat improvement project
7. Skin and hide improvement project
8. SNVs-BOAM's programmed, a program focusing on the capacity building of business associations, and implementing activities on the value chain development in milk and milk products and honey and wax sub-sectors.
9. IPMS-Ethiopia
10. Pro-poor livestock policy initiative of FAO

Are some to mention

Ladies and Gentlemen:

In the crowded and competitive world of development, this is unprecedented activity and interest for what has been seen in the recent past as a very marginal, almost no-go area.

And hope we all agree to ask one question: is livestock a 'sunrise sector' in Ethiopia?

But underneath the smart rhetoric, the slick mission statements and funding promises, what are some of the underlying debates, assumptions and trade-offs? What competing perspectives on ways forward for livestock development are being explicitly-and implicitly- discussed? Is this a return to the 1970s and 1980s hey-day of pastoral development when the focuses was on

supporting traditional production systems for enhancing livelihoods, or are there new agendas on the table?

Distinguished Guests and Dear Participants

It was with the intension of helping to address some of these questions in light of experiences from the national and global environment that this year's conference theme has been committed to the "Institutional arrangements and challenges in market oriented livestock agriculture in Ethiopia".

In addition, new to our society, there Brown Bag Sessions are organized on the 5th, 6th, 7th September during lunch times whereby papers presented and discussed by identified discussants and conference participants focusing on three pertinent issues of livestock agriculture in Ethiopia and in the region:

The trust of this conference include:

1. Examine the provision of animal health and other services, and evaluate the extent to which these services are sufficiently and responsively meeting the needs of different stakeholders (Producers, Processors, trades and consumers) in light of market requirements and expectations.
2. Articulate the essential steps in developing an effective delivery system for market-oriented, demand-driven services that stimulated investment in livestock enhance farmer capacity to develop livestock enterprises, and generate pro-poor benefits for small-scale livestock farmers and pastoralists.

In order to address the above, the issues must be examined from different angles and perspectives. Government ministries and agencies, private companies and entrepreneur, the Civil Society Organization (CSOs)/NGO community and professional associations including ESAP should and can contribute a lot in sharing knowledge, developing appropriate policies, and formulating innovative institutional arrangements to develop the livestock sector.

Ladies and Gentlemen:

After analyzing the opportunities treats, challenges we in the livestock sector development is facing, the EC committee of ESAP raised pertinent questions. Such as should we continue as we are or do we need to transform our selves as a society that contribute more in the livestock sector development supporting other stakeholders?

Ladies and Gentlemen:

The future of the Ethiopian livestock industry lies greatly on the commitment of those of us, professionals, serving the research, development education, private sector, policy and other sectors to change the above challenges into opportunities and exploit existing above- indicated opportunities to the benefit of the economic development of the nation.

Ladies and Gentlemen:

In order to help answer the above concern, be ESAP EC commissioned a strategic plan and management study supported by SWOT analysis. In short the outcomes of the assessment are:

- On its past performances and achievements, ESAP as a professional society successfully met the objectives set when it was established.
- More opportunities are clearly visible for ESAP and its members to play key role in the national livestock development arena in addition to its original objectives

- ESAP requires re-energization.

And concluded that the future of the Ethiopian livestock industry lies greatly on the committeemen of those of us, professionals, and serving I research, development, challenges into opportunities and exploit existing above-indicated opportunities to the benefit of the economic development of the nation.

And EC initiated a transformation process.

Dear Participants:

ESAP is the transformation process with the vision to actively involve in

- Knowledge management to be a national and regional warehouse of development/research information.
- Public- private partnership that is to play a role in establishing the link amongst major stakeholders and help bridge the weak link between academia/experts and policy makers, and also between producers and marketers
- Working on advocacy and networking

If ESAP is do the above, it needs huge support from public institutions(e.g.MOARD), the privates sector and NGOs should make significant investment in assisting ESAP and members should also be engaged in formulating and implementing the new visions of ESAP.

More presentations and discussions are to come on this issue in the courses of the conference.

Last bun by any means not least, I would like to thank all those organizations and individuals that in one way or another contributed to the success of this conference organization and help us to undertake our mission as a professional society. Special thanks go to the management of EIAR for allowing us to utilize this hall with its facilities.

I thank for your attention

Opening Address

H.E.Dr. Abera Deressa,
State Minister of Agriculture and Rural Development

Mr. Chairman
Dear distinguished guests,
Participants,
Ladies and Gentlemen,

Distinguished Guests,

Conference Participants,

Ladies and Gentlemen,

It is indeed an honor and a great pleasure for me to be amongst you to officiate the opening of the 14th Annual conference of the Ethiopian Society of Animal Production (ESAP).

Agriculture is the backbone of the Ethiopian economy. However, absence of a clear development polity framework coupled with the command economy that prevailed for 17 years in the last regime remained to be the major constraint for the development of this sector. Therefore, the government of the Federal Democratic Republic of Ethiopia gave top priority to solve the above two key development bottlenecks. The establishment of federalism and the replacement of the command economy by the market economy were two crucial milestones that were made in the early 1990s to bring about economic development in the country.

In an agrarian economy on which 85% of the population depended, the economic development is unthinkable unless and otherwise agriculture development takes the lead. That is why the Federal Democratic Republic of Ethiopia developed a strategy known as Agriculture Development Lead Industrialization (ADLI) in the early 1990s.

The Rural development Policy and Strategy was then put in place to pave the way for the transformation of Ethiopia's agriculture from subsistence to market oriented. The Rural Development Policy and Strategy underlines the advantage of the agro-ecological diversity for both specialization and diversification in market-oriented agricultural production.

After the Rural Development Policy and strategy came into being different technology packages were prepared to transform subsistence agricultural into market-oriented. These packages have been implemented since 1992/93 and they have ensured to encouraging impacts.

A five year Plan for Accelerated Sustainable Development to End Poverty (PASDEP) has also been prepared based on the market-oriented agricultural development policy and is being implemented. It is, therefore, due to the clear economic policy and strategy framework that the country came out of the economic and social stagnation and started to register overall economic growth over the last three years.

However, a lot remains to be done to scale up the encouraging results that have been registered so far and bring about a significant impact on the food security and poverty issues that still are menacing the country and to meet the objectives of the Millennium Development Goal, which will require us to register a double digit annual economic growth.

Distinguished Guests,

Ladies and Gentlemen,

Our development issues are many and widely spread. However, as the resources that are at our disposal are very limited, it goes without saying that we cannot address them all at once. Therefore, it is very important to make sure that development interventions consider issues according to their priority. It is also important to avoid duplication of effort, identify and exploit areas of synergy and complementarities and formulate strategies to exploit them right from the very beginning of any intervention.

Professional societies and their members in their respective responsibilities, have a role, through their advisory services, in ensuring that identification of intervention areas, as well as preparation and implementation of development interventions are made according to government priorities. It has been brought to my attention that the theme of this conference is "Institutional Arrangements and Challenges in Market-Oriented Livestock Agriculture in Ethiopia". This theme is appropriate and timely and hence deserves due attention.

Now the market economy has transformed the world into a global village. So, inter-dependency and the need for mutual existence have become as important not only for all institutions in a given country but also for all peoples and nations across the globe as never before. I a globalization era, the economy of any nation can grow in a sustainable manner only if it is market-oriented. Cognizant of the global market environment, the government of Ethiopia has developed, as indicated above, key policy framework to pave the way for the creation of a market oriented production system in all economic sectors. Power has been devolved not only to the regions but further down to the weredas or districts. There are many constraints that need to be addressed before the full-scale result of these policy interventions is realized.

Hence identifying key market issues in agriculture in general and in the livestock sub-sector in particular, undertaking an in-depth discussion on these issues giving priority to those that are cross-cutting and come up with concrete recommendations that would be used as input for accelerated development are key issues that deserve due attention. Such recommendations would give impetus not only to government but also to non-governmental organizations as well as to our development partners in their future short and long-term development interventions.

Distinguished Gusts,

Ladies and Gentlemen,

Recommendations that emanate from this and such others are highly valued because they would be established after a thorough diagnosis of the development issues and exhaustive assessment of the options to address them.

The fact that the demand for livestock products is increasing and will continue to increase at a rate much higher than that of food grains is both an opportunity and a challenge for Ethiopia. An opportunity because there is high potential to increase livestock production and productivity and exploit the comparative advantage the country has in the region and beyond as it is surrounded by countries that have high demand for livestock products.

On the other hand, the challenge the sector is faced with is the low productivity due manly to prevalence of a very extensive livestock production system, lack of efficient livestock marketing system, (including availability of and access to market information, livestock transport and health services), lack of market infrastructure and lack of or inadequate effort in genetic improvement.

Distinguished Guests,

Ladies and Gentlemen,

I would like to take this opportunity to express my deepest appreciation to ESAP and its partners for creating such a forum and all actors involved in this conference for their ever-increasing contribution to address issues of the livestock development sub-sector. The government supports such initiatives and I would like to assure you that it will continue to do so to enhance the enabling environment that has been created so that ESAP would fully realize its vision and goals in encouraging its role in the development t of livestock sector.

With due appreciation to the efforts you have been making so far, I would like to underline that more pro-active involvement is expected in terms of working closely with the Federal and Regional Governments identifying, prioritising, formulating, implementing, monitoring and evaluating livestock development interventions to ensure sustainability. I very much hope that ESAP would play a big role in this regard by brining together all actors not only once a year but as frequently as the need arises.

Finally, wishing all conference participants and ESAP partners successful deliberations and looking forward to your concrete recommendations I would like to declare this 14th annual conference officially open.

Thank you

Speech of the invited farmer

ስሜ ጌትነት ሞላ ሲሆን የመጣሁት ከአማራ ክልል ከሰሜን ጎንደር መስተዳደር ዞን ከአዘዞ ተክለሃይማኖት ቀበሌ ሥራዬም አርሶ አደር ነው፡፡

በቅድሚያ እዚህ ቦታ ተገኝቼ የራሴን የህይወት ተሞክሮ እንዳቀርብ ለተሰጠኝ እድል አመሰግናለሁ፡፡

1. ከፕሮጀክቱ በፊት እተዳደርበት የነበረው ስራና የኑሮ ሁኔታ በአጭሩ ባስቀምጠው በአዘዞ ቀበሌ አስተዳደር ልዩ ስሙ አይራ ጎጥ ኑዋሪ ሲሆን የተቀናጀ የእንስሳት ሃብት ልማት ፕሮጀክት በቀበሌያችን ስራ ከመጀመሩ በፊት መተዳደሪያዬ የነበረው 3 ቃዳ መሬት ላይ በቀንጃ በማረስ አመት ጠብቄ ባገኘሁት ምርት የተወሰውን ለቀለብ የተወሰነውን ምርት በመሸጥ ከሞለ ጐደል ቤተሰቦቼን በችግር አስተዳድር ነበር፡፡

2. ከፕሮጀክቱ ከታቀፍኩበት ጊዜና የሰራሀቸው ስራዎች ለማስቀመጥ ያህል የተቀናጀ የእንስሳት ሃብት ልማት ፕሮጀክት በቀበሌያችን ስራ የጀመረው በ1990 ዓ.ም ነበር፡፡ እኔ በፕሮጀክቱ ተሳትፊ የሆንኩት በ1992 ዓ.ም ሲሆን የቀበሌው ህብረተሰብ የፕሮጀክቱ ወኪል ገበሬ ሆኜ እንዳገለግል በመረጠኝ መስረት ሁለት ዓመት በማገልገሌ የበለጠ በፕሮጀክቱም ሆነ በወረዳው ባለሙያዎች በሚደረግልኝ ስልጠናና የሙያ እገዛና ድጋፍ ኘ ሮጀክቱ የሚሰራቸው ስራዎች እንዳውቅ አቅም የፈጠረልኝ በመሆኑ ግንባር ቀደም በመሆን በእንስሳት ዕርባታና በእንስሳት ማድለብ ስራዎች በመስራት ላይ እገኛለሁ፡፡

3. በስራው ያመጣኋቸው ለውጦች ከአፈራሁት ሃብትና በቤት ውስጥ አያያዝና አመጋገብ ከታየው የኑሮ መሻሻል ሲታይ በፕሮጀክቱ በወረዳ ባለሙያዎች በተደረገልኝ የሙያ፣ የስልጠና ድጋፍና በፕሮጀክት በመንግስት በተመቻቸልኝ የብድር አገልግሎት ባገኘሁት ገንዘብ በ1992 ዓ.ም ስራውን ስጀምር ከ2 እስክ 4 በሬዎችን አደልብ የነበርኩኝ በዚህ ሁለት ዓመታት የማድለብ አቅሜን በማሣደግ በዓመት 120 በሬዎችንና 50 በጐችን አድልቤ በመሸጥ ከ30 ሺ እስከ 50 ሺ ገቢ በማግኘት የአፈራሀቸው ሃብትና ያሳየሁት የኑሮ መሻሻል ከዚህ በታች እንዳስቀመጥኩት ነው፡፡

   - ከሣር ቤት መደ ቆርቆሮ ቤት ለመሸጋገር በቅቻለሁ፣
   - ሞባይል ገዝቻለሁ
   - ዘመናዊ የቤት ዕቃዎት አሟልቻለሁ
   - ልጆቼን በአግባቡ በመያዝ ትምህርት አስተምራለሁ
   - የቁጠባ ሂሳብ ከፍቻለሁ 3000 ሺ ብር አስቀምጫለሁ
   - የውሃ መሳቢያ ሞተር ገዝቻለሁ
   - አምስት የተሻሻለ ዝርያ ያላቸው የወተት ላሞች ገዝቻለሁ

4. የወደፊት ዕቅዱን ተግባራዊ ለማድረግ የተፈጠረ አደረጃጀት

አሁን ካለሁበት ደረጃ በ1999 ዓ.ም 5 የተሻሻሉ የወተት ከብት ላሞችና 180 በሬዎች ለማድለብ 630 ኩንታል የተለያዩ መኖዎችንና ሁለት ክምር ድርቆሽ በመግዛት የበለጠ በእንስሳት እርባታና ማድለብ ስራ ለመሰማራት ዕቅድ ይዣለሁኝ፡፡ የያዝኩትን ዕቅድ ተግባራዊ ለማድረግ ያለው አደረጃጀት የእንስሳት ሃብት ልማት ፕሮጀክትና በጐንደር ከተማ ወረዳ ግብርና ፍ/ቤት ባለሙያዎች በማህበር እንድንደራጅ በተሰጠን ትምህርትና የሙያ ዕገዛና ድጋፍ በቀበሌያችን ጥቅምት 1998 ዓ.ም ወ **106** ሴት **7** በጠቅላላ **113** አባላት በያዘው የታግለህ አደግ የእንስሳት እርባታና ማድለብ ግብይትና ህብረት ስራ ተደራጅተናል፡፡ በማህበሩም ሊቀመንበር በመሆን የተሻለ ብድርና ምቹ የገበያ ሁኔታን የሙያ ዕገዛና ድጋፍ በማግኘት በ1999 ዓ.ም ለመስራት ያቀድኳቸውን ዕቅዶች ተግባራዊ አድርጌ የበለጠ ራሴን ለመለወጥ ተዘጋጅቻለሁ፡፡

5. በስራው ወቅት ያገጠሙ ችግሮችና የሚፈለጉ ድጋፎች

በማድለብ ስራ ያገጠሙ ዋና ዋና ችግሮች፡

1. የደላቢ እንስሳት ዋጋ መናርና የአቅርቦት ችግር
2. የተመጣጠነ መኖ አቅርቦት ችግር፣ የመኖ ዋጋ መናርና ጥራት መጓደል
3. የደለቡ እንስሳት ለማጓጓዝ ምቹ ተሽከርካሪ አለመኖር እንስሳቱ ታፍኖ መሞት
4. ለዘለቄታ የብድር አገልግሎት አለመኖር (ይህ እንኳን እየተፈታ ያለ ነው)

6. በገበያ ልማት ስራ ያገጠሙ ዋና ዋና ችግሮች

1.በአገር ውስጥ አስተማማኝ ገበያ ያለመኖር
2. በቂ የገበያ መረጃ ያለመኖር
3.የግብይት ስርአት በጐረቤት አገር ጋር አለመኖር

<u>ለምሣሌ</u> ከሱዳን ጋር የተፈለገው ከብት ብዛት ዋጋ የሚፈለግበት ጊዜ ግልፅ አለመሆን

- በሻጭና በገዥ መሃል የገንዘብ ልውውጥ ላይ የዱቤ ሽያጭ መኖር

4.የተሞላ የእንስሳት ማቆያ ቦታ ያለመኖር (ሽያጩ ካልተፈፀመ እንስሳቱ የመክሳት ሁኔታዎች አለ)
5.የስጋ ፋብሪካ ያለመኖር

<u>ለወደፊት የሚፈለጉ ድጋፎች</u>

1) የተመጣጠነ መኖ ማደራጃ ፋብሪካ ቢቋቋም
2) የእንስሳት እርባታ ስራ ትኩረት ተሰጥቶት ቢሰራ
3) የደለቡ እንስሳት ማንገዣ ምቹ ተሽከርካሪ ቢኖር
4) ዘለቄታ ያለው የብድር ስርዓት ቢመቻች
5) በየጊዜው የገበያ መረጃ ኢንፎርሜሽን ማመቻቸት
6) በተለይ ከሱዳን ጋር ያለው የገበያ ሁኔታ ቢመቻች የሚሉ ናቸው፡፡

በመጨረሻም እነዚህ ከላይ የተጠቀሱትን ችግሮች በመፍታት ይህ ስብሰባ በዋና ዋና ችግሮቻችን መፍትሄ ይሰጠናል ብለን ተስፋ እናደርጋለን፡፡

አመሰግናለሁ

Input Supply System and Services for Market-oriented Livestock Production in Ethiopia

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Abstract

Livestock production in Ethiopia has, for long, remained subsistence with limited market-orientation and poor institutional support. Farmers and pastoralists produce and keep animals for various valid reasons, with little market-orientation. However, producing for the market requires re-orientation of the production system and development of a knowledge based and responsive institutional support services. Institutional support services of extension, research, input supply, rural finance and marketing are key areas of intervention that can play a central role in the transformation of subsistence mode of production in to market orientation. Livestock production systems in Ethiopia can be broadly categorized into crop-livestock mixed systems, pastoral and agro-pastoral system, urban and peri-urban production systems. The demand for institutional support services for livestock development in these production systems vary significantly. The way extension system is structured in Ethiopia may not be in the best interest of farmers and pastoralists and lacks the responsive capacity to the demands for livestock services. In fact, most often livestock development issues are left to development projects and NGOs that have limited scope, coverage and duration. The major inputs for livestock development include animal genetic resources, feeds and forages, veterinary drugs, vaccines, machinery equipment and utensils as well as knowledge. The experience so far has been the supply of improved (exotic?) animal genetic resources for dairy development, sheep production (meat and wool), improved poultry (broiler and egg production), supply of bee colonies, provision of forage seeds and planting material, dairy goats, provision of processing equipment and utensil (dairy, apiculture), drug supply and vaccination services. Most of these activities have been mainly supplied by the government or government sponsored projects. Limited credit facilities to support livestock asset accumulation and development have been provided by microfinance institutions, food security projects, small-scale micro enterprises and NGOs. The contribution of the private sector in livestock input has been limited to supplies of veterinary drugs and services, roughage and concentrate feeds, and processing equipment and utensils. Recent trends show that there is an encouraging move to involve the private sector in input supplies such as production of beehives. Due to the recent increase demand for live animals and animal products in the domestic and export markets, there has been a renewed interest to promote market-oriented livestock production. As a result, a lot of interventions are happening to engage farmers and pastoralists in a more market-oriented livestock production in areas where the resources offer the opportunities. For example, a lot of activities are happening in apiculture production, small ruminants breeding and fattening, cattle fattening, poultry production and dairy production. Institutions such as microfinance, small-scale and micro enterprises, NGOs, women's affairs office are involved in these activities with limited engagement of the Office of Agriculture and Rural Development at Woreda levels. The demand for input supply, particularly for improved animal genetic resources has increased substantially with poor response of the supply side. There is a gap in coordination of efforts

and in basing livestock development interventions on scientific knowledge with the value chain in mind. The extension system has to be re-oriented to be able to respond to the increasing demand for improved and market-oriented livestock development if farmers, pastoralists and the private commercial producers are to benefit themselves and contribute to the development of the national economy.

1. Introduction

Ethiopia has an approximated land area of about 1.1 million km² and an estimated human population of over 77 million, growing at a rate of 3% per annum. About 85% of the population lives in rural areas and practices subsistence agriculture and livestock production. Livestock production is an integral part of the country's agricultural production system. The country, with its extreme variations in agro-climatic conditions, possesses one of the largest and the most diverse plant and animal genetic resources in the world. Agriculture accounts for 45 percent of GDP and 85 percent of export earnings, and the sector employs about 85% of the population. A recent study by IFPRI (2006) indicates that the livestock sector contributes an estimated 16 percent to the total GDP and over 40 percent to the agricultural GDP. As an essential component of the overall farming systems, livestock serve as a source of draught power for the rural farming population, supplies farm families with milk, meat, manure, serves as source of cash income, and plays significantly in the social and cultural values of the society. In pastoral areas, the livelihood of the population depends on livestock. Despite the importance of livestock to the farming and pastoral populations and to the national economy at large, the sector has remained underdeveloped and underutilized.

Over the years, lack of market-orientation of the livestock sector has shadowed and demeaned the role it can play in contributing to the national economy. The comparative advantages of the unique genetic resources, the agro-ecology they live in and the associated production systems have not been exploited appropriately and adequately. The share of government investment in livestock research, education and extension services and other development activities has been relatively minimal. Large extensive areas with pastoral and agro-pastoral production systems have been largely ignored and marginalized. The visibility of these areas has been reduced through replacement with crop production and expansion of large scale commercial farms without due consideration to the livestock sector. Livestock producing areas have been viewed through the lens of cereal crops production and most often labeled as '*food insecure, marginal, moisture stressed or low potential*" areas, despite the huge, yet unexploited, livestock resources they carry. As a result, most livestock development efforts in the sector have been left to projects that are either location specific, species specific or breed specific and have failed to be sustainable as most activities have focused on natural resources (rangeland, livestock, construction of physical structure, etc) than on sustainable livelihoods development of the people who live in these areas and own the livestock resources.

Recent trends, however, indicate that there is adequate government recognition of the huge and yet untapped potential of the sector and has renewed effort to develop and elevate its contributions in both domestic and export markets. The public sector has now realized this trend and encouraging changes in approaches and methods to develop the sector are happening. However, the performance of the sector has been limited due to lack of adequate experience and knowledge, poor input supply system, weak input/output marketing system, limited support services and other technical and socio-economic considerations. The major technical constraints are shortage and fluctuation in quality and quantity of feed, poor genetic resource base for

production traits, poor management practices, diseases, poor market infrastructure and policy and institutional arrangements. Most inputs have been supplied by the government and there is a tendency to continue to do so. This paper presents the resource base, development efforts so far and examines the processes and problems encountered in livestock input supply system. Information collected from various secondary sources and from a Participatory Rural Appraisal (PRA) from eight Woredas (Fogera and Metema in Amhara; Ada'a and Mieso in Oromiya; Dale and Alaba in the SNNPR and Atsbi and Alamata in Tigray is used and presented. These Woredas are Pilot Learning Woredas (PLWs) for the Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project.

2. The Livestock Resource Base

Ethiopia has the largest livestock population in Africa. It is estimated at around 35 million tropical livestock units (TLU), which includes 30 million heads of cattle, 42 million heads of sheep and goats, about 7 million equines, one million camels, over 53 million chicken, 10 million bee colonies, and 40 thousand ton annual harvestable fish. Cattle play the most important role in the farming economy followed by sheep and goats. The livestock population is primarily of the indigenous type and not adequately characterized and documented.

Cattle found in Ethiopia are mostly Zebu. The main cattle "breeds"/populations identified and characterized so far include the Boran, Fogera, Horo, Sheko (Gimira), Abigar (Nuer), and the Afar. These main cattle "breeds"/populations are indigenous to specific regions of Ethiopia. The Fogera and Horo, well known for their milk, are reared around lake Tana and Eastern Wellega regions, respectively. The Boran, a renowned beef "breed"/population, is found in the southern and eastern parts of the country, while the Gimira and Abigar "breeds"/populations, which are considered to have tolerance to high tsetse challenge, are found in the south-west. European breeds, especially Friesian and Jersey, have been imported for many years and crossed with the indigenous cattle breeds.

Some seven sheep and about twelve goat "breeds"/populations have been identified so far in Ethiopia. However, only few of these have been studied and characterized to some extent. These include the Horro, Menz, Afar, Arsi and Black-Head Ogaden Sheep, and the Afar, Long and Short eared Somali and the Harerghe Highland goats. Few exotic breeds of sheep and goats have been introduced into the country for crossbreeding. Among these, the Awassi, Dorper, Hampshire and Corriedale sheep have been used for meat and wool in the highlands, while the Anglo-Nubian, Sanan, Toggonburg, are preferred for milk and meat production in the lower altitude of the mixed farming systems. With regard to poultry, the indigenous birds comprise over 99%, while the remaining 1% includes improved exotic chickens (such as White leghorn, Rhode Island Red and Bovan), imported by various bodies and their crosses with native birds.

3. Development Efforts

To overcome the development constraints and realize the benefits from the huge but untapped livestock resource, efforts have been made in various aspects to develop the livestock secto. These are presented as follows.

3.1 National livestock development strategy

Realizing the major development constraints of the livestock sub-sector, a National ruminant Livestock Development Strategy has been prepared, within the overall policy objective of livestock sub-sector to develop and utilize the available resources and increase its contribution to the social and economic development of the country (MoA, 1996, 1997). Components of strategy are include a) *feeds and nutrition* with the major objectives to increase supply and quality of feed and improve ruminant nutrition; b) *animal health* with the main objectives to control and ultimately eradicate economically important ruminant livestock diseases; ensure only healthy and wholesome foods of animal origin reach the market and are placed in the hands of consumers; meet international animal health standards and requirements; and restrict tsetse fly advance into new areas and suppress the existing fly population in active fly dispersal areas and thereby reduce losses from trypanosomiasis; c) *animal breeding* with the main objective to improve milk and meat production through breeding with the view to achieve self -sufficiency in the short term and surplus for export in the long term; and d) *livestock marketing* with the objective to improve the efficiency of the livestock and livestock products marketing. Currently, a study to develop a national livestock development master plan is under way.

3.2 Livestock development projects

Various livestock development projects have been prepared and have been/are being carried out to minimize/overcome the development constraints of the sub-sector. The major ones include: the First, Second and Third Rangeland Development projects, Arsi rural development unit (ARDU), Wolayita Rural Development Unit (WADU), Fourth Livestock Development Project (FLDP), Pan African Rinderpest Campaign (PARC), Pan African Control of Epizootics (PACE), Farming in Tsetse Controlled Areas (FITCA), Small-holder Dairy Development Project (SDDP) and National Livestock Development Project (NLDP). Currently, new livestock development projects are underway with support from various sources. These include the Integrated Livestock Development Project (ILDP) in North Gondar, supported by Austrian Government, various USAID supported projects such as the Ethiopian Dairy Development Project led by Land O' Lakes, the Ethiopian Livestock Marketing and Sanitary and Phytosanitary Project led by Texas A and M University, the Ethiopian Sheep and Goat Development project and Ethiopian Skins and Hides project. In addition, the Pastoralist Livelihood project (PLI) supported by the World Bank, SNV supported by the Netherlands government and many other are operational. There are also a number of development projects that have livestock component being implemented by various national and international NGOs.

3.3 Livestock development packages

In line with the recent approach of agricultural extension, which is a package approach, four different livestock development packages have been prepared and employed in the different agro-ecological zones of the country as applicable. These packages are: milk production improvement through introduction of exotic blood; meat production improvement using indigenous animals; egg production improvement through introduction of exotic blood; and honey production improvement using traditional and improved hives and improved management.

4. General Livestock Inputs and Services in Ethiopia

The most common livestock inputs and services in Ethiopia are animal health, breed improvement, feed resources development, research, extension services and development, finance and marketing. The components and manner of provision of inputs and services to livestock producers vary from region to region depending on their circumstances.

4.1 Breed improvement programs

Ethiopia does not have livestock development policy and specific breeding policies. Livestock development is planned and implemented on the basis of the overall government policy in the agricultural sector, and based on the National Livestock Development Strategy and Program. Currently, a project to develop a livestock development master plan is underway.

The indigenous livestock "breeds"/populations of Ethiopia have the capacity to cope with the harsh environmental conditions of the country. They often have special adaptive traits for disease resistance, heat tolerance and ability to utilise poor quality feed which they have acquired through natural selection over hundreds of generations. They therefore need relatively less environmental modification to achieve increased productivity. On the other hand, the temperate livestock breeds, although they have the genetic capacity for higher production, their performance under the existing environment is not that attractive and they are often not viable. The focus of breed improvement in Ethiopia so far has been through crossbreeding of the local stock with exotic breed. In line with this, different initiatives have been made to promote crossbreeding scheme. These include: Establishment of National Artificial Insemination Centre (NAIC); establishment of cattle, sheep and poultry breed improvement and multiplication centers, with the major aim to distribute improved animals to smallholders.

4.1.1 Cattle Improvement

There are some government operated cattle multiplication and improvement centers in different arts of the country. These centers also have an element of conserving identified cattle "breeds"/populations in their own environment. These centers are Borana breed improvement and multiplication centre in Oromia Region, and Fogera breed improvement and multiplication centre in Amhara Region. There was a plan to establish similar centres for Begait cattle in Tigray, for Abigar breed in Gambella and for Horro breed in Oromia.

A recent study by Ababu *et al*., (2006) designed to determine heifer production efficiency at the Abernossa ranch,, used sale value, cull value and annual operation cost including labor cost (salary). They found out that on average only 65% of the female calves born reached puberty; and the average efficiency of getting heifers in-calf to the third month of pregnancy was only 61.4 %. Out of the in-calf heifers, 95% could be distributed. Overall, about 38% of the female calves born could be distributed as in-calf heifers to smallholder farmers. Comparison of operation cost with the value from sale of crossbred heifers and culled animal showed that crossbred heifer production was at lower cost recovery. Taking into account the actual number of cows, their calving rate and observed calf viability, the projected heifer production efficiency was found to be 42.8%. This index assumes that all cows present in the ranch are fertile and used for crossbred heifer production and this is nearly triple (14.6%) of the observed heifer production and the sale during the period 1994 to 2000. The effective heifer distribution efficiency was only 14.6% (269 heifers sold). Late age at first calving, prolonged days open, long calving intervals and high

mortality were responsible for the low returns. High mortality and high rate of culling of females substantially reduced the number of heifers available for distribution. The major problems associated with the ranch are that the focus is only on crossbreeding and the Boran improvement program has been terminated, frequent change in management and little attention given to its objectives, it has become the victim of the AI system, poor data collection scheme and lack of timely and proper data analysis, poor understanding of the genetic value of the herd and poor and variable management with limited financial outlay, poor staffing and other resource allocation.

The national artificial insemination service mainly focuses on cattle, to boost milk production, and uses exotic and local semen as appropriate. Exotic semen includes Friesian and Jersey, while the indigenous include Fogera, Horro, Borana and Barca (Begait). There has been semen importation as required. Having recognized the importance of AI in dairy development, the government embarked on the technology at a wider scale and established the National Artificial Insemination Centre (NAIC) at Kaliti in 1981. The centre was initially designed to accommodate 25-30 bulls at a time. Office, laboratory, AI technicians' Training Center and other facilities were constructed. Bulls donated by Cuban Government (25 Holstein and 10 Brahman) and importation of 44,800 doses of Friesian and 2,000 doses of Jersey semen were source of semen used for frozen semen technology (Getachew Felleke and Gashaw Gedda, 2001). The centre operates a semen processing laboratory and liquid nitrogen processing plants. To date, semen collection was based on exotic and indigenous as well as crosses of these breeds namely Friesian, Jersey, Brahman, Borana, Barka, Fogera, Horro, Sheko and crosses of 50% and 75% Holstein-Friesian and indigenous bulls. From the total semen produced the major share is from Friesian (75.3%) followed by Jersey (10.5%). NAIC is now the only centre that produces semen in the country. On average about 120,000 doses of frozen semen and 40,000 to 50,000 litres of liquid nitrogen are produced annually at Kaliti. The center keeps about 40 bulls for semen production. The total number of inseminations undertaken annually does not exceed 40,000 and about 50% of these inseminations are undertaken in and around Addis Ababa and Arsi where relatively large concentrations of crossbred dairy animals are available.

In order to improve the animal genetic improvement efforts of NAIC, the NLDP has provided substantial support to upgrading the Kaliti centre, procured a bull dam farm at Holetta, provided funding for purchase and installation of about 10 liquid nitrogen plants in strategically selected locations across the country and provided substantial support for training of AI technicians and to improve field AI operations.

A recent study by Mohammed (2003) analyzed production and reproduction data collected from 1981 to 2002 at Holetta, Selale and Stella dairy farms to examine if bull dam recruitment procedure for AI among local Holstein Friesian herds does lead to genetic progress. The trend in 305 days milk yield using the 1982 base population (Figure 1) phenotypic and genetic trends showed that the main determinant in phenotypic performance was the environmental deviation component. As a result, environmental influence and management situation in the time period explain the decline in phenotype from 1990 to 1993 and the slight improvement from 1994 to 1998. Annual genetic average regressed against calving year showed positive trend (Figure 2). The author speculated that the slight recovery after 1994 compared to the base population might be due to imported germ line from Israeli and the adopted bull dam selection procedure practiced by the NAIC in addition to improvements in environmental conditions. He concluded that it was apparent (Figure 2), from the absence of significant annual trend with linear equation of $y = -4029 + 2.016x$, that no sustained improvement in the phenotype had been achieved in the 21

years of the study period. The efficiency and effectiveness of AI bull recruitment, semen production and quality, field AI operations have been evaluated under the NLDP project. Some of the major problems of the system include AI operation has remained under government as the sole provider of this service so far, lack of recording scheme focusing on AI, but not on genetic improvement, lack of selection criteria for bulls, some data collection but no proper and timely analysis to benefit genetic progress, lack of pedigree information to technicians and consumers, and problems with efficiency and effectiveness of AI technicians.

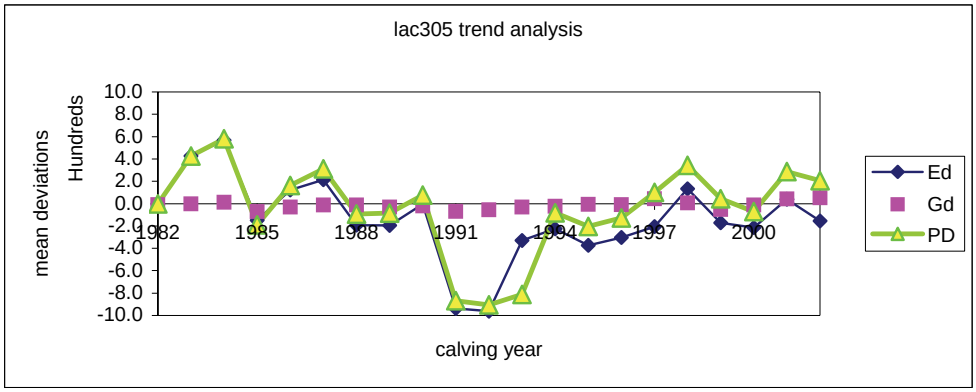

Figure 1 Phenotypic, genotype and environmental deviation against the base population in 1982

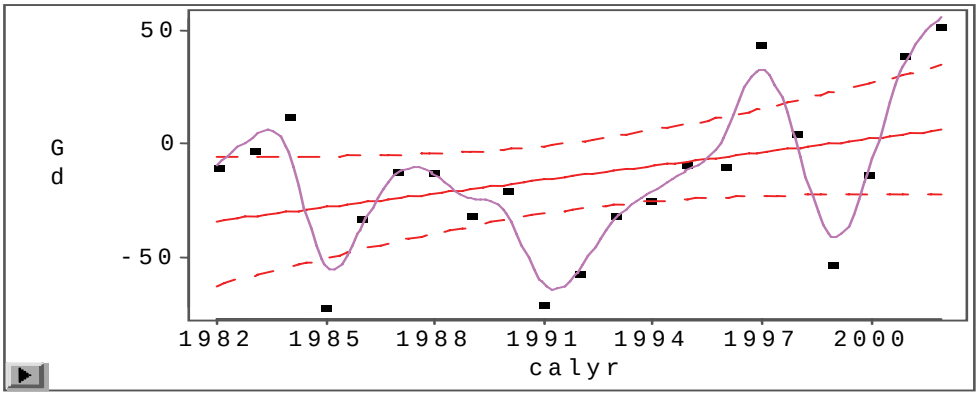

Figure 2. Regression of genetic annual average deviation on calving year

4.2.1 Sheep and goat improvement and multiplication centres

These are located at Debre Berhan and Amed Guya centers in the Amhara Region, which concentrate on the improvement of the Menz sheep. The Horro sheep breeding centre in the Oromiya Region, which was established recently with the aim to address the Horro "breed"/population predominantly found in the Western part of the country is not operational due to technical reason. But there is a plan to establish a centre of the same. Two other recently established sheep breeding centers are the Kokosa and Jijiga centers. While Kokosa focuses on the highland Arise-Bale sheep, the Jijiga centre will focus on the improvement of the lowland Wanke (Black-Head Ogaden) sheep. The primary aim of the sheep breed improvement program is to increase production of mutton, which commands a premium price on both the domestic and

export markets. Wool production, though less important than meat, has a valuable role to play in sheep development, especially where it's production is associated with peasant level handicraft industries. Apart from limited experiences of Farm Africa in crossbreeding of local goats with exotic dairy goats for improved milk production in the Haraghe highlands and the SNNPR, there has been no organized goat improvement program. The major limitations in the sheep improvement program in Ethiopia include:

- Improvement program through crossbreeding has been limited to Menz sheep only – Debre Berhan wool factory, conducive temperate environment in Debre Berhan area
- There has been no comprehensive local sheep improvement program – Washera, Bonga, Black Head Somlai, Afar, Arsi-Bale, Abergellie, etc. breeds
- There is no adequate information on meat, milk production and on reproduction, housing, feeding, disease control methods for different breeds of small ruminants in the country.

4.2.2 Poultry breeding and multiplication centers

There are 11 poultry breeding and multiplication centers located at Mekelle, Adigrat (Tigray), Andassa, combolcha (Amhara), Nazereth/Adama, Adelle, Bedelle, Nekempt (Oromiya), Awassa (SNNPR), Dire Dawa and Harar that mainly focus on Rhode Island Red breed. Unlike the cattle and sheep breeding program for genetic improvement, the poultry breeding program favours distribution of pure exotic breeds than crosses. The overall objective of the poultry breeding program is genetic improvement for egg and meat production through the provision of improved breeding cockerels, pullets, chicks and fertile hatching eggs.

Generally, however, like elsewhere in the tropics, crossbreeding schemes between exotic and indigenous breeds resulted in limited improvement in productive traits and even less improvement in fitness traits. Crossbreds are hardier than pure exotics due to adaptive traits inherited from their local parents but they still require substantial feed and veterinary inputs to survive and maintain reasonable productivity in the existing environment. Therefore, the importance of setting up a breeding program with emphasis on appropriate local breeds in each ecological zone should be well recognized.

- There has been no activity on improving or promoting local chicken and there has been no attempt to improve egg collection, storage and marketing from local chicken
- Focus has been on exotic breeds - broiler, egg or dual-purpose breeds
- Genetic material supply has been from government multiplication centers
- There has been limited capacity, no parent stock development, disease threats, vaccine limitation, no sustainable feed supply system
- There is restricted distribution to farmers – eg. five pullets and one cock, or cock distribution to communities and lacked proper targeting
- Improved breed distribution has not been accompanied by organized input supply and marketing system

4.2 Animal health services

In general, animal health inputs and services in Ethiopia include:

- Preventive services and vaccinations

- Education/extension including public health education
- Regulatory services to control occurrence of new diseases
- Clinical services which includes diagnosis and treatment of sick animals
- Supply of livestock drugs
- Meat inspection services at abattoirs.
- Public health in relation to zoonotic and food-borne disease control, hygiene, food and feed safety and the environment

In Ethiopia, the government is the major animal health service provider. There is also limited involvement of the private sector and NGOs in the provision of drugs and animal health services. A few years back, there have been attempts to promote privatized veterinary services, but has not effectively materialized. Due to the nature and variability of livestock production system in Ethiopia, some animal health services have public good characteristics. The widespread nature of killer diseases, limitations in accessibility, cross-border animal movement and drug supplies, lack of adequate infrastructure and the presence of incomplete markets contribute to market failure in the provision of animal health services. This situation is not different from many African countries (deHaan, and Bekure, 1991; Smith, 2001)

In Ethiopia, public sector involvement and support has often been associated with disease surveillance, eradication campaigns, vaccine production, drug and vaccine quality control, quarantine, and food hygiene and inspection measures. Eradication and control programs of killer diseases call for national and international efforts, and surveillance and control measures often require national coverage including remote and inaccessible areas. However, the public sector has been limited by lack of adequate resources to deliver the services. Shortage of manpower (quantity and quality), lack of transport, availability of drugs and other supplies, poor information, communication and reporting systems, and limited finances are some of the reasons frequently raised by the professionals in the field. The major complaint and dissatisfaction of livestock keepers is unavailability of professionals, lack of communication, unavailability or shortage of drugs, poor diagnostics capability and lack of confidence in the quality of the service. Public or private service provisions could include diagnostic services, vaccination, vector control, and treatment. However, private sector animal health service provision is limited in Ethiopia due to a number of factors. These include lack of capital, willingness of livestock keepers to pay, affordability of drugs and services, poor accessibility, high transportation costs, alternative cheap supplies of drugs from illegal markets, NGO and public sector provision of drugs and services at subsidized rates, and isolated herds.

Other public health services such as zoonotic and food-borne disease control, hygiene, food and feed safety and environmental control are often very weak and at best are limited to major urban centers. Farmers tend not to report risk factors on the farm due to deterrent costs of treatments or scare of some serious zoonotic diseases such as brucellosis or tuberculosis that may result in slaughtering of animals without compensation. Furthermore, given the poor communication and transport system, and lack of appreciation of timely information, reporting could be costly, ineffective and inadequate. In urban areas meat inspection is undertaken in abattoirs and is the responsibility of the Ministry of Agriculture and Rural Development. However, the administrative responsibility is Public Health Department or Municipality. In Ethiopia, it is also common to slaughter for home-consumption, without undergoing any inspection.

In commercial farming such as large dairy farms and intensive poultry production systems, extension and (veterinary) public health services are more likely to be delivered privately

without extensive public intervention. Smallholder dairy producers often form cooperatives and often provide farm inputs and animal health services. For example, the Ada'a dairy cooperative in Debre Zeit provides animal health and milk quality control services.

4.3 Feed and Water Resources Development

Although a number of projects were involved in feed and water resources development in both crop-livestock and pastoral systems, the recent ones include the fourth livestock development project, the smallholder dairy development project (SDDP), and the national livestock development project (NLDP). Activities included improvements in natural pastures and crop residue utilization, feed conservation practices, introduction of improved forages using different strategies. Introduction of improved forages was facilitated through these projects and used government nurseries for multiplication and seed production. However, the successes of these projects in developing a market-oriented livestock production system that responds to adoption of feeds technologies remains to be determined. Recent trends however, indicate that there is a renewed interest to introduced improved forages for feed production and natural resources management in various parts of the country. According to Dr. Jean Hanson (personal communication), requests by regional governments, NGOs and the private sector for forage seeds and cuttings from ILRI's forage germplasm collections has increased over the last five years (Figures 3 to 5). The total amount of sales of forage seeds from the year 2001 to 2005 increased by a factor of 3.5. Over the last five years, the highest demand for forage seeds included *Avena sativa* (1620 kg), *Lablab purpureus* (665 kg), *Vicia dasycarpa* (350 kg), *Trifolium quartinianum* (180 kg), and *Vigna unguiculata* (100 kg). Similarly, sales of Napier grass increased from 580 in 2000 to about 1.5 million cuttings in 2005. These figures should be taken with caution as they relate only to requests to ILRI and additional materials could have been supplied from other sources. In addition, apart from increasing trends in requests, data on use of these materials under farm conditions are not available. Data regarding other feeds improvement operations including efforts on natural pasture improvements in various parts of the country are not available. In addition, the involvement of the private sector in forage feed production has been limited as the market at farmers level for these resources has not yet been developed.

Although the government of Ethiopia has put tremendous effort in water harvesting systems and technologies, the extent of benefits to the development of the livestock sector needs careful assessment.

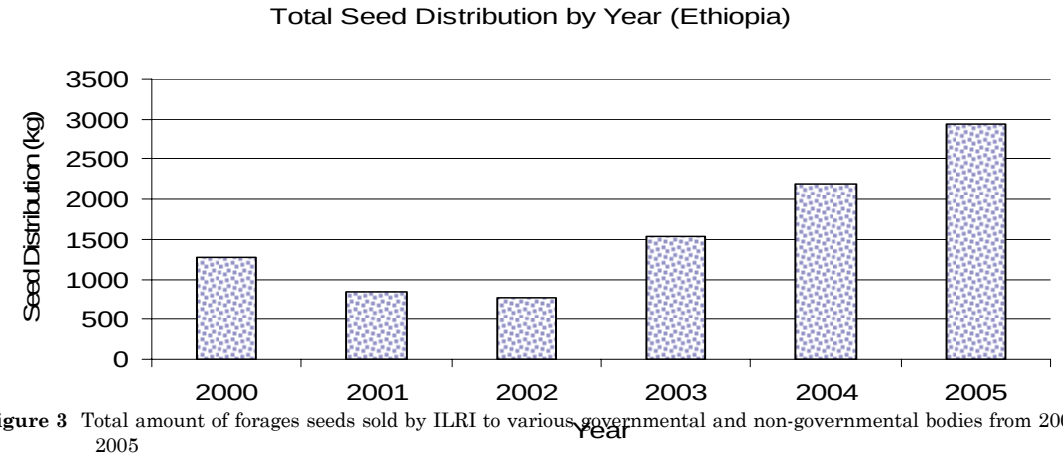

Figure 3 Total amount of forages seeds sold by ILRI to various governmental and non-governmental bodies from 2000 to 2005

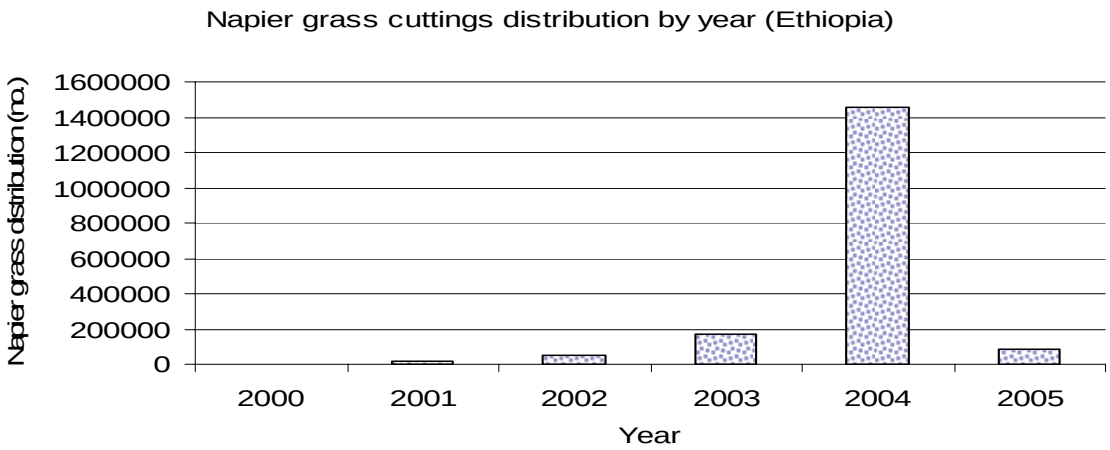

Figure 4 Total number of cuttings of Napier grass sold by ILRI to various governmental and non-governmental bodies from 2000 to 2005.

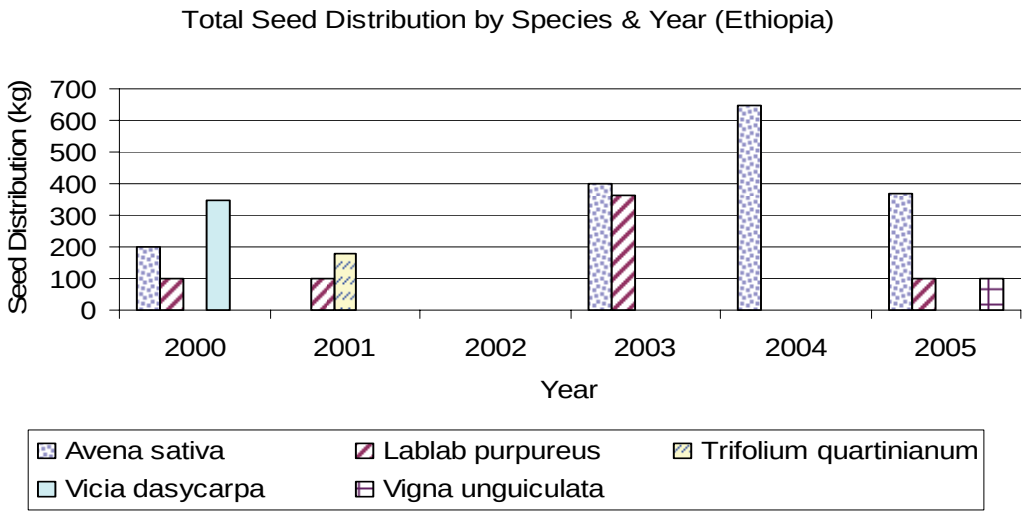

Figure 5 Amount of the top five forage seeds sold by ILRI from 2000 to 2005

5. Extension and Development

In many developed countries, extension services have been significantly reduced or eliminated. In developing countries, however, extension services by the public sector continue to be more dominant, and Ethiopia is no exception. As shown in the various sections above, extension service for in the livestock sector has been more of input supply services. In the recent past, various organizations were put in place to play regulatory role and to ensure adequate and timely supply of crop inputs. These included the National Seed Agency and the National Fertilizer Agency – which were later merged to form the National Agricultural Inputs Authority, Agricultural Inputs Supply Corporation, Ethiopian Seed Enterprise, etc. All these organizations mainly dealt with crop (cereal) inputs, mainly fertilizer and improved seeds and never included livestock input supplies. The MoARD (2005) developed a strategy document which deals with input and output marketing and implementation mechanisms. The document clearly states the

need for increased privatization of input supply and rural finance, while recognizing the role of the government.

The MoARD Extension and TVETs Department is organized into three extension teams - moisture reliable, moisture stressed and pastoralist teams. Although livestock is considered as part of the extension activity, most of the focus still revolves around cereal crops production. The major input supply system in the extension department of the MoARD focus on extension packages which are the regular, minimum and household packages. These packages are funded by the government. The minimum and regular packages mainly involve crop production and protection activities such as the use of improved seeds, inorganic fertilizers, agricultural chemicals and soil and water management practices. The household package provides opportunities for farmers to choose from a menu of extension packages which include livestock technologies such as improved poultry breeds, improved dairy cows, improved beehives, fattening. For inputs involving extension packages, the Woreda OoARD is involved in the operation and the procedure includes estimation of farmers needs, production or procurement of inputs and delivery of inputs. For the estimation inputs, DAs are involved and is more or less similar in all the regions. Estimates of inputs in each PA is collected and passed on to the input supply desk or cooperatives desk at the Woreda OoARD which compiles estimates and passes on to the Region for central production or purchase. The Regions arrange the supplies through companies or organizations which either purchase or produce the inputs. These inputs finally are distributed to farmers on credit basis. The major livestock inputs still handled by the OoARD purchase and delivery of small ruminant (breeding and fattening), cattle (fattening, drought), improved poultry (eggs and meat), improved beehives and improved dairy animals on credit basis and AI and veterinary services and drugs mostly on cash basis at subsidized rates. In addition to the OoARD, a number of other institutions such as NGOs, women's affairs office, microfinance institutions, small-scale and micro-enterprise provide financial support for livestock development activities independent of the OoARD.

The procedure for the procurement of animals from local markets (mainly small ruminants, beef cattle) included in the extension package involves a committee composed of staff from the OoARD, PA leaders and a number of representatives from woreda level government offices. The effectiveness of this procedure and the impact of the intervention in improving market-oriented livestock production is subject to research. The main source of supply of improved dairy animals has been the government ranches that have very limited capacity and have not been able to meet the demand. The supply of improved beehives appears to be higher than the demand and lacks an integrated approach. Parallel activities in availability of auxiliary equipment such as queen excluder, smokers, veil; bee forage development, bee colony or queen rearing activity, availability of bees wax are essential for the success of the operation. One of the critical factors that derives apiculture development is availability of adequate quantities and quality of bee forages. As it stands now, the sole supply of boxes of improved bee hives will not enhance apiculture development and may even result in mere replacement of traditional beehives.

In line with this government strategy, efforts in improving agricultural inputs at Woreda level are just emerging and some encouraging innovations are happening. In the livestock sector, the involvement of the private sector in beehive manufacturing is a good example. In Woredas like Ada'a, animal health services, drug and feed supplies, and artificial insemination services are taken up by a dairy cooperative, in Alaba Woreda, nursery and forage seed production and marketing is being taken up by the private sector. Production of day old chicks and pullets for distribution to smallholder framers is also being out sourced to private companies such as

ELFORA and Genesis Farms. However, most livestock extension and development activities could be characterized as follows:

- Livestock development issues have been left to donor funded projects and limited to species of convenience.
- Recently, food security and safteynet programs, rural finance and micro and small scale enterprises are getting involved in livestock development based on credit. However, there is need to coordinate activities with technical support from the OoARD.
- Some livestock resources such as apiculture, fisheries, sericulture were marginalized with major thrust on ruminants.
- Livestock development activities lacked comprehensive market chain approach with limited linkages with rural finance, marketing, quality control, etc systems.
- The currently organizational set-up and resource allocation (human and material) at Federal, Regional and Woreda levels do not allow sufficient and adequate flexibility to respond to the demands of livestock keepers in different production systems.

6. Research

As it is the case in many developing countries, provision of research outputs in Ethiopia has been by the public sector, despite the budgetary constraints. Research services include generation of information and knowledge in plant and animal genetic material, balanced rations, drugs, vaccines, machinery and equipment Technological change generated by research and development plays a pivotal role in promoting agricultural growth and development. Although there are some limited research is undertaken by the private sector and NGOs in Ethiopia, the core scientific activity has remained in the public sector. In countries like Ethiopia, the private sector will not invest in agricultural research due to the uncertainty associated with outputs and returns to investment, the fact that it requires expensive scientific equipment and the need for having multidisciplinary teams and the difficulty of appropriating the benefits. Therefore, public investment in agricultural research in developing counties should be considered as a springboard to economic development.

Studies based on appraisals of investments in agricultural research indicate high payoff investment opportunities. The mean Internal Rate of Return (IRR) was found to be 49% for 375 appraisals of applied research projects. For livestock specific research, rates of return also appear high, if lower than for crop research. Analysis of returns to agricultural research in South Africa, showed that, in the absence of research, livestock production would have fallen due to losses from animal disease. When this effect is taken into account, the estimated rate of return on livestock research is increased from initial estimates of 0-5% to 35% for animal health research and 18-27% for other animal research (Townsend and Thirtle, 2001).

In Ethiopia, livestock research in the national research system has focused on genetic improvement studies for dairy production, beef production, sheep and goat production and improvement, feed resources development, animal nutrition, animal health, animal power, poultry production, fisheries and aquaculture, and apiculture. Thesis research outputs conducted by a number DVM and post-graduate students in various universities are also valuable sources of information and knowledge. In addition, the country has benefited from the research outputs of ILRI in various aspects of livestock production. However, most of this dearth of scientific information is not available in an organized and useful manner to livestock keepers and is not

easily accessible. It has also been argued that the uptake of these technologies and knowledge by the smallholder farmers is far from satisfactory. The reasons for this lack of or poor adoption of technologies require carefully study and analysis.

7. Credit and Insurance for Livestock

Providing credit/loans for the purchase of livestock, feed, and health services and insurance against the loss of valuable productive assets play an important role in encouraging new investments in the sector and also in coping with difficult problems such as drought and disease. In Ethiopia, where financial and insurance services are not well developed, the provision of loans/credit/micro-credit and insurance for animal loss are non existent. Some NGOs have attempted such an intervention with very little or no success.

In Ethiopia, the sources of financing for livestock development generally engage government owned banks, private banks, micro-finance organizations or NGOs. Microfinance institutions (Dedebit in Tigray; ACSI in Amhara; OCSI in Oromiya; Omo Microfinance and Sidama Microfinance in the SNNPR) provide credit for livestock development. However, their interest rates vary and have upper limits on credit access which in most cases do not encourage larger investments in the livestock sector. The involvement of commercial banks is limited and most often they provide credit in situations where the government provides incentives for special agricultural development activities or are supported with guarantee funds against loss of animals or low repayment conditions. These sources of financing, generally involving subsidized, low-interest credit, tend not to allow smallholders to borrow money unless they are organized in groups or through cooperative arrangements. Although the public sector often considers investments in the livestock sector as a high risk, some microfinance and NGO credit schemes have become successful through the application of appropriate approaches and methodologies. For example, according to FAO (1992) the Grameen Bank in Bangladesh extends its credits to about 40-50% of landless farmers to acquire and raise livestock. In India similar practice, particularly to women livestock keepers, has also been successful.

In countries like Ethiopia, the risk associated with livestock production due to recurrent drought and disease outbreaks, and recently flood that incur high social and economic disasters, communities have established coping mechanisms for households through traditional livestock insurance mechanisms by contributing breeding animals to affected households. In crop farming communities, crop failures due to drought, diseases and insect pests or other disasters have been compensated through food and cash aid. In communities where livelihoods are based on livestock, responses to losses of livestock and livelihoods as a result of natural calamities have been through provision of food aid to the affected people. Support to such communities seldom considered feed aid and compensation to losses of livestock. However, due to recent disease outbreaks such as mad cow disease and avian influenza in many parts of the world, and the implications thereof to individual farmer, to local, national or regional economies, attention is being shifted to considering the large economic and financial costs to producers and national economy. However, the guidelines and mechanisms for implementation of livestock insurance have to be developed taking the varying production systems and the species of animals involved. Lessons from countries such as India, Nepal, Thailand, Indonesia, Malaysia and the Philippines that successfully implemented livestock insurance schemes through public and private banks FAO (1992) are important to consider in developing such a scheme in Ethiopia.

8. Livestock Marketing

Marketing of livestock and livestock products is an important activity all over the country. Farmers sale livestock and livestock products to cover household cash expenses and to purchase crop inputs. Live animals are marketed through traditional marketing routes (channels) developed over the years. Livestock passes from primary markets (collection centers) to secondary and tertiary markets to reach the consumer. Cross-border exports are also common in the southeastern, southern and northwestern parts of the country. Marketing of livestock products such as milk, egg, hide and skin is also considerably high. Fresh milk and egg is directly sold after meeting family needs at farm level though production is carried out at subsistence level. Surplus production and supply is usually higher in urban areas due to market orientation and urbanization, which creates better demand for products.

In Ethiopia, government arrangements in livestock marketing activities have taken various organizational forms. The Livestock and Meat Board was the first one established to develop livestock production and marketing in the country. A number of other development projects also dealt with livestock marketing issues over the years. The most recent one was the Livestock Marketing Authority (LMA) which took national responsibility for the promotion of livestock marketing until it was dissolved in 2004. Currently, livestock marketing is organized under the Agricultural Marketing and Inputs Sector of the MoARD.

In many countries, livestock marketing services include provision of market information, quality control and grading of meat or milk, operation of auction markets, facilitation of marketing systems themselves, provision of marketing and processing facilities, and transport of livestock or of raw milk. Marketing systems have been generally administered by organizations such as marketing boards, co-operatives or a combination of both.

In Ethiopia, the marketing of livestock and livestock products is underdeveloped. The major problems are the traditional management systems which is not market oriented, underdeveloped marketing systems and poor infrastructure, poor financial facility, and presence of cross-border trade. In addition, the marketing system, major actors and characteristics is not adequately known. Experiences from other countries indicate that direct government intervention in livestock markets has achieved some success For example, The Botswana Meat Commission (BMC), has established and maintained favourable export markets for local beef, and has stimulated an off-take rate for cattle, much higher than on similar range grazing conditions in other parts of Africa. India's 'Operation Flood', has been successfully moved the country to be self-sufficient in milk and to become the largest single milk producer in the world. On the other hand, large government projects aimed at promoting market off-take from pastoral systems, by providing stock routes, watering points, holding grounds and marketing have been criticized for not bringing sustainable development and for not benefiting smallholders. In general most argue that direct state involvement in the provision of marketing and processing services has had little success in promoting development of the livestock sector and favour liberalized markets. In Ethiopia, in order to develop the market in line with the Government's livestock policy objectives, the structure of livestock and livestock products marketing system and the roles of the public and the private sector need to be studied.

9. Major problems in input supply and services

- Lack of market-orientation of the production system
- Lack of focus on individual or community capacity development

- Fragmented livestock development operations that are project based, location specific, and species specific, lack of value chain approach
- Lack of selection and genetic improvement programs for indigenous breeds
- Limited crossbreeding with exotic animals for dairy and sheep
- Limited capacity of government ranches and multiplication centers for the supply of improved animals
- Inefficient and ineffective AI services
- Distribution of improved breeds or technologies in isolation from other associated inputs and services
- Focus on number (output) than on outcome and impact
- Limitation on number of improved genetic resources distribution per household
- Lack of targeting of development locations and households
- Feed resources confined in government nurseries; limited activity in introduction of improved forages and no targeted activity to develop bee forages
- Almost no inputs and development activities on natural pasture
- Reasonable vaccination coverage of ruminants and poultry, and limited activity in the supply of veterinary drugs (both gov't and private)
- Limited credit facility for livestock development – high interest rates, upper limits for credit not allowing farmers, focus on short term activities such as fattening that have short re-payment schedule; no livestock insurance system
- Illegally cross boarder trade and importation of veterinary drugs
- Poor post-harvest handling limited processing capacity and capability and supply of equipment and utensils
- No quality control and standards and certification system
- Limited handling, processing, labeling, storage, transport facility
- Limited private sector involvement and poor organization of farmers for input supply
- Poor marketing and infrastructure, limited knowledge of the marketing operations and lack of market information system
- Disorderly private sector/cooperative participation
- Limited capacity of the research and extension system
- Limited flexibility for innovative input supply and provision of services
- Non-inclusive approach to agricultural production and marketing

10. Possible interventions to improve input supply and services

- Increase skilled man power, conduct focused training
- Increase supply of improved local and exotic genotypes through private and community based animal genetic improvement program for targeted intervention
- Improve animal health services and supply of drugs and diagnostics, encourage private health technicians and drugs vendors; consider paravets to provide animal health services and supply drugs
- Develop community based forage seed /seedling production system

- Engage micro finance institutions to provide credit and insurance for livestock development
- Establish linkages/joint planning (microfinance/women/OoARD)
- Develop feed resources (feed market, seed/seedling production)
- Improve handling, storage and transportation facilities
- Involve the private sector and cooperatives in input supply, improve efficiency, organize local processors and traders
- Introduce standards and implement quality control
- Re-defining the role of the public sector
- Coordination – public-private, traders, input supplier, transports, abattoirs, NGO, Research, development, etc
- Value chain approach – move from production focus to embrace the production to consumption
- Develop, implement and monitor quality and standards for both input and outputs
- Regulatory role
- Capacity development and training
- Market linkage and promotion

11. Conclusion

Although Ethiopia ranks first in Africa and 10th in the world in its livestock population, the livestock sector has remained underdeveloped and its potential has not been efficiently and effectively utilized. The sector is an essential component of the over-all farming system, being a major source of: traction power, organic fertilizer, cash income, and food. The contribution of livestock to the national effort to ensure food self- sufficiency both at the national and household level is significant. The large human population the country owns and its proximity to potential export markets offer great opportunities for development of the sector. Despite the huge livestock resource and the important role of livestock in agriculture, livestock resource of the country is characterized by low productivity and production levels. Average yields per animal slaughtered or milked are estimated to be 105 kg of beef, 10 kg of mutton and 213 kg of cow milk. Egg production from indigenous poultry is between 40 to 60, with an average egg weight of 45g. Livestock production and growth rates are very small and lag behind the human population growth. The resulting is a decline in per capita consumption of livestock products. At present the per capita consumption of milk, meat, egg, fish and honey is estimated at 19 liters, 8 kg, 1.23, 0.25 kg and 0.29 kg, respectively, putting Ethiopia the least even from its neighbouring countries. Based on these estimates, the annual per capita consumption of meat is 43% below the African average of 14 kg. To reach this standard, we need additional output of 378,000 tones which makes present annual requirement 508,778 tones. Further additional annual increment of 3% (15,263 tones) is expected to meet demand from the growing population. Our milk deficit is even worse than for meat. Our annual per capita consumption of 20 liters is 49% below the African overage. We need an incremental output of 1,146,600 tones to reach this minimum average plus 69,946 tones per year for the growing population.

In general, the constraints for livestock development can be broadly categorized into environmental, technical, infrastructure, institutional and policy. The major technical constraints are under-nutrition and malnutrition, high prevalence of diseases, poor genetic resource management and poor market infrastructure. To ensure sustainable development of the sector, considerable efforts are being made and more than ever before and the Government has

attached significant importance to the sector. However, it has to be understood that livestock development programs are expensive, have long gestation period, which require strong and continuous commitment and collaboration from stakeholders at all levels. Improved technological applications, efficient and effective input supply system, better management, capital. etc. are required on the supply side. The development of market infrastructure and market institution is also very important for inducing efficiency and incentives for market participants on the value chain. The marketing system should operate efficiently to ensure that the consumer gets what it wants and the producer gets the reforms needed to continue production. The Middle East countries are our traditional partners for meat and livestock exports and our exports to these countries has been increasing. Given their high income and the consumer preferences for our products and our proximity to these countries, there is high possibility to boast export. New markets in Africa and Asia should also be explored and considered for export.

This paper assessed the Ethiopian livestock resources, the potential for development and the current input supply system and services provision. The impacts of the current system have to be assessed on the performance of the livestock sectors in terms of how well the inputs and services are performing. In such an evaluation, performance indicators such as herd productivity, the incidence of animal diseases, food safety concerns, meat and milk production and marketing and incomes of poor farmers should be included. The inputs and services required to benefit livestock producers may change over time depending on new and emerging markets. The provision of these specific inputs and services either publicly or privately should be examined in order to improve the functioning of the sector. Other key public services, such as education, and development roads, water supplies, and telecommunications can benefit not only livestock keepers, but the whole rural community. Access to land, labour and input markets for genetic resources, drugs and animal health, feeds, equipment and utensils and technical advice are also important for specialized livestock production systems. The current market pressure for livestock and livestock products will create opportunities for livestock keepers and this will affect the provision of inputs and services to the livestock sector in Ethiopia. In countries like Ethiopia, although there is recognition that the government must still participate in the provision of inputs and services to the livestock sector, alternative modalities for specific production systems should be further opened up to be more inclusive.

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Organization and performance of government-owned cattle breeding ranches in the supply of genetically improved breeding stock in Ethiopia[1]

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Abstract

The existing seven government-owned cattle breeding ranches or breeding stations are the only cattle breeding ranches operating in Ethiopia to date. All of them started off their operations with pure breeding of a target indigenous cattle breed for genetic improvement and conservation. The four major ranches (Gobe, Abernosa, Metekel and Andassa) made a sudden and drastic change of objective to focus instead on production of F1 in-calf heifers to supply smallholder dairy farmers in central highlands. The supply these heifers at heavily subsidized prices to selected farmers despite the far higher market price of F1 heifers. Although the official policy is to maintain 50 to 62.5% exotic blood level in the crossbreds of target smallholder farmers, these ranches continue to produce in-calf heifers with 75% cross calves which end up being mated with 100% exotic semen of backcrossed with local bulls. All of them have has very low levels of performance compared to their output targets, but they never had an independent critical evaluation of their performance. One way of rationalizing the ranch operations is to consider partial privatization while retaining the essential role of the public sector in importation of improver genotypes, quality assurance and regulatory services. The total annual target output of in-calf heifers from these ranches is 765, which is less than 1% of the annual estimated demand of 10,000 heifers, thus justifying support to alternative suppliers. The paper identifies and discusses four alternative and complementary options for supply of improved cattle breeding stock are possible to test and promote in Ethiopia: in situ contract production, ex situ contract producers, private ranches and in vitro fertilization. The first two options are already at work to some degree, but the other two are new.

Keywords: cattle ranches, crossbreeding, in vitro fertilization, semen sexing, F1 heifer production, dairy cattle.

1. Introduction

When the economic and biological justifications are met, crossbred dairy cattle, particularly the first generation crosses (F1) help raise milk production and productivity levels in tropical environments. In their review of dairy cattle crossbreeding projects in the Tropics, Cunningham and Syrstad (1987) concluded that F1 cows of Zebu X Taurus background outperformed all others in lactation milk yield, and that the more stressful the environment, the greater the superiority of the F1. This becomes more relevant in light of knowledge that neither local cows nor pure temperate cows are as good as the F1 crosses in milk production. The exotic breed is

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combined with the local breed for its higher milk production capacity while the local breed contributes adaptive attributes to for instance high ambient temperature and disease and parasite burden. However, when these special gene combinations of the first generation crosses (i.e. the hybrid vigour) are disrupted in later crosses, both milk production levels and thriftiness of the animals decline. There is now consensus that for tropical semi-intensive dairy cattle production to succeed, farmers will have to use F1 heifers and cows. This requires that there is a continuous and sufficient local supply of F1.

With this back ground, this paper reviews the organization and performance levels of cattle crossbreeding ranches in Ethiopia as suppliers of F1 heifers in Ethiopia, and sets out to answer three key questions:

1. How is supply of F1 breeding stock organized and operated in Ethiopia?
2. Do farmers receive adequate supplies?
3. Are there alternative options to improve input supply for livestock development in Ethiopia?
4. Is (complete?) privatization of input supply viable (practical) option in Ethiopia?

In trying to answer these questions, the author wishes to make the following conjectures to lay the ground for the discussion. First not everywhere in the highlands does Ethiopia need F1 heifers for increased dairy production. Second, not all smallholder farmers would need F1 heifers. Third, crossbreeding is not the only preferred way of genetic improvement in Ethiopia. Fourth, the current equity criteria for targeting of recipient farmers compromises chances of success and demonstrative attribute.

2. How is supply of F1 heifers organized and operated in Ethiopia?

Currently there are two operational options for production of genetically improved breeding stock in Ethiopia. These are supplies of F1 breeding stock from the government-owned cattle breeding ranches, and use of crossbreeding whereby semen from exotic improved breeds (usually Hostein Friesian and Jersey breeds) are used to inseminate local and grade cows to produce crossbred cattle. The focus of this paper is however on the first option.

Several cattle crossbreeding and multiplication ranches have been operational in Ethiopia in recent decades. Interestingly all of these are owned and operated by government institutions with extension and/or research mandates. For the purpose of this discussion, these ranches can be classified into three groups:

Group 1: Gobe, Abernosa, Metekel, Andassa: These are the largest and oldest of the ranches with decades of experiences in the production of F1 crossbred heifers and bulls as part of the nation-wide highland smallholder dairy cattle promotion initiatives. The history and performance of these ranches will be assessed in more detail below.

Group 2: Did Tuyera, Assela, Bako: these ranches were established with the aim of genetically improving major local cattle breeds through pure breeding and they have had (or still have) research mandate.

Group 3: Aba Samuel and Begie,: Both of these ranches are no more operational, but they were established for pure breeding of the Fogera and Sheko breeds respectively.

2.1 Gobe ranch

The Gobe ranch was established in 1938 in a collaborative development project between the Governments of Ethiopia and Italia. The initial activity of the ranch covered pure breeding of cattle, sheep, goats, and swine and it continued until 1968, when the ranch changed its objective and concentrated on cattle crossbreeding with the aim of producing 50% exotic in-calf heifers to supply smallholder dairy farmers. The exotic sire breed used was Holstein Friesian with the local Arsi breed providing the dam breed. This new initiative was supported by the Ethio-Swedish collaborative project known as the Chilalo Agricultural Development Unit (CADU) until 1989. After 1989, the ranch continued its crossbreeding operation financed by government budget. However, during the political instability following change of the Derg regime by the EPRDF forces in April 1991, the ranch was ransacked and substantial research data and property was destroyed. Custodianship of the ranch was transferred in 1993 to the Oromiya regional state, and rehabilitation of the ranch was started in 1994 (Ababu Dekeba, 2002; 2004; Samuel Taye, 2006).

Because of lack of functional linkages with the surrounding cattle farmers, the community did not have active interest in operations of the ranch, and in fact land claims and disputes were believed to be the major reasons for the ransacking of the ranch. Responding to these claims by the community, considerable amount of land was given back to the community and the ranch retained the current holding of 1600 hectares.

Total number of local cows maintained in the ranch in 1994 was about 800, built up to about 2400 in 1998 and gradually declined thereafter. The decline was mainly caused by absence of replacement stock within the breeding herd as the ranch did not have a clear herd replacement policy. Nevertheless, with total cow numbers of between 1500 and 2000, its annual F1 in-calf heifer output target of 350 was realistic. In practice, however, a maximum heifer output of 260 was achieved in 2003, the average annual between 1994 and 2003 being only 124 (Figure 1). This gives a heifer production efficiency of only 24% (Ababu Dekeba, 2004). This rather low performance is attributed to low level of management and lack of expert advice.

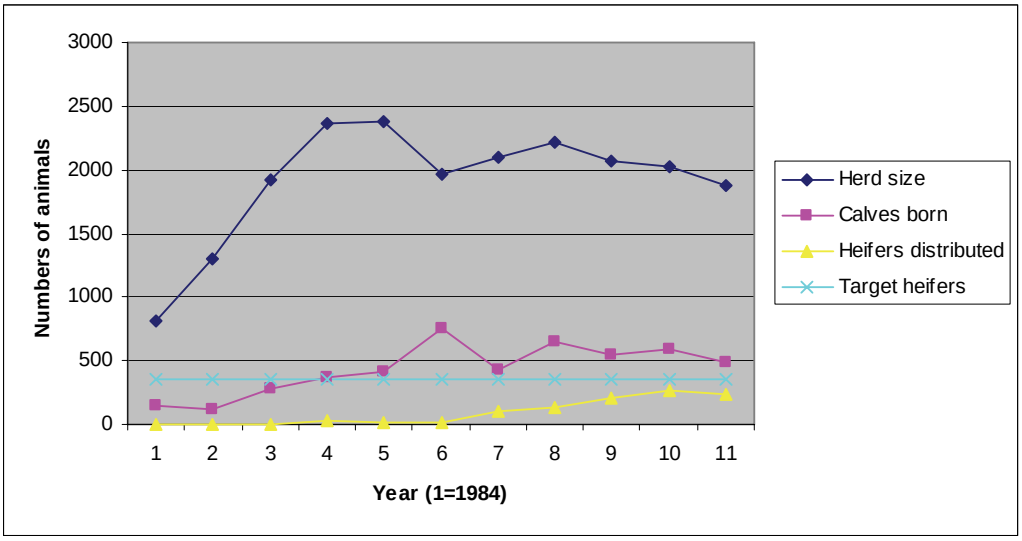

Figure 1. Performance of Gobe ranch between 1994 (Year 1) to 2004 (Year 11) (Ababu Dekeba, 2004; Samuel Taye, 2006)

2.2 Abernosa ranch

The Abernosa ranch was established in 1962 as a ranch for genetic improvement of the Ethiopian Boran cattle for its key performance trait - beef production. This objective was revised in 1972 when crossbreeding program of the Borana with Holstein Friesian was initiated to improve dairy production, a major departure from the original objective. In 1991, its land holding was 4328 ha, less than half of its size at establishment. Throughout its operation, the ranch did not have functional working relationship with the surrounding farmers. As in the case of Gobe ranch, land dispute remained a continuous problem for this ranch, perhaps fuelling the ransacking of the ranch twice, first in 1973 and later in 1991. In response to this, between 1980 and 1991, a total of 1780 hectares was given back to the community and the ranch retained the remaining 2548 hectares. Even after this, the grazing paddocks of the ranch continued to fall under heavy grazing pressure from herds of the adjacent villagers. As a result trespassing herds always posed health and mating risks to the breeding herd of the ranch, contributing to its low performance levels. A major rehabilitation of the ranch structures was undertaken in 1992/3 under the Oromia Regional Government (Ababu Dekeba, 2002; 2004; Azage Tegegne, 2004).

Herd size ranged from 1500 to 1800 during the period 1980 and 1988, but declined sharply in 1989 to 680, and further to 364 in 2003 (Figure 2). Its target annual in-calf heifer production for the 1990s was set at 200. The maximum annual number of heifers distributed to farmers was recorded in 1989 with 288 heifers supplied. This figure sharply contrasts with the heifer outputs of later years when a maximum of 75 heifers were distributed in 2003 (Figure 2). The average annual output of heifers between 1980 and 2003 was only 105, with calculated heifer production of only 15% (Ababu Dekeba, 2002).

According to Ababu (2004), the ranch generally faced some economically important constraints: lack of a system of replacement of Borana cows, which limited the scope for genetic selection and crossbred heifers production, occurrence of Streptotricosis, especially on crossbreds, frequent abortion, uncontrolled mating with bulls (local) from outside the ranch and low production of F1 calves relative to its capacity.

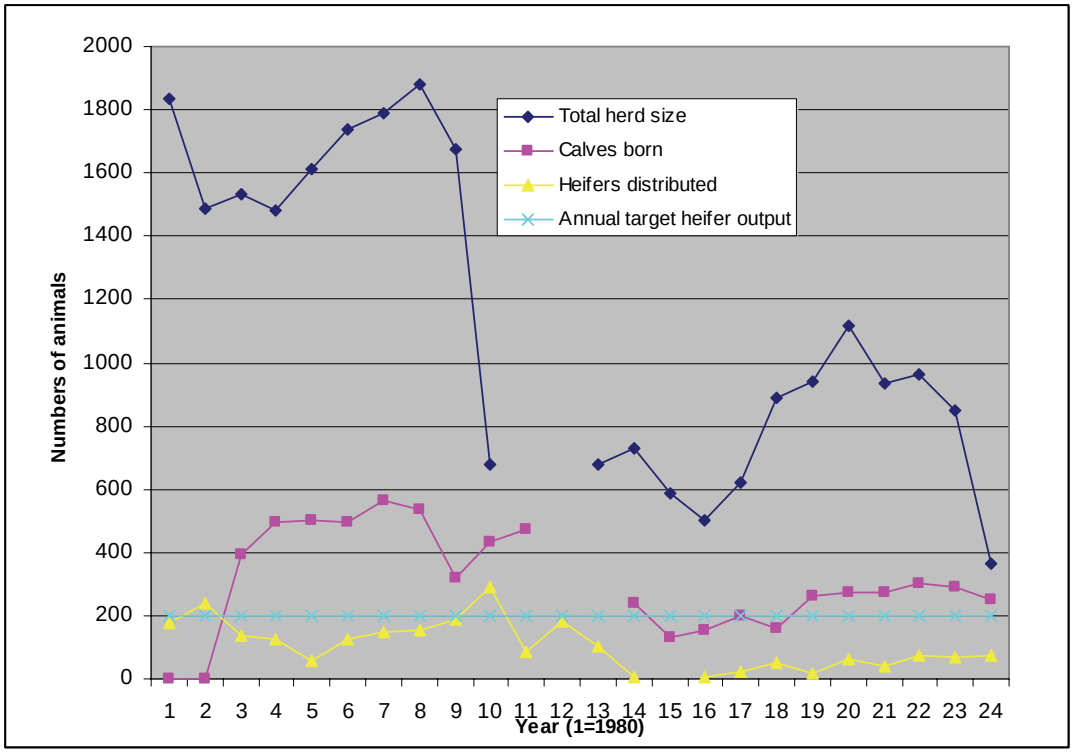

Figure 2. Performance of Abernosa ranch: 1980 - 2003 (Ababu, 2004)

2.3 Metekel ranch

Metekel Cattle Breeding and Improvement Ranch was established in 1986 and became functional in 1988. Its total land holding is 4600 hectares. The ranch has a twenty-year master plan and started off with a base population of 500 Fogera cows. According to its master plan, the ranch was expected to produce and distribute 3227 in-calf crossbred heifers, 1321 breeding bulls, 3306 draught oxen, and 1903 beef cattle over the 20 year period. Afterwards, it was expected to maintain an annual distribution of 326 heifers. Nevertheless, it only produced 398 (12.3%) in-calf crossbred heifers, 1453 (31.0%) breeding bulls and draught oxen, and 1501 (79.0%) beef cattle in the first nineteen years (Fasil Getachew, 2006). The target heifer production was 161 per annum, but it could achieve only 20 per annum. By mid-2006 there were over 2200 cattle in the ranch.

2.4 Andasa ranch

The Andassa Livestock Research Centre was established in 1964 as the Imperial Fogera Cattle Conservation Centre under the Ministry of Agriculture. It shifted its operations to crossbreeding of the Fogera cattle with Holstein Friesian for dairy improvement in 1982 and continued to produce the crossbreds ever since. By mid 2006, the centre maintained herd of 395 Fogera and 70 crossbred cattle. The land holding is about 200 ha. Its estimated annual capacity is to distribute twenty-five to thirty in-calf crossbred heifers per annum. However, during the last 22 years the centre distributed a total of only 355 in-calf crossbred heifers in the last twenty-two

years, or an average of only 16 per annum (Fasil Getachew, 2006). The centre was also involved in the promotion and delivery of artificial insemination service. In the last few years the centre re-initiated pure breeding of the Fogera cattle for genetic improvement.

2.5 Commonalities between the ranches

One key common feature of the four major cattle breeding ranches in the country is that they are government owned and have undergone frequent restructuring and change of strategic policy direction. It is worthwhile to relate that there is not a single private commercial ranch in the country, at least to serve as a performance comparator. They started off with a pure breeding / genetic improvement and conservation objective, and over time made a radical shift towards the production of F1 crossbred heifers for smallholder dairy improvement. Work on genetic improvement for beef production was abandoned altogether, beef being considered as a subsidiary product of dairy production. This is reflected to date in the absence of any long-term improvement work for beef production, although beef has been, and still continues to be, a major export commodity for the country. The local beef market is also significant. Furthermore, the three target breeds, the Arsi, Borana and the Fogera, are believed to under growing threat of genetic dilution from interbreeding and uncontrolled inbreeding. In the absence of other options like private cattle ranches, the conservation agenda remains unattended.

Another common feature of these ranches is that they rely on public funds and distribute in-calf heifers at heavily subsidized prices contributing to significant distortions in local markets of these crossbreds. Although F1 in-calf heifers are distributed by the public extension services to smallholder farmers based mainly on equity criteria, these animals end up being sold at much higher market prices to wealthier dairy farmers in urban and peri-urban areas. It is critical that the target smallholder farmers do not retain the F1 heifers as envisaged by the smallholder dairy cattle development projects. This issue of poor targeting is outside the scope of this paper, but it is important to note that the whole mark of serving poor dairy farmers through these poorly performing crossbreeding ranches is being challenged in a major way. Despite this the ranches continue to follow the same faulty strategies.

The official government policy for promotion of smallholder dairy in Ethiopia remains unchanged: maintain 50 to 62.5% exotic blood in the crosses of smallholder farmers. However, the ranches mainly produce in-calf heifers with 75% cross calves. And these heifers are mostly mated or served later by 100% Holstein Friesian semen or bulls. In cases where the AI services are inaccessible or not available, the crossbred cows are often backcrossed to local indigenous bulls (e.g. Ababu Dekeba et al., 2004). Although technically expected and possible, all the four ranches do not actively produce F1 breeding bulls for distributions with the F1 heifers. This would involve genetic selection of suitable animals to produce superior bulls; but this is not happening in any of the ranches. There is no logical explanation as to why this is not happening, although the crossbreeding exercise itself would also require some level of selection among the dam lines. In any case, there is lack of clarity in the policy guidelines to drive the crossbreeding scheme from all the ranches.

Another commonality of the ranches is the lack of clear herd replacement plans, and they rely to some degree on external suppliers of young heifers of the dam breed. Indeed this shows the lack of a long term breeding programme, even for the purposes of the crossbreeding scheme. Not surprisingly, these public establishments have a very low overall performance as measured by their success rate to meet their annual average output targets. This also meant absence of

independent critical evaluation of their performance. In some way this relates to their independence in financial management, which is often ambiguous.

Last but not least, the ranches share a common feature of functional disconnect with neighbouring cattle keeping farmers, and the resultant build up of discontent and frustration among the farming communities on the lack of service of support from the ranch operations. Serving immediate needs of local communities has never been a priority activity of the ranches as they are linked up with a broader service function to smallholder dairy farmers in central highlands. Farmers in the surrounding communities of all the ranches are not considered for semi-intensive dairy production using crossbred animals. But this does not exclude them from getting support in other more relevant services that the ranches can afford, like facilitating animal health services (which also serves the needs and concerns of ranches), forage production, marketing and supply of pure indigenous breeding stock.

3. Do smallholder dairy farmers receive adequate input supply services?

Technically nearly all smallholder sedentary crop-livestock farmers in mid and high altitude areas of country are considered qualified to be engaged in semi-intensive dairy cattle production to meet their own subsistence needs as well as to supply consumers in urban and peri-urban areas. According to the recent agricultural census surveys, the total number of these farming households is estimated to be 10 million, but these does not meant that all of these maintain cattle. There is also another numerically perhaps insignificant but in terms of market share more important group of farmers – the urban and dairy farmers.

The actual number of rural dairy farmers in is not known for sure, and with it's the size of effective demand for F1 dairy heifers. But for the purposes of the foregoing discussion, only crude estimates can be made. Assuming that only 1% of the 10 million smallholder highland farmers would express genuine interest to acquire F1 heifers, and that 10% of these need to buy one each per annum, the aggregate demand would be 10,000 heifers per annum. This figure sharply contrasts with the average capacity of the four ranches, although there is no claim that the four ranches would meet this demand. The annual average output of heifers of four ranches over the ten to twenty years of observation period was 265 heifers against total target of 741. This means the four crossbreeding ranches cannot meet just 1% of the expected demand, even when they perform at their maximum targets.

This huge gap between expected demand and supply partly explains the two to three fold price differentials between official and market prices of F1 crossbred heifers all over the central highlands of Ethiopia. There is therefore a strong need to develop and support alternative sources of F1 heifers.

4. Are there alternative options to improve supply of F1 crossbred dairy heifers in Ethiopia?

Four alternative, and indeed complementary, options of crossbred heifer supply are considered here. F1 crossbred bulls and semen are also important inputs for smallholder dairy, but the focus here is on F1 crossbred heifers as these have become critical to the dairy development scheme.

4.1 In situ production by recipients themselves

Perhaps the most effective of the four options discussed here is to engage the smallholder cattle keepers themselves to produce their F1 heifer requirements by crossing their cows with dairy improver genotypes. Of course, this measure requires careful identification of target areas and users. There is neither the need nor the logic to involve all rural villages in this scheme. Dairy economic imperatives should justify the upgrading of local cows to their half crosses.

Such an extensive crossbreeding would also require easy and affordable access to effective Artificial Insemination (AI) services. As happens in many other developing countries, private AI service delivery can complement the public services and hence it should be seriously considered to cover at least parts of urban and peri-urban areas. Without doubt, dairy markets should also be promoted and supported to provide necessary incentives to all actors in this chain. Another important requirement is the set up of progress monitoring and evaluation component for the whole scheme.

4.2 Ex situ contract production F1 heifers in private dairy farms

Despite lack of concrete comparative data, this option perhaps stands out as the most important supplier of crossbred dairy cattle for the urban and peri-urban dairy producers, who currently happen to be not favoured as recipients of F1 heifers produced in the government-owned ranches. This option can be harnessed as a reliable source of crossbred breeding stock under a formal contract arrangement with the public sector. For this option to succeed in this way, it requires careful identification of target contract producers, delivery of reliable and effective AI service, including private AI service, and networking with major market corridors. It makes economic sense to encourage large-scale operations of these private farms. A system of progress monitoring and evaluation can facilitate drawing lessons.

4.3 Private cattle ranches

It is unfortunate that, unlike many other countries endowed with such large livestock resources like Ethiopia, there is not a single private cattle breeding ranch in operation. There had probably been some initiatives during the imperial era several decades ago, but there are no traces of them to date. The overriding socialist ideology of the Derg regime and its controversial land redistribution scheme led to nationalization of major private investments like estates and ranches and effective ban of new initiatives. The gradually liberalized economic policy of the government that followed it did not encourage these either. The contentious land policy of the current government does not encourage investment in ranches, although technically major rural investments are favourably received in many parts of the country.

By its nature, livestock ranching, and especially that on cattle, operates in a very long time horizon owing to the slow and long reproduction cycles of the species. In high potential high and low altitude regions, the relative returns to investment in ranching may be low at present, for instance compared to crop production. The economic margins are expected to be mre favourable in pastoral and agro-pastoral areas. However, these areas are severely constrained by lack of access roads and scarcity of other socio-economic services. Political and social instabilities are major concerns in some areas. Unless more affirmative support services and incentives are put in place, it is unlikely that serious investment is attracted in to private ranching.

The advantage of private ranching is that they are more likely to take on a long-term development path based on current and future markets, and hence have a far better chance of success. Such a long-term planning framework is essential to plan and implement cattle genetic improvement programmes of the type witnessed in private ranches in Kenya, Zimbabwe and South Africa in the development of such indigenous improved breeds like the Improved Kenyan Boran, the Tuli and the Bonsmara. There are suitable indigenous cattle breeds in Ethiopia that can be used for pure breeding, terminal crossing or development of synthetic composites in different parts of the country. For instance, the Ethiopian Borana breed can be targeted for beef improvement in the Borana rangelands and adjoining semi-arid pastoral areas of southern, south-eastern and south-western Ethiopia. In the same way, the Horro cattle can be promoted in western Ethiopia, from Western Shoa, Eastern Wollega, Western Wollega, Illubabor and eastern parts of the Beni Shangul Region. The Fogera breed can serve similar needs in the Fogera plains, Metekel, Metema and Humera areas. In the same way the Arsi breed has a good chance of success in the Arsi-Bale highlands.

Judging by experiences of the existing ranches, linkages of private ranches with neighbouring rural communities could prove critical for smooth running of ranch operations. They may also require an efficient and reliable AI service delivery and animal health services. Potentially such private ranches could come out major suppliers of F1 heifers to cater for the needs of priority rural and urban areas. From profitability stand-point, large scale operations need to be encouraged.

4.4 In vitro production of crossbred embryo

A major set back of cattle crossbreeding programmes is the practical difficulty of ensuring continuous and adequate supplies of F1 heifers. Current developments in reproductive technology could now make it possible to produce F1 females on a continuous basis. This involves ovum pick up and maturation, *in vitro* fertilization, embryo collection and implantation in surrogate cows on-station. Prof. Paddy Cunningham of Trinity college, Dublin, Ireland has been discussing this concept since the 1990s, but it has to be tested yet for efficiency and economic viability; the proponents of this concept believe that if this system can be demonstrated to stand up technically and economically, it could provide a solution that would be widely useful in developing-country dairying, and even beyond to serve the needs of even the developed world as work is in progress to address declining performance in fitness and fertility of high-profile productive commercial breeds. The forgoing discussion is based on the personal communication on this concept with Dr Sandy McClintock of ILRI in Nairobi who is pursuing on behalf of ILRI the testing of this new concept with Prof. Cunningham. Essentially this concept is a new breeding strategy combining two developing techniques – semen sexing and *in vitro* fertilization.

Ovum pick up has been made a relatively straightforward procedure with the refining of *in vitro* ovum maturation techniques. Technically these can be collected from known genetically superior cows towards the end of their reproductive life, or even at post mortem in abattoirs from such or any other desirable females. These options allow a lot more oocytes to develop into offspring than would be expected through natural breeding. At the same time it allows a few superior animals to reproduce large numbers of offspring for the next generation. The laboratory requirements for ovum pick up and *in vitro* maturation and needs of training manpower are considered achievable at present, initially for testing and later for large scale operations.

Semen sexing is a proven technology with high initial capital requirements, but is cost effective if used at full capacity and at large scale. It is now possible to achieve 70 to 85% success rate in identifying X-chromosome carrying spermatozoa, which can be used to produce either sexed embryo under in vitro environment or direct insemination. But for effective use of the sexed semen, the former option is to choose.

In vitro fertilization and embryo implantation have now become standard practices in Multiple Ovulation and Embryo Transfer practices, and both technical and financial requirements are considered achievable in countries in Ethiopia. These techniques are now routinely used in a number of countries for multiplying up rare or valuable females. In this new concept, a much cheaper method is proposed to produce fertilised F_1 embryos at large scale in the laboratory for implantation so that recipient cows give birth to a calf whose genetic make-up was determined in the laboratory. In the words of Cunningham, one straw of semen which has been processed to have 85% 'X-bearing sperm' can be used to fertilise hundreds of eggs and produce almost double the proportion of female calves with little added cost. The key requirements of this option are therefore:

- A suitably equipped laboratory and well trained laboratory staff,
- Recipient cows which are managed for good calving rates and that are at the correct stage of their reproductive cycle to receive the *in vitro* fertilised (IVF) embryos,
- A source of suitable sexed semen and
- A source of suitable eggs.

The high technology requirements can be made cost effective when operated at large scale. This is an area for the public sector to support and promote, leaving the more routine management of crossbreeding ranches for the private sector.

5. Is privatization of input supply practical in Ethiopia?

Privatization is consistent with the current national development policy of the Ethiopian Government, and input supply for the livestock sector is not an exception. The question is whether complete privatization of the existing ranching and AI services is realistic under free market economy. The high level of initial investment, expected slow rates of return on investment at early years and the limited experience of the private sector in delivery of breeding stock and AI services do not support sudden change towards complete privatization. The public sector needs to retain its supportive role in the import and testing of improver genotypes, supply of liquid nitrogen, quality assurance and regulatory services. Operations of the government owner ranches can and should be privatized in the interest of making a more rational use of the public resources at the disposal of these ranches and encourage longer term planning for genetic improvement.

Private ranches are flourishing in other developing countries, and privatization has already tested to work for informal and formal economic sector. Nevertheless, there may be need for economic incentives to attract substantial interest as is the case in other sector.

More importantly, the conservation objectives on livestock genetic resources will always rely on support from the public sector, although ironically this is not the case even when all the ranches are owned by the government. This is precisely the reason why more rational decision making is

needed for use of the public resources; the comparative advantages of public resources is in generating public goods that the private sector does not take active interest or interest to.

6. Conclusions

All the government crossbreeding ranches have been operating far below their target performance levels, and yet they did not undergo critical independent review of their operations. They continue to enjoy heavy subsidies in their operations causing market distortions.

Even at their maximum target output levels, the four major crossbreeding ranches could meet only less than 1% of the annual estimated demand for F1 dairy heifers, thus calling for support for alternative suppliers of these inputs. One way of rationalizing their operations is to consider privatization while retaining the essential role of the public sector in importation of improver genotypes, quality assurance and regulatory services.

Four alternative and complementary options for supply of improved cattle breeding stock are possible to test and promote in Ethiopia. These are *in situ* contract production, *ex situ* contract producers, private ranches and *in vitro* fertilization. The first two options are already at work to some degree, but the other two are new.

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Livestock Technology Generation and Transfer as a Dialogue: Experience with Holetta Research Center Based Institutional Arrangements

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Abstract

The national agricultural research and extension system of the country has been generating and transferring livestock technologies to smallholder farmers. It has been using various research and extension approaches to make technologies generation and transfer process client-oriented, problem-centered and need-based. The main emphasis of the approaches was to improve farmers' level of participation in the whole process. As a result, farmers' level of participation has shifted from passive nature of receiving the top down research recommendations to collaborative nature where they are considered as partners. Client-oriented research approach, collaborative in nature, was introduced into the research system at the end of 1990s. Since then, it has been modifying its approaches to suit to the ever changing, complex and risk prone smallholder farming system. One of the changes being implemented is formulation of Zonal Based Research-Extension Advisory Council (REAC). REAC brought a change in institutional arrangements in livestock technologies generation and transfer process. It has been effected for the last six years in the form of council meeting during research 'SETS' review, field days, tours, field visits and consultative meetings. It acted as a forum where the various institutions at the mandate zones of Holetta research center came together for dialogue. In the dialogue process, they categorized zonal livestock related problems into researchable, development and policy issues and forwarded them to responsible and accountable institutions for action. It has also sought alternative options and taken actions for some problems. In doing so, it refined the sub sector problems and contributed much to rural development intervention of the government. However, in order to envisage increased output and impact, livestock technology generation and transfer system need to identify, describe, analyze and consult the potential clients (men and women) from various farmers' categories and institutions.

Introduction

The national agricultural research and extension system of the country has been generating and transferring livestock technologies to smallholder farmers. It has been using various research and extension approaches on which the new approach has been emerging on the limitations of the old approaches. In the old approaches, research protocol development was based on individual researcher interest. Researcher reviewed publications to identify knowledge gap which he/she thinks can be solved through research. Proposals were developed and reviewed by peers and research scientists and technologies generated in this way were transferred to farmers. The non-adoption of some livestock technologies by resource poor farmers through the approaches has brought a shift of emphasis towards client-oriented research approach.

The main emphasis of client-oriented research and extension approach is to increase institutions' level of participation in all phases of technology generation and transfer process. It was introduced to the national research and extension system as a pilot project at Holetta, DebreZeit

and Melkasa research centers on barley, cool season food and forage crops, Vertisol, African Highland Initiatives and Farmers' Field Schools. The project was externally funded while management was done by responsible researchers at the centers. Experiences gained on pilot project was further incorporated and institutionalized into national research and extension system since the late 1990s. Since then, client-oriented approach has been modifying its components to suit to smallholder farmers' production practices; one of which is formulation of Research-Extension-Farmer Linkage Strategy into the national research and extension system. The strategy requests research centers to formulate center based Research-Extension Advisory Council (REAC) within the mandate zones. Holetta research center based REAC was established in 2001 through representatives (male and female) from various institutions active in zonal development planning and management. The council has formulated abiding laws and rules for which the institutions are accountable. It has also guided technology generation and transfer demand-driven, problem-oriented and need-based. Furthermore, it has identified and categorized zonal problems into researchable, development and policy issues and sought institutional support to solve some of these problems. Moreover, it has played active role in the establishment of sub centers with similar agro ecologies and characteristics to reduce risks within diversity. This paper therefore reviews REAC dialogue process in livestock technology generation and transfer and forwards action areas for further improvement.

Methodology

Experiences with client-oriented research and extension approach at pilot level were reviewed and shared among institutions. Its contribution towards demand driven livestock technology generation and transfer was agreed upon and ended with the formation of research-extension farmer linkage strategy. The strategy requested center based REAC formation which can bring zonal institutions together for dialogue. Then a letter signed by research director general from head office instructed the center to establish REAC at center level. Holetta research center took a lead and created forum to raise awareness level of institutions about client-oriented research and extension approach. The key institutions at initial phase included the zonal and wereda agricultural extension officers, zonal and wereda head, Ambo College of Agriculture, representatives from farmers and development agents, Holetta research center and Ambo crop protection research. After some years of REAC experience, the number of institutions increased due to the need for their potential contribution. Some of these include Sebeta animal health research center, Sebeta national fisheries and other living aquatic research center, non-governmental organizations, rural development institutions and Holetta bee research and training center (Table 1).

Selection of REAC participants was decided by the council. Holetta research center wrote formal letter addressed to each institution and reminded them the date, time and place of meeting. Selection of representative farmers and development agents was done in consultation with development agents and bureau of agriculture respectively. The number of participants from each intuition was also decided as per council decision.

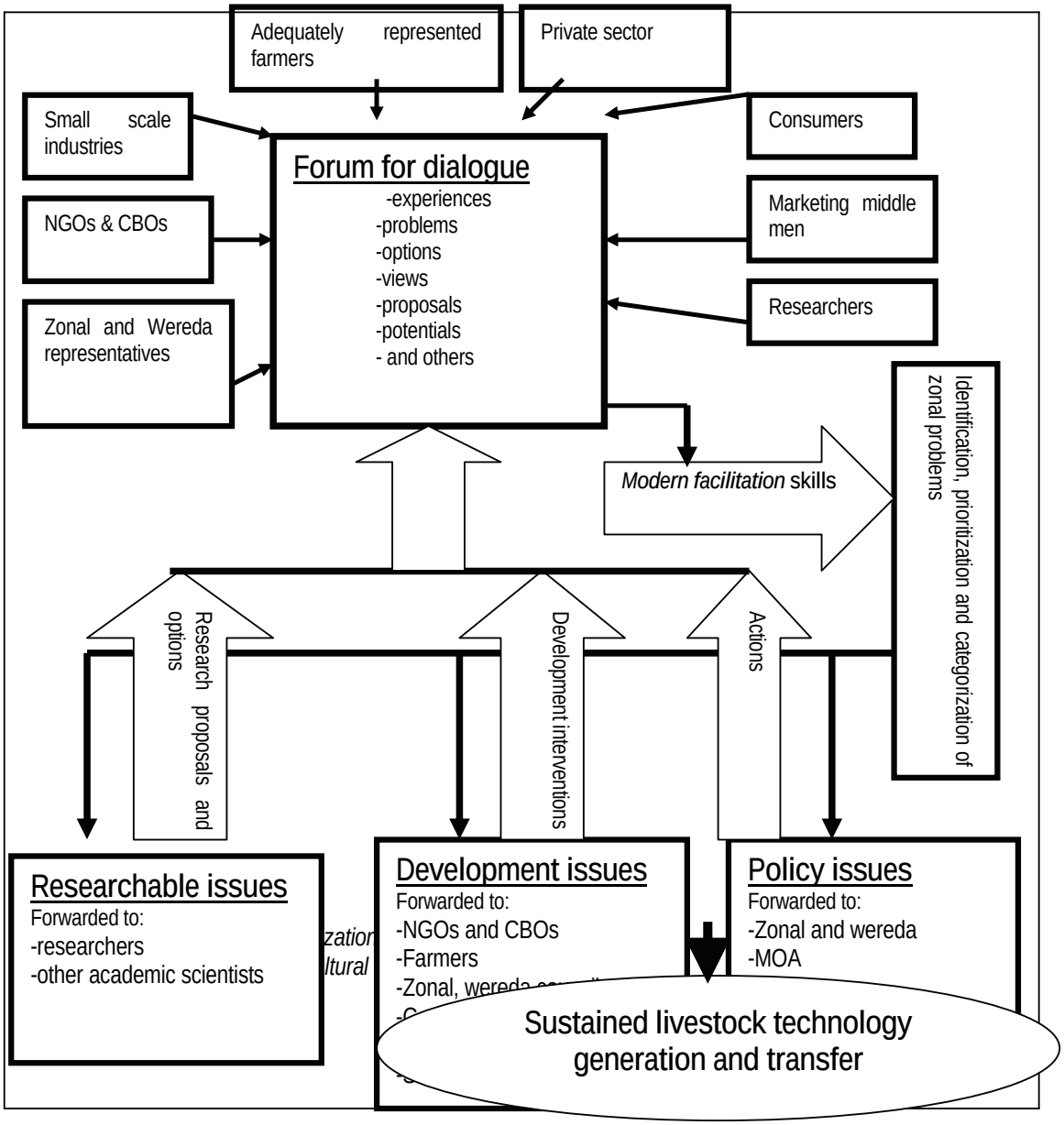
Council members came together for dialogue two times per year: during problem identification and prioritization and livestock technology performance evaluation. In the identification and prioritization phase, each institution came with potential problems and alternative options if possible to solve the problems. Researchers developed proposals on prioritized researchable issues and presented for thorough review. Some of the proposals were accepted, some others

modified and the rest were rejected. Once presented, members formulated small groups for detailed discussion and categorized the issues into researchable, development and policy. The issues were forwarded to responsible institutions to be solved or come up with alternative options for the next review meetings.

The second time when council members came together for dialogue was during technology performance evaluation. Members visited the trials and compared technology performance with local breeds/practices. This was mainly accompanied with leaflets, field days, field visits and tours among others. Extension pamphlets and leaflets which included detailed management practices have been disseminated to aid understand. The key outcome during performance evaluation was sharing of experiences, a wealth of expertise and technical advice, observation, reflection and analysis. Moreover, researchers collected data, recorded, analyzed and reported the findings to the council during the subsequent meeting. Further discussions and review were done to refine technology generation and transfer process more need-based and problem-centered. In all these, zonal heads chaired council meetings alternatively each for two consecutive years and passed it to the other zone. The center has been acting as secretary for the council and produced and disseminated council minutes and workshop reports to members.

Conceptual framework

Recently, livestock technology generation and transfer is seen as a dialogue between government, non-government, small scale industries, researchers and farmers who have different levels of formal organizations and development objectives. These institutions bring zonal problems, experiences, views, options among others into the dialogue and seek solutions jointly to make it need-based and problem-centered (Figure 1). The main emphasis is therefore to use and activate information, knowledge and interests of all groups in a joint dialogue with the objective to formulate a broader consensus on technology generation and transfer. In this case, it is believed that the dialogue processes and the way it is handled and implemented are as important as the final product (technologies). To achieve the intended objective, the institutions have developed specific dialogue structure and procedure through which all groups are fully involved as an interactive human community.



Source: Authors' construct

Figure 1: Need-based, problem-centered and demand-driven livestock technology generation and transfer

Livestock technology generation and transfer as a dialogue accept and manage the complexity that arises from the interaction among different institutions and recognizes the reasons for their 'rationalities'. In addition, institutions should recognize that they have unequal negotiation capacities, contradictory interests and eventually antagonistic strategies. They should also understand the basic essence of dialogue as for talks, discussions, presentations, consensus building, brainstorming and exchange of ideas and point of views. Dialogue serves to increase mutual understanding through sharing of experiences and knowledge and provides groups and individuals with new orientations in decision formulation and opinion building processes (Jenssen, 1998:31). In such instances, different institutions with different power interests and orientations communicate, bargain and negotiate while protecting their interests. However, few members may build coalitions or try to dominate the others; all kinds of variations should be thinkable by facilitators. To overcome these, facilitators must be equipped technically with modern management tools because a dialogue is a kind of human engineering which is a guide to unknown knowledge and experiences (ibid).

In the process of dialogue, learning which occur is not restricted to increase the knowledge about others but to adjust one's own positions or to look for totally new solutions which satisfy (as a consensus) all the parties involved. In most group learning process, the system learns from mistakes or identifies a gap between the 'is' situation to the 'should be' situation. In this case, conflict solving, consensus building and increasing mutual understanding and knowledge are main elements of dialogue. In many instances, complementary interests draw facilitators' attention on synergy effects, which are seen as an additional source for livestock technology generation and transfer. In other words, it refers to a situation where several activities create a totally new situation, which none of the individual activities could have achieved alone.

Livestock technology generation and transfer as a dialogue is not a pre-determined planning process with a fully identified methodological set but an open exercise in learning, it is an event with lots of surprises and challenges which require flexible reaction. It should be noted that open in this context does not represent lack of structures in the process but it requires procedures and structures to embark a new pattern of development activities with success.

Livestock technology generation and transfer as a dialogue bring institutions together to share responsibilities and optimize efficient utilization of resources while avoiding redundancies. Certain fields of responsibilities are shared among institutions while each institution complements and supports others in filling resources gap. Some institutions loose monopoly of information and objective setting for zonal development and encourage in information exchange between and among each other. As a result, the scattered knowledge and information over a variety of institutions are coordinated and communicated. This leads to a higher level of organization which is more accountable and responsible to society problems and local needs.

The most important outcome of livestock technology generation and transfer as a dialogue is identification, prioritization and categorization of zonal problems into researchable, development and policy issues. At the end of a dialogue, institutions forward alternative options for solving the various issues and assign responsible institutions. Livestock technologies are generated on the basis of these problems, tested on-station, on-farm, demonstrated and popularized before a wider dissemination to complex, diverse and risk prone farming environment. Development issues are forwarded to development institutions whereas policy issues are channeled to wereda, zonal, regional and central governments for action. The results are further brought to the institutions for evaluation and refinement forming a kind of vicious circle (Figure 1).

Experience with REAC

Before client-oriented approach to the national research and extension system, livestock technology generation and transfer process was more of individualistic. Individual researcher reviews literature and identifies the knowledge gap which he/she thinks be filled through research. On the basis of this, proposals were developed and defended for implementation. Findings were presented at forum and whenever possible outcomes were published. Attempts were made to transfer technology generated in this way but the non-adoption of some of the technologies by many resource poor farmers and unwillingness of institutions to participate in transfer process brought a shift to involve potential institutions. As a result, ways were sought out to create a good environment for institutions at zonal level to come together and make a dialogue. One of the ways was establishment of zonal based REAC in the national research and extension system.

REAC has become functional at the center level for the last six years having two main objectives in livestock technology generation and transfer. The first objective is to identify and prioritize zonal problems and review research proposals for feasibility. Though it reviewed technical feasibility of the proposals, much emphasis was given to social, economic, environmental aspects and critical problems. The second objective is to evaluate technologies generation and transfer progress during field days, tours among others. In all these, the cost of running REAC has been covered through IFAD-client-oriented project. REAC has both strengthens and weakness and lessons learnt and problems encountered in livestock technology generation and transfer are reviewed below.

Successes of REAC

It created a forum for various institutions to come together, make dialogue, identify and prioritize zonal problems and seek alternative solutions. Each institution is given chance to present institutional potentials and problems encountered while implementing activities to achieve institutional objectives. Research centers presented proposals which are developed on researchable problems as identified; some of which were accepted as proposed, some were rejected and still some others were modified (Table 2). For example, donkey as a source of power for plowing was conducted at farm level and experiences indicate that donkeys face wound problem at their back. Using harness has been recommended in order to control, fasten to the cart and reduce the wound. However, participants pinpointed to conduct research to generate breeds that tolerate wound with donkey utilization as draft power source. The center has given much emphasis to conduct research to improve the problems taking Holetta area to represent highlands and Zeway areas to represent lowland donkeys.

Due to frequent disease on cattle in *kola* areas in the zones, it is difficult to use oxen as draft power. Participants pointed out if it could be possible to use horse and donkey for the same purpose. The response was that research along this line is already underway at Adami Tulu research center; the result of which could be utilized in our area as appropriate. The outcome of this research will be pursued and made available to the council.

Participants mentioned breast disease with introduced crossbreed cows and asked for options to minimize the problem. It was explained that this happens as a result of crossbreed cows' anatomical structure of hanging, huge milk outlet and high milk potential. The disease is mainly observed on body and breast parts of crossbreed cows. Germs can easily enter into breast through holes and cause severe disease. Therefore, it is recommended to wash breast with warm

water before and after breasting. In addition, separation of diseased crossbred cows with medication/treatment prevents spread of disease among cows.

Participants requested research institutions to assess traditional livestock feeds feasibility and nutritional values for livestock. Research activities are on progress to see local feeds efficiency, feasibility and nutritional values around Pawe and Werer research centers. The results and experiences from these centers could be used for the same purpose. The findings if accepted will be presented to REAC and then demonstrated to farmers to increase livestock productivity and optimize profit from interventions.

Honeybee packages disseminated to farmers are not complete, why? Responsible institution responded that what has been said by farmers is true but they were not able to find solution for the problem. The problem emanated because components of a package come from different institutions. For example, hive is from Bako whereas as *sem* is from Addis Ababa. To make package complete, this requires institutional commitment which in turn is the role of either federal or regional governments.

REAC reduced repetition and redundancy of resource utilization in research and development endovers. The same research activities conducted separately by Sebata Animal health, Holetta Animal health, non government organizations and wereda agriculture were agreed upon and carried out to reduce resource redundancy. Through dialogue, REAC created collaborative approach for institutions to work together while reducing repetition. Consensus was reached in that REAC must monitor and evaluate institutional collaboration, problems existed and potential contribution of each while working together.

REAC has identified discontinued research proposals, assessed the causes and forwarded options to overcome them. Conflict between and among researchers was among the causes for discontinuity. Council members carried out investigation and transformed the conflict through mediation, negotiation and agreement. This has encouraged and created a good spirit of working together for multidisciplinary institutional team.

Livestock technology transfer was limited to few weredas in the zones before REAC establishment. On the basis of farming system categorization into similar agro ecologies, livestock technology generation and transfer at the moment covers wider agro ecologies. In addition, Zonation maps with more or less similar units were further identified and two sub centers at Adadi Mariam and Jeldu weredas and one trial site at Degem wereda were established to represent specific agro ecological zones. Selection of priority villages for on-farm verification, demonstration and popularization were done to ensure that socioeconomic conditions do not hamper adoption of the proposed activities.

REAC reached consensus that shortage of livestock technologies are among the problems that reduced farmers' productivity. Though it is a policy issue, REAC encouraged demonstration of breeds on farmers' field which has been effected as per council decision. Moreover, they encouraged and created farmer to farmer technology dissemination and other institutions involvement on technologies dissemination. In this regard, preconditions such as training and capacity building were provided to collaborating farmers to improve management skills. Research centers monitor the progress under farmers' circumstance for further dissemination.

Development agents play dual roles; as development agents and as administrators. They mainly collect credits and enforce farmers when some are incapable to make repayment. REAC passed the issue to policy makers for further refinement. While transferring livestock technology to

farmers, the council advised to include indigenous technical knowledge because farmers do have their own ways of controlling say diseases and other related problems. In addition, respondents reminded that local breeds as compared to demonstrated and popularized crossbreeds have high resistance to disease and withstand harsh conditions such as feed shortage. As a result, surveys have been conducted to identify promising traits on local breeds.

In the past, reports, publications, extension materials among others produced by individual institutions were shelved without dissemination to beneficiaries. In some accessible institutions, they were produced and delivered in an inaccessible format (foreign languages) to non-academics (farmers and development agents) to understand and apply them. REAC, however, documented available information and recommendation and disseminated them to institutions. In this case, reports, publications, and extension materials have been produced in a format that allows users to understand and apply them. In addition, extension pamphlets and leaflets were produced and disseminated.

Problems encountered

Although REAC has done a lot in shaping research and extension system demand-driven, problem-centered and need-based, it has some problems which it encountered during implementation. In principle, potential institutions must be documented and known in terms of origin, objectives, staff, intervention domain, research agenda and potential contribution. There are many NGOs such as GTZ, Hunde, World vision, ERSHA, Self help international, Food for Hunger International, Mekane Yesus, among others active in the zonal development interventions. Only few representative institutions were participated in REAC and Table 1 gives the type of institutions and number of representatives. In addition, some institutions engaged in small scale industries and marketing that primarily utilize farmers' products were not represented. Moreover, participated farmers were not selected to represent the whole farming communities from various categories (both men and women). As a result, large seats in REAC dialogue processes were dominated by researchers and other academics while farmers had little control over the nature and quality of the process.

REAC has been financed through externally funded research project and is donor-driven. This may challenge its sustainability if the external initiation is pulled out. In other words, it lacked local or demand-driven financial initiatives in the whole research and extension system in the country.

It is getting clear that no single institution in the zones alone can solve the range of problems affecting smallholder farmers. Each institution has its own potentials and constraints in livestock technology generation and transfer. The weak part of one has to be filled by the strong part of the other and therefore each must willingly and dedicatedly participate. It is recorded that some of the institutions were absent during REAC dialogue due to may be lack of commitment for various reasons (Table 1). REAC, in turn lacked council means to enforce bylaws or rules to control absentees. As a result, the council was unable to review and evaluate progresses of some research protocols (Table 2).

Conclusion and recommendations

The national research and extension systems have become client-oriented in such a way that it included wider range of institutions. The institutions were identified on their potential roles in

rural development interventions in general and livestock technology generation and transfer in particular. They are the ones who directly or indirectly influence or who are affected by technologies generation and transfer. The institutions formed REAC which managed the research and extension activities at the mandate zones. This has shifted technologies generation and transfer processes from researcher-based research protocol development to a dialogue. In the dialogue, the institutions have been actively involved in technologies generation and transfer processes. In doing so, they made research and extension approach demand-driven, problem-centered and need-based. They identified livestock improvement constraints, prioritized and solved some of the problems. They also jointly established sub centers to develop site specific technologies through agro ecological characterization. They encouraged and strengthened institutional coordination and collaboration. They reduced resource duplication and repetition of research and development activities. In general, they classified zonal problems into researchable, development and policy issues and forwarded them for consideration by concerned institutions. They also monitored actions taken, solutions sought and problems solved.

Though the REAC has done considerable input to improve research and extension system institutions-based, problem-centered and need-based, it has areas for further consideration to make it more productive and responsive. Some of the recommendations include:

1. The REAC approach needs to be further demand-driven and requires institutionalization into the national research and extension system to maintain sustainability. In other words, donor financed approach should be replaced by local means; the best of which is to include its financial components in research protocols or allocate separate budget for its activities.
2. The issue of accountability, responsibility and commitment of the institutions to participate in the dialogue process was weak. REAC lacked a mechanism to enforce members to abide and obey the date of meetings, field days, tours among others. This requires establishment of agreed upon means to enforce bylaws and rules.
3. Mobilization of all potential institutions to include diversity in livestock technology generation and transfer. Involvement of the missing institutions in the dialogue will generate tasks related ideas and information that will help in the refinement of livestock technology generation and transfer.
4. Sustainable and successful agricultural research in livestock technology generation and transfer can be achieved by empowerment, participation and satisfaction of the institutions. In client-oriented research and extension approach, detailed knowledge of the farming communities and their needs is as a prerequisite for change. Since farmers are the source of detailed information about their real farming and socio-cultural settings, it is through their adequate representation in the dialogue process that their needs and problems specified. Furthermore, any research and extension system that envisages increased output and impact will have to identify, describe, analyze and consult the potential clients (men and women) from various farmers' categories and institutions.

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Table 1: Institutions and representatives during REAC meetings (1992-1997)

Name of institutions	Number of member participated per year						
	1992*	1992	1993	1994	1995	1996	1997
HARC[3]	18	28	24	24	30	32	18
West Shoa zonal agriculture	5	9	4	14	4	4	2
West Shoa development agents representative	-	2	2	-	3	3	3
West Shoa farmers' representative	2	2	2	2	6	4	2
North Shoa zonal agriculture	5	6	12	11	5	4	3
North Shoa woreda representative	-	2	1	-	4	2	5
North Shao farmers' representative	2	1	2	2	8	5	1
South west Shoa zonal agriculture	-	-	-	-	4	1	1
South west Shoa wereda representatives	-	-	-	-	3	3	4
South west Shoa farmers representatives	-	-	-	-	6	6	1
Holetta Bee research and training center	1	7	6	2	2	3	3
Ambo crop protection research center	-	12	6	5	6	7	-
Ambo highland maize improvement	-	-	-	-	-	-	
Ambo College of Agriculture	-	-	-	-	1	1	1
Sebata animal health research center	1	3	2	3	3	-	1
Sebeta national fisheries and other living aquatic research center	1	-	1	1	1	-	1
NGO	-	ERSHA and FHI[4]	FHI	Birbirsa na Chirech a	Birbir sa na Chirec ha	-	World Vision
Total	35	74	63	65	87	74	47

Source: Holetta Research Center; Research and Extension Division (REAC minutes, 1992-1997)

* Institutions and their representatives during REAC establishment

[3] Holetta Agricultural Research Center
[4] Food for Hungry International

Table 2: Research protocols reviewed during REAC meetings (1992-1997)

Institutions	Years																	
	1992			1993			1994			1995			1996			1997		
	Completed	On-going	New sets	Completed	On-going	New sets	Competed	On-going	New sets	Completed	On-going	New sets	Completed	On-going	New sets	Completed	On-going	New sets
HARC	151	131	155	133	137	115	163	93	146	124	153	139	145	132	157	169	124	171
Holetta Bee research and training center	4	14	8	1	20	2	4	14	2	5	14	8	5	19	16	3	25	6
Ambo crop protection research center	12	48	15	11	42	6	15	65	12	20	20	11	26	59	45	-	-	-
Ambo College of Agriculture	-	-	-	-	-	-	-	-	-	5	5	6	3	6	11	3	10	6
Ambo highland maize improvement	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-			
Sebata animal health research center	3	4	3	4	7	-	-	2	2	2	9	4	-	-	-	2	8	4
Sebeta national fisheries and other living aquatic	-	-	-	-	-	1	-	-	-	5	26	-	-	-	-	-	-	-

Institutions	Years																	
	1992			1993			1994			1995			1996			1997		
	Completed	Ongoing	New sets	Completed	Ongoing	New sets	Competed	Ongoing	New sets	Completed	Ongoing	New sets	Completed	Ongoing	New sets	Completed	Ongoing	New sets
research center																		
Total	160	197	181	149	206	124	160	174	162	161	231	168	179	216	229	177	167	187

Notice: 4, 4, 4, 3 and 4 discontinued research activities at Holetta in 1997,1996,1994,1993 and 1992 respectively. 1, 1 and 1 discontinued research activities at Holetta Bee, Ambo College and Sebeta National livestock health centers respectively (1997).

Source: Holetta Research Center; Research and Extension Division (unpublished REAC minutes, 1992-1997)

Extent of institutional partnerships and the interaction between policy, research and extension for market-oriented dairy development in Ethiopia

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Abstracts

The opportunity of using market-oriented dairy production as a tool for poverty reduction is hampered by several inter-related factors. Poor institutional partnerships, poor marketing infrastructures and product prices, poor research delivery pathways i.e. weak interaction between dairy research and research extension are presumed result in less than desirable success in market-oriented dairy production in Ethiopia. In addition, not only shortage of input supplies but also non-strategic approach in providing the available resources, absence of effective dairy development policy and centralized recording scheme and inefficient credit/micro-finance facilities are among major barriers to the sector.

Therefore, for market-oriented dairy production to be successful and sustainable in Ethiopia, all actors involved in dairy development need to re-orient their efforts towards a common goal and institutionalize themselves with shared responsibilities.

Introduction

It is well known that Ethiopia is an agrarian country with an estimated population of over 76.4 million, growing at 3% annual rate and is predominantly (>80%) rural. Agriculture is the dominant sector of the economy that accounts for over 50% of the total Gross Domestic Product (GDP) and provides means of living for over 65% of the inhabitants (Ayele et al,. 2003). The livestock sector accounts for about 40% of agricultural GDP and 20% of the total GDP. Besides, livestock serves as the pillar of Ethiopian agriculture in which they play multiple roles. They serve as a direct source of food, (meat, milk, egg, blood), as a raw material for leather and carpet industries, as crop production inputs (draft power, manure, trampling), (Goshu et al., 1989) and contributes heavily to country's export revenue earnings accounting for about 12-15% of the total export earning, the second order of importance (Ayele, 2003).

Time and again, Ethiopia enjoys a considerable livestock wealth from the continent both in terms of number and diversity. Recent reports (CSA, 2003) indicated that the total cattle population for the country is estimated to be 41,527,142 of which the female cattle constitutes about 56.2 percent (23,336,163) and the remaining 43.8 percent (18,190,980) are male cattle. The majority (97.9 percent) of the cattle population is found in rural areas, while very small proportion is accounted for urban areas (2.1 percent). Moreover, the results showed that 99.4 percent of the total cattle in the country are local breeds and the remaining are hybrid and exotic breeds that accounted for about 0.5 and 0.1 percent, respectively. In 1997, Tsehay reported that the proportion of exotic and crossbred dairy breeds was estimated to be less than 0.01 percent. However, recent census indicated that the numbers of improved dairy breeds are rapidly increasing.

It has been estimated that Ethiopia posses a total of about 9,307,582 milking cows producing about 2.591 billions liters of milk of which 2.48 billion (95.67 percent) is attributed to rural areas. However, the majority of milk production at the national level is consumed at home (48.1 %) while only 5.06 % is supplied to market. Rural areas, which constitute the majority of milk production in the country, market only 4.44 % of the total milk production. Therefore, the lowest level of per capita milk production in Ethiopia has attributed not only to shortage of milking cows and level of milk production but also to the failure of forming marketing network for milk produced at household level. Besides, several other factors including weaker inter-institutional linkage, poor interaction between research and development, absence of well defined livestock development policy, quality control and safety regulations and poor marketing infrastructures are among to mention.

Global perspectives of dairy production

Estimates of realized and projected consumption trends by the International Food Policy Research Institute (IFPRI), the Food and Agriculture Organization of the United Nations (FAO) and the International Livestock Research Institute (ILRI) shows that production of certain food commodities will have to increase more rapidly than others (Figure 1) in different parts of the world to meet expected demands (Delgado et al. 1999). Whereas only marginal increases in consumption of meat and milk are expected in the developed world, increases of 114% and 133%, respectively, are projected until the year 2020 for meat and milk consumption in the developing world. The projected production increases to meet these demands in developing countries amount to 108% for meat and 145% for milk. The greatest (85%) increase in world meat consumption will be developing counties, with highest increases occurring in Asia, specifically East Asia where Ethiopia has better market opportunity. Also, more than 90% of the world's predicted 60% increase in milk consumption will occur in Asia, mainly South Asia (FAO, 2005a). However, for the next 10 to 25 years, minimal growth will take place in the overall global consumption of these two livestock products.

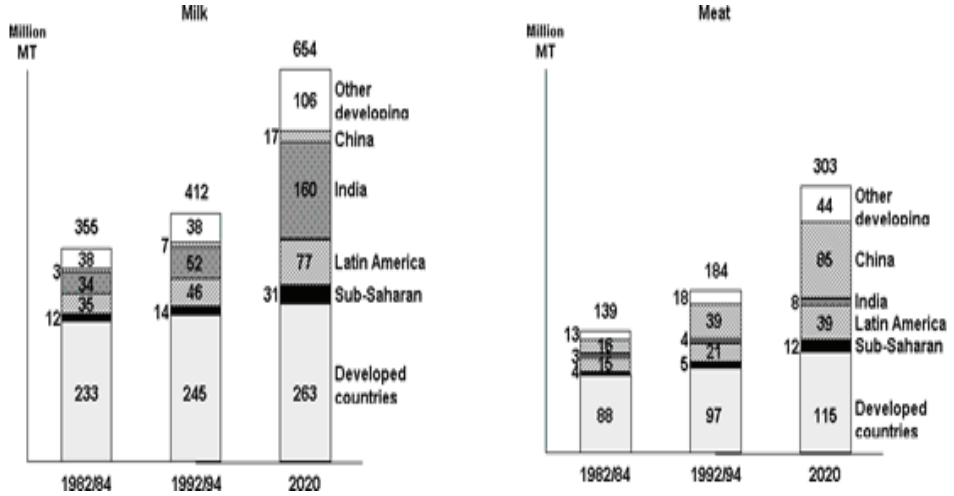


Figure 1. Total milk and meat consumption during 1983 and 1992 and projection for 2020.

Source: Delgado et al. (1999).

The demands for increased animal products are higher than for cereals because of changing consumption patterns following urbanization, population growth and projected income growth. Diets with more high-value protein and micronutrients will improve human health and the livelihood of many poor. The implications of increased food production and changed diets of billions of people may be dramatic in the next few decades and could improve the well-being of many rural poor as both consumers and producers (Delgado et al., 1999).

In contrast to the familiar green revolution that started in plant production thirty years ago, a livestock revolution is just underway in order to meet the increase in demand for food of animal origin. Such a revolution assumes a wise use of natural resources, including animal and plant genetic resources, in order to be realized. The challenge is how to take advantage of prevailing trends for the benefit of the rural and sub-urban poor livestock keepers in developing countries rather the more industrialized production in other parts of the world. Already predictions are that unless major improvement in productivity occurs, East Asia and Africa will increasingly remain net importers of meat and milk products (FAO, 2005a). For cereals, milk and dairy products, South Asia, Africa and East Asia will increasingly become net exporters of cereals.

Although mixed crop-livestock production systems will persist in the foreseeable future, higher levels of intensification will be required, with increased use of livestock genotypes that are likely to respond better to the changes in production systems. Consequently, small scale mixed crop-livestock production systems will eventually be confined to more remote areas, with poverty persisting and livestock playing a more central survival role and a key first step out of poverty. Under such conditions livestock on their own are unlikely to create overwhelming riches to their keepers.

The Ethiopian Dairy Industry

The emergence of modern commercial dairying in Ethiopia is dated back to the Second World War (1940s) during which Ethiopia was able to obtain dairy cattle through the United Nation Relief and Rehabilitation Administration (Abaye et al., 1989). These animals were served as the nucleus for the establishment of the present Holetta Dairy Cattle Genetic Improvement Farm and Shola Dairy Farm in Addis Ababa.

The establishment of the agricultural colleges (the former Ambo Junior College of Agriculture in 1939; Jimma Junior College of Agriculture; and Alemaya College of Agriculture in 1955) also made significant contribution to dairy research and development programs in Ethiopia.

Cursory reviews show that on-farm dairy program was started in the late 1960s during the establishment of Chilalo Agricultural Development Unit (CADU), in 1968. This project was financed by the Ethiopia and Swedish governments include research and extension programs, marketing services and credit and input supplies for the smallholder farmers. Availability of veterinary and artificial insemination (AI) services and the introduction of improved pastures and forage crops were important components of this package for livestock (Abaye et al., 1989). Besides, the Wolaita Agricultural Development Unit (WADU) was established during the same time and employed the same approach, but instead of crossbred heifers, bull service stations were taken as an alternative to upgrade local cows in addition to AI. As a new technology, the response of farmers was promising except the less success in Wolaita due to limited bull station and AI services. The drawback of these project were that implementation cost and workforce demand was high so that it becomes impossible to expand the scope nationally and the anticipated success was not attained (Abaye et al., 1989).

Constraints to market-oriented smallholder dairy development in Ethiopia

Many attempts to improve dairy in Ethiopia have been made, mainly through crossbreeding. Although it should be recognized that improved livestock have been successfully produced or introduced in favorable highland areas and in relatively intense peri-urban production systems, many attempts have did not met their goals.

Several institutions like research centers, conservation and multiplication farms, institution of higher learning, state dairy farms and co-operative dairy farms have been involved in dairy cattle production and multiplication in the country. However, crossbreeding of indigenous breeds with exotic breeds has been undertaken indiscriminately without enough consideration of environmental conditions for production. Lack of comprehensive approaches to design simple, yet effective breeding strategies in low-input environments also contributed to less success of smallholder dairying in Ethiopia.

In addition, recording systems through out the country and among institutions are designed for different purposes and therefore there is lack of uniformity in data recording. In some cases, the data collected are irrelevant (unwanted traits for improvement), inconsistent; vary in the frequency of collection and finally ended up with without meaningful data for planning and policy formulation. Moreover, little or no efforts have been made in analyzing the data that have been accumulated over the years. Limited information that are available so far have not been properly organized, compiled and channeled into extension systems to meet development objectives. In general, some of the problems associated with the poor performances of smallholder dairy production are as indicated below.

Shortage of input supply

a) Feed resources: An important feature to be considered in the crossbreeding program in the low input productions system is the availability of feed resources. In Ethiopia, feed usually based on fodder and grass, are either not available in sufficient quantities due to fluctuating weather conditions or, when available, are of poor nutritional quality (Ahmed et al., 2003). These constraints result in low milk yield, high mortality of young stock, longer parturition intervals and low animal weights (McIntire et al, 1992,103 cited in Ahemd, 2003).

According to the survey made by CSA (2003), it was indicated the major feed type for cattle in both rural and urban areas of the country is green fodder (pasture), constituting about 60.17% followed by crop residues (26.02%). Hay and by-products used as animal feed comprise of 6.8 and 1.45% of the total feed, respectively. Very small amount of improved feed (only 0.12%) was used as animal feed. Other types of feed accounts about 5.43% (Table 1).

Table 1. Animal feed resources of Ethiopia

Item	Rural and urban holding		Rural holding		Urban holding	
	Number reporting	Percentage That use:	Number reporting	Percentage: That use:	Number reporting	Percentage: That use:
Total Green/fodder grazing……..	9,462,178	100 60.17	9,192,256	100 60.55	269,922	100 48.85
Crops residue….	7,825,828	26.02	7,660,221	26.35	165,608	16.3
Improved feed…	66,009	0.12	62,595	0.12	3,414	0.24
Hay…….	2,852,543	6.8	2,764,117	6.77	88,426	7.67
By-products...	987,506	1.45	892,592	1.26	94,914	7.17
Others ……	3,085,797	5.43	2,868,982	4.95	216,815	19.77

Source: CSA (2003)

From the survey report, it can be realized that the major feed resources reported are mainly seasonal and are of poor quality, which cannot sustain productivity of improved dairy breeds the whole year round. Although several feed production, utilization technologies and strategies were developed to address the problems of inadequate and poor quality feeds, dissemination and adoption of these technologies has been limited. Therefore, relentless effort is needed to extend improved feed resources and their utilization strategies to small-scale dairy producers through intense sensitization and capacity building.

b) Poor animal health services: The Ethiopian livestock industry really suffers from animal diseases, because Ethiopia is one the countries in Africa where many of the diseases prevails (Goshu et al., 1989). Apart from direct effect through the death of animals, diseases cause morbidity, which results in loss of weight, slow growth rate, poor fertility, productivity and overall physical unfitness.

Central Statistical Authority of Ethiopia (2003) made nationwide survey on the number of total livestock vaccinated, afflicted, treated and dead and the result is shown in Table 2. Survey reports show that the estimated number of vaccinated animals within the reference period in the country was about 11,4452,357 out of which about 81.24% were cattle followed by goats, which constitutes about 6.94%. Sheep, draught animals (horses, asses, and mules) and poultry accounted for about 6.85, 3.25 and 1.39%, respectively. The estimated number of vaccinated camel was only 0.33% of the total vaccinated animals.

Form the extrapolation of total number of animals the country owns, it was estimated that only 22.4% cattle, 5.3% sheep, 5.8% goat, 6.3% pack animals (horses, asses and mules), 8.4 camels and 0.3% poultry were vaccinated against various diseases (Table 2). Therefore, it is evident that there are no adequate and dependable animal health services in promoting the highly vulnerable dairy breeds under Ethiopian conditions.

Table 2. Estimated number of livestock species, number vaccinated, afflicted, treated and died in Ethiopia in 2002/3

Species	Total No.	Total vaccinated	%	Total afflicted	%	Total treated	%	Total died	%
Cattle	41,527,142	9,304,316	**22.4**	5,149,263	4.5	1,863,573	4.5	2,243,274	5.4
Sheep	14,655,565	783,971	**5.3**	1,765,586	12.1	238,555	1.6	1,289,861	8.8
Goat	13,661,562	794,935	**5.8**	1,695,284	12.4	231,108	1.7	1,213,385	8.9
Pack animals	5,821,297	371,651	**6.3**	380,229	1.37	120,094	2	193,027	3.3
Camels	447,842	37,925	**8.4**	39,666	8.86	8,473	1.9	17,165	0.3
Poultry	42,915,629	159,557	**0.37**	11,336,709	26.4	293,056	0.21	10,401,496	24.2
Total	**119,029,037**	**11,452,355**	**48.6**	**20,366,737**	**65.6**	**2,754,859**	**11.91**	**15,358,208**	**50.9**

Source: Abstracted from CSA (2003)

c) Inadequate supply of improved dairy genotypes: Unlike Kenya, the large cattle population of Ethiopia has relatively limited numbers of improved dairy genotypes. Currently, exotic or crossbred dairy cows in Ethiopia are estimated at 0.6% (245,646) of the total 41,527,142, cattle population of the country. The National Agricultural research system of Ethiopia proved that F_1 crosses and crosses near to the F_1 are suitable and are the rational choice for smallholder dairy production systems. Remarkable success has already been achieved through on-farm verification trials by research centers and ranches. However, there is no responsible body for multiplication and distribution of the recommended crossbred types in Ethiopia. Few multiplication ranches available in the country could not meet the ever-growing demands due to the interplay of several problems (Table 3).

Table 3. Number of improved dairy breeds distributed by ranches and multiplication centers in Ethiopia

Ranches	Year																									
1. Abernosa	1979	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04
Heifers	199	239	137	125	59	127	150	153	190	288	88	183	102	3	-	6	20	50	-	61	22	70	72	75	66	27
Bullocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-	108	18	177	-	283	153	196	207	-
Annual plan	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
2. Gobe Ranch																										
Heifers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6	5	30	16	20	103	131	200	260	233	151
Bullocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-	108	18	177	-	288	153	196	207	-
Annual plan	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350

Source: Kefena (unpublished data)

d) Inadequate budget allocation: Information is being collected from regional and national research institutions!!

Poor micro-finance/credit facilities

In Ethiopia, the rapidly growing micro-finance institutions support the off station contract breeder to the extent of ETB 5000. On one hand, this credit facility did not put in practice to serve poor farmers. On the other hand, the amount of loan available is not sufficient enough to fit with the growing economic standards. The small and medium scale credit (ETB 500 to 25,000) required for scientific breeding is not available because of collateral and equity requirements. Most of the loans are now guaranteed to large private investors who can meet the collateral security and equity requirements. But for large investors, animal breeding is not an attractive field because of long gestation period to recover the investments and other inherent constraints.

Poor extension system

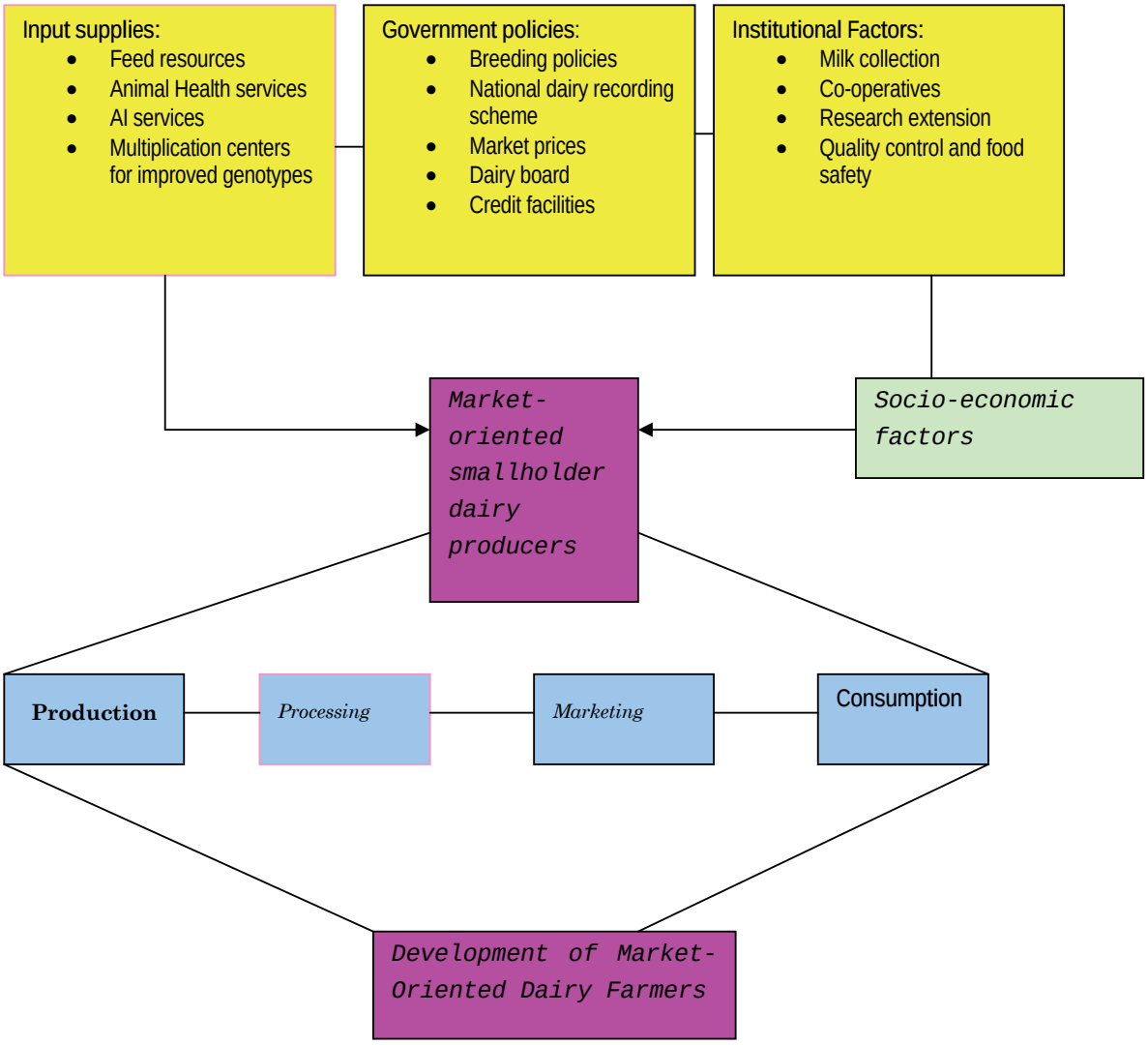
Literally, livestock research is mandated for generating, verifying and fostering scientific technologies pertaining to livestock development through various forums. Research extension department is supposed to disseminate generated technologies to ultimate user (farmers). However, extension system is more of crop biased and the livestock in general and dairy in particular is highly overlooked despite of its contribution to the national economy.

Poor market infrastructure and producer's price

In most parts of Ethiopia, difficult market access restricts opportunities for income generation from dairy products. Remoteness resulted in reduced farm-gate prices, increased input cots and lower returns to labor and capital (Ahmed et al., 2003). This, in turn, reduces incentives to participate in economic transactions and results in subsistent rather than market-oriented dairy production systems.

Although data is lacking to substantiate it, the existing government policy favors consumer's rights than producers. As a result, most milk marketing occurs through the informal market in the form of raw milk sold directly to consumers (Stall and Shapiro, 1996). It was indicated that the formal milk market, run by a parastatal, supplies only 13% of the liquid milk the capital. The large role of the informal market appears to result from low formal milk prices and institutional constraints.

Options for the development of market-oriented dairy development in Ethiopia



Conclusion

Market-oriented dairy development is constrained by several factors in Ethiopia. The previous "top-bottom" development program in Ethiopia was failed to meet the need of the people for whom it was intended. The full and unfettered involvement of the resource poor in development processes was considered to be the shortcomings of this approach. In 2000, this approach was realized to be one of top constraint to developments and technology transfer in the Ethiopian Agricultural Research System and consequently, another approach called participatory approach was began to enter development discourse with the vision of system approach, involving various stakeholders.

However, though the approach was designed to involve all the actors in a given development process, dairy sector lacks holistic approach in the process. Feed shortage both in terms of quantity and quality, animal health services, marketing infrastructures and product prices, credit/micro-finance services, multiplication centers for generated technologies and establishment of dairy co-operatives still remained unsolved.

Therefore, institutional partnerships and interaction between research, policy and research extension is an urgent need for market-oriented dairy development in Ethiopia. Thus, institutions should re-organize and re-orient themselves towards common goal and share responsibilities with terms of reference.

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Preferences of Phenotypic Traits in Central Ethiopia: What are the implications for Cattle Production and Marketing Decisions of farmers?

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Abstract

Production and marketing decisions in the semi-subsistence cattle keeping systems of Ethiopia are principally influenced by farmers' preferences of cattle phenotypic traits. Eliciting the preferences and quantifying the economic worth of these characteristics would reinforce efforts in the production, marketing, and sustainable conservation and use of animal genetic resources (AnGR). This study focused at understanding what farmers and farmer-buyers' preferences are regarding the cattle they want to keep or buy in the market and what implications these preferences have on their decisions. The research was conducted in and around Dano district of Central Ethiopia both on farm and in the cattle markets. Farmers, as cattle keepers, identified age, origin, and suitability for ploughing for oxen and age, fertility, origin of the animal, and calf strength for cows as the most important traits. As cattle buyers, farmers selected age, suitability for ploughing, origin of the animal, and calf strength for oxen and age, origin, milk yield and calf strength for cows as the crucial traits in their buying decisions. The research verified the fact that farmers have age-old mechanisms of identifying and ranking their trait preferences in a consistent and meaningful manner. The identification of these trait preferences implies that decisions for genetic improvement and conservation of indigenous cattle in these production systems should be based on comprehensive understanding not only of the relative importance attached to each phenotypic trait but also of the ways in which cattle keepers and consumers measure these traits.

Key words: Cattle buyers, Cattle keepers, Dano, Trait preferences.

Introduction

Cattle type choice and marketing decisions in less market oriented farming systems depend mainly on phenotypic characteristics as opposed to the basis for same decisions of the market oriented farmers in the developed countries. In the former case, consumers look at the color, age, body size, origin, tail length, horn type, and so on, whereas in the latter case, decisions are mainly influenced by body weight, pedigree, and breed type. Given the fact that the phenotypic characteristics are so important and that they considerably manifest genetic features, eliciting the preferences and quantifying the economic worth of each of these characteristics would significantly serve efforts in the production, marketing, and sustainable conservation and use of the animal genetic resources (AnGR) in the (semi-) subsistence livestock keeping systems.

Design for the sustainable management of indigenous livestock genetic resources, particularly in developing markets such as Ethiopia, should base on a thorough understanding of owners' reasons for keeping the livestock. However, little documented empirical evidence is available in Ethiopia on the comparative use values of indigenous cattle genetic resources (van Dorland et al., 2004). The fact is the genetic resource base of the country is declining anyway. Declining trend of animal genetic resources in Ethiopia is believed to happen due to, among others, interbreeding among the indigenous populations, uncontrolled crossbreeding with and replacement by exotic breeds in projects designed to improve animal production, neglect, droughts and consequences of drought associated restocking schemes, political instability and associated civil unrest, changes in producer preferences, usually in response to changes in socioeconomic factors leading to change in breed use, and weak development interventions (Workneh Ayalew, 2004).

Artificial insemination using the semen from exotic cattle breeds has also been implemented over the last three to four decades with the aim of 'improving' the indigenous cattle breed. While artificial insemination has, in most cases, been and is still being executed on indigenous breeds that have not been evaluated and/or not characterized, complementary efforts to conserve the gene pool of the indigenous breeds are non-existent. Due to the ease of artificial insemination, indiscriminate crossbreeding is resulting in unforeseen levels of dilution of the indigenous gene pool (IBC, 2004; Kassahun Awgichew, 2004; Nigatu Alemayehu et al., 2004). Also important is the fact that Ethiopia is yet to formulate livestock breeding policy. Therefore, the level of threat to animal genetic diversity in Ethiopia cannot be easily projected. Virtually no studies have been conducted to look into the trait (both productive and nonproductive) preferences in the production and marketing arenas for indigenous farm animal genetic resources in Ethiopia. Such neglect of local knowledge on preferences and management of farm animal genetic resources both in the past and at present causes major difficulties to develop and implement adequate participatory conservation and utilization strategies at national and local level (Wollny, 2003).

The contemporary school of thought advocates the presentation of solid argument to justify investment on indigenous genetic resources while they are hardly rewarding in the market (Mendelsohn, 2003). As a contribution, efforts are being made to include the economic worth of the different productive and non-productive traits in selection for breeding (Kosgey et al., 2004; Berry et al., 2005). The development of economic weights for the preferred traits of animals starts from identifying the preferences of livestock keepers and consumers. This research focused on eliciting and examining the implications of these preferences in Dano district of central Ethiopia.

This study specifically aimed at understanding what farmers and farmer-buyers' preferences are regarding the characteristics of the cattle they want to buy and/or keep or sell. Seven traits were considered for oxen and eight traits were considered for cows. The traits considered for oxen were color, age, origin, body size, horn type, draft power, and calf strength. For cows, color, age, origin, body size, horn type, fertility, milk yield, and calf strength were the traits of interest.

Materials and Methods

The study area

Dano is located some 250 km south west of Addis Ababa and 125 km west of Ambo town. It has an area of about 659 square km and a human population of 83,000 in 2005. Traditional

classification of the agro-ecologies indicates that 5% of Dano is highland (>2200 masl), 80% midland (1500 - 2200 masl), and 15% lowland (<1500 masl). Topographically the district is characterized by dissected plateaus, mountains, hills, flat lands and valleys. The district receives on average 900-1400 mm annual rainfall and has 15-30 C° average daily temperature. According to the estimate available at district level, there are about 75,000 cattle, 4,500 goats, 2,900 sheep and 3,500 equines (Archives of the district office of agriculture and rural development). Livestock are crucially important for the farming community in the district.

Sampling, data collection and analysis

This paper reports findings of a participatory research done with 75 farmers. Data were collected using different participatory and conventional approaches and techniques. Transect walk, simple observation, key informant discussions, semi-structured interviews, pair wise comparisons and structured surveys were the main techniques employed. The data generated were analysed using narrative analysis for the qualitative ones and descriptive statistics for the quantitative ones.

Results and Discussion

The livestock production system

Types and Purposes of Animals Kept in Dano

Cattle, chicken, sheep, goat, mules, donkeys and horses are the major types of animal kept by farmers in Dano. The main purposes of keeping animals were indicated to be traction power (for plowing and transportation), milk, meat, egg (for household consumption and for cash generation), farm manure and reproduction. The consumption of milk, butter and egg was indicated to be as frequent as 15-30 days per month while chicken and cattle meat is consumed very sporadically 3 or 4 times (each lasting from 2-7 days) a year. One important issue in this regard is milk marketing and consumption. The culture of milk selling and buying is not yet developed that people would give it free than selling it. Even cows are milked every other day as there is storage problem, in addition to the 2-3 weeks grace period after parturition.

The basic constraints of the farming system were described to be drought (erratic distribution of rainfall) and land shortage (or uneven distribution). The constraints of livestock production in this area are essentially diseases such as trypanosomiasis and anthrax, lack of feed (due to shrinkage of communal and private grazing land), and lack of money. Lack of adequate and timely supply of veterinary services was mentioned to be aggravating the effects of the prevailing diseases.

Labor Division

Protecting and managing the grazing land and the herd, purchasing and supplying feeds and supplements, and training and employing oxen for plowing are the tasks of men. Men also do activities such as branding, medication, selling, and buying salt for oxen. On the other hand, milking, churning, buying salt for cows, and feeding salt for all animals were described to be women's job. Women also engage in activities such as selling butter, cleaning the barn, and adding manure on the farm. In fact, these responsibilities are not mutually exclusive that the

household members bear any of them whenever the need arises. Children are the primary care takers of cattle at daytime.

Housing and Herding

Cattle are kept in barns under normal circumstances and calves are kept in houses until they are strong enough to bear the extreme climatic phenomena. In fact, most of the farmers take in their animals to their houses during very cold times given the number of animals and the size of the house. Some farmers in the lowlands construct houses instead of barns for their animals.

Herding is done in groups and alternately. Each household would have to take care of the cattle of the group. The number of animals of the households has no relationship with the frequency with which they take turns. The group can be formed by 20 to 30 households. If someone could not keep his/her turn due to reasons beyond his/her control, the next person would take care of the animals.

Mating and Improvement Aspired

When the heat period of the cows is distinct, farmers select bulls and have the cows served with these preferred bulls. Otherwise, the animals would be served arbitrarily in the field. Most of the farmers were found to be satisfied with the status quo while a few of them argued that they should control the mating in order to get fast growing and strong calves. The possibility of having selected bulls for breeding was indicated to be hardly affordable as the bulls are also used for plowing. This clearly makes the fitness of the bull quite low to serve as many cows as required.

With regard to improvements aspired by livestock keepers, farmers want to keep their animals in clean barns, smaller number, buy more plots of grazing lands and provide feed supplements of both home and market origin for their animals within the limits of affordability. Aspired trait level improvements were reported to be big size, fast growth, more milk yield, and plowing strength (higher traction power).

Interaction of the Subsystems

The crop, livestock and natural vegetation sub-systems are interrelated as captured in the sketch below (Figure 1). The complementary relationships are indicated in regular font while the competitive ones are italicized.

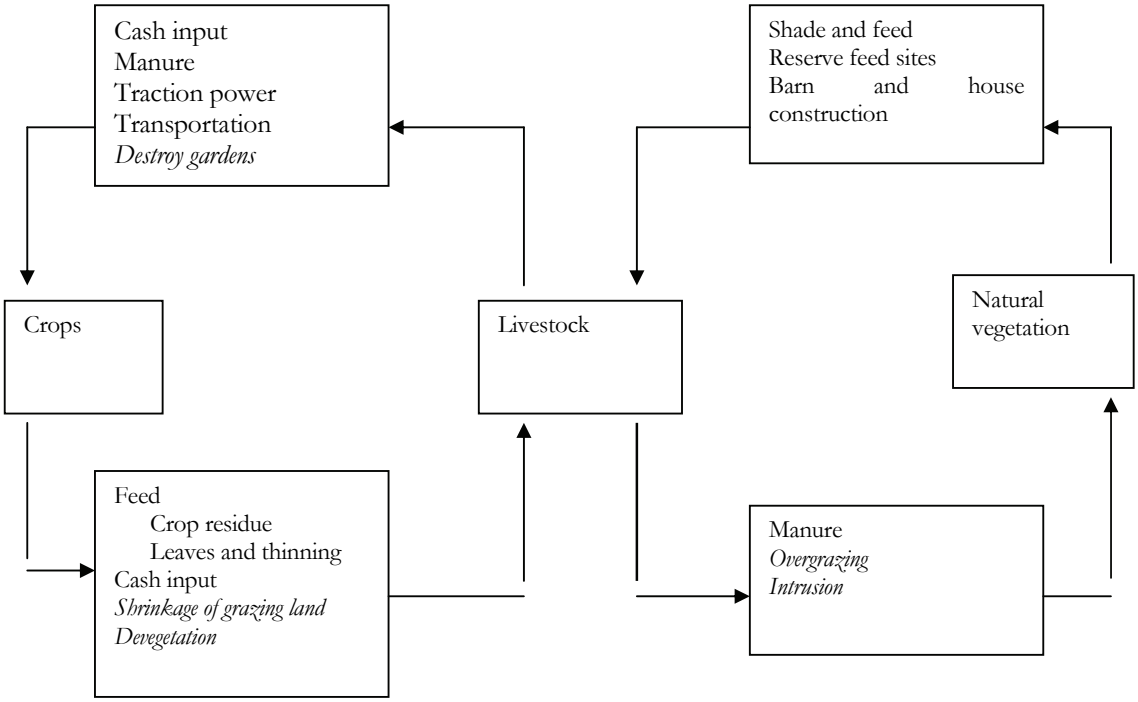

Figure 1: The interaction among crop, livestock and natural vegetation in Dano district

Marketing and Pricing of Cattle

Farmers buy and sell cattle from village markets and open markets such as Sayo Dano, Dano roge, Harbi Gulfa, Menz - with in the district, and Silk Amba, Ijaji, and Benja – out of the district. These are not the only markets farmers have access to but they prefer these to other for reasons including price differentials, size and proximity of the market and number and quality of livestock supplied to the market. Markets set on one or two days per week.

Price setting in these cattle markets is through a prolonged bargaining. When farmers want to sell an animal, they would first go to the market and do a sort of price assessment. Then they set an initial bargaining price, which is plus 50-300 birr over the selling price. The bargaining is usually between only the buyer and the seller. When allowed only brokers or elderly people, intervene and advise the parties to agree with a compromise from each side.

Before the payment is made, in fact, the origin, productivity background, the address of the seller, body size, strength, body condition, length, height, beauty, and age of the animal would be examined to set the final price of the animal. Farmers also prefer buying from farmers and from those who have some traditionally plausible reasons to sell than to buying from traders even if the traders are already known for their trustworthiness. Farmers are at a disadvantage if powerful traders (and their brokers) are indeed interested to buy their animals. The sabotage starts with offering a lower price and informing to virtually all traders and brokers not to offer over and above that. The brokers are usually paid by the buyers and so are believed to be biased towards them. This is an important point vis-à-vis the general satisfaction in buying and selling prices of livestock reported by most of the farmers.

Interestingly enough, the price distributions developed by farmers in their working areas (as producers) and in the markets (as buyers/sellers) are so close that it looks like that there is a reliable mechanism of generating and disseminating market information. The months in which the different levels of prices of cattle occur also appear to be comparable across the different peasant associations and markets (Table 1). The marketing decisions of the livestock keepers are also quite related as can be seen from the periods when they are buying and selling.

Table 4 - The calendar of the cattle price distribution in and around Dano district

Place	Respondents	When does the price level happen?			Selling	Buying
		Minimum	Maximum	Average		
S. Gamb.	Keepers	Oct.-Nov.	Feb.-Apr.	Dec.-Jan.	Feb.-Mar., June.	Nov.-Dec.
S. Gud.	Keepers	Jul.-Sept.	Feb.-May	Oct.-Dec.	Feb.-May	Oct.-Dec.
Dire Wuj.	Keepers	Oct.-Feb.	Apr.-June	Jul.-Oct.	Jul.-Sept.	Mar.-July
Sayo	Buyers	June-Dec.	Feb.-May	Jan.		
Harbi	Buyers	Oct.-Dec.	Feb.-June	Jan		
Roge	Buyers	Oct.-Jan.	Mar.-Sept.	Jan.-Feb.		
Ijaji	Buyers	Oct.-Nov.	Jan.-Mar.	Dec.		

Trends in livestock production and marketing

The communal and general perceptions about the trends of cattle population size and cattle disease were found to be vague and ambiguously both increasing and decreasing. In fact, in the case of population size, the dominant perception seems to be increasing while in the case of cattle diseases, decreasing is the dominant perception. In the case of feed availability, farmers unanimously described the trend as decreasing especially over the last two three decades. The trend that significantly increased is the price of animals. This trend was indicated to start some 10 years ago. Calculations based on current and 15 years old price data actually revealed that there are increments up to 290% in nominal prices over the period of 15 years (Table 2).

Table 2: Prices for different types of cattle currently and 15 years ago

Animal	Price in 1991*	Current price	Price change based on maximum (%)
Fattened ox	200 - 500	1100 - 1400	180
Ox	140-350	700 - 800	128.6
Bull	70-285	500 - 700	145.6
Pregnant cow	120-400	600 - 1200	200
Fattened cow	140-400	600 - 900	125
Cow	80-350	400 - 600	71.4
Heifer	60-230	400 - 500	117.4
Calf	20-90	150 - 350	289

*** Source:** Tesfaye Kumsa, 1991.

Preferred traits

In the production system

Trait preferences were elicited both in the production and in the marketing areas. The traits were presented separately for oxen and cows. For oxen, farmers in their production areas identified age, origin, and suitability for ploughing as the three most important characteristics after a pair wise comparison of all the traits. Colour and horn shape were found to be the least

preferred traits. Body size and calf strength were also mentioned by farmers to be middling traits of oxen (Table 3).

Table 3 - Scores of traits of oxen as set by livestock keepers

Farmer	Color	Age	Origin	Body size	Horn type	Draft power	Calf strength	Peasant Assoc.
1	1(6)	5(1)	5(1)	4(3)	0(7)	3(4)	3(4)	S. gamb.
2	2(5)	4(3)	5(1)	1(6)	0(7)	4(3)	5(1)	S. gamb.
3	1(6)	3(4)	6(1)	4(2)	0(7)	4(2)	3(4)	S. gamb.
4	2(5)	6(1)	4(3)	3(4)	0(7)	5(2)	1(6)	S. gamb.
5	3(3)	4(2)	0(7)	3(3)	2(6)	6(1)	3(3)	S. Gud.
6	1(5)	5(2)	6(1)	1(5)	3(4)	4(3)	1(5)	S. Gud.
7	2(5)	6(1)	5(2)	3(4)	0(6)	4(3)	0(6)	S. Gud.
8	3(3)	5(2)	2(5)	6(1)	0(7)	3(3)	2(5)	Dire Wuj.
9	1(6)	3(4)	6(1)	2(5)	0(7)	5(2)	4(3)	Dire Wuj.
10	3(4)	5(1)	3(4)	1(6)	0(7)	5(1)	4(3)	Dire Wuj.
11	1(6)	5(1)	5(1)	3(4)	0(7)	5(1)	2(5)	Dire Wuj.

* Numbers in brackets show relative ranks of the traits according to each respondent.

Similarly, for cows farmers identified age, fertility (short calving interval), origin of the animal, and calf strength to be the four most important traits when thinking of animals to keep. Milk yield and body size were found to be of second-rate importance. Skin colour and horn shape are the least important characteristics of cattle from livestock keepers' perspective (Table 4).

Table 4 - Scores of traits of cows as set by livestock keepers

Farmer	Color	Age	Origin	Body size	Horn type	Fertility	Milk yield	Calf strength	Peasant Assoc.
1	1(7)	7(1)	6(2)	3(4)	0(8)	5(3)	3(4)	3(4)	S. gamb
2	1(7)	4(3)	4(3)	3(6)	0(8)	6(1)	6(1)	4(3)	S. gamb
3	2(7)	6(2)	7(1)	4(3)	0(8)	3(4)	3(4)	3(4)	S. gamb
4	1(7)	7(1)	6(2)	5(3)	0(8)	3(5)	2(6)	4(4)	S. gamb
5	1(7)	2(6)	5(3)	3(5)	0(8)	6(1)	5(3)	6(1)	S. Gud
6	1(7)	3(5)	5(2)	3(5)	0(8)	5(2)	4(4)	7(1)	S. Gud
7	2(7)	5(2)	3(5)	3(5)	0(8)	6(1)	5(2)	4(4)	S. Gud
8	1(7)	6(1)	4(4)	2(6)	0(8)	5(3)	4(4)	6(1)	Dire Wuj.
9	1(7)	6(2)	3(5)	2(6)	0(8)	7(1)	4(4)	5(3)	Dire Wuj.
10	1(7)	5(3)	3(5)	2(6)	0(8)	7(1)	4(4)	6(2)	Dire Wuj.
11	1(7)	6(1)	6(1)	3(4)	0(8)	6(1)	3(4)	3(4)	Dire Wuj.

*Same as above.

In the marketing system

Age, suitability for ploughing, origin of the animal, and calf strength were identified to be the most important characteristics of oxen in the markets by farmer-buyers. Colour and horn shape again happened to be the least significant traits. Body size was found to be of average importance here in the market as well (Table 5).

Table 5- Scores of traits of oxen as set by the buyers in the markets

Buyer	Color	Age	Origin	Body size	Horn type	Draft power	Calf strength	Market
1	1(6)	3(4)	4(3)	2(5)	0(7)	5(2)	6(1)	Dano
2	1(6)	6(1)	5(2)	3(4)	0(7)	4(3)	2(5)	Dano
3	3(3)	4(2)	2(6)	3(3)	1(7)	5(1)	3(3)	Dano
4	1(6)	6(1)	2(5)	3(3)	0(7)	3(3)	5(2)	Harbi
5	1(6)	3(3)	3(3)	3(3)	0(7)	6(1)	5(2)	Harbi
6	2(5)	5(2)	6(1)	3(4)	0(7)	4(3)	1(6)	Harbi
7	3(4)	4(3)	5(2)	2(5)	0(7)	6(1)	1(6)	Roge
8	1(6)	5(1)	2(5)	4(3)	0(7)	5(1)	4(3)	Roge
9	1(5)	6(1)	5(2)	4(3)	0(7)	3(4)	1(5)	Roge
10	1(6)	4(3)	5(1)	2(5)	0(7)	4(3)	5(1)	Ijaji
11	1(6)	4(3)	3(4)	2(5)	0(7)	6(1)	5(2)	Ijaji

*Same as above.

For cows, age, origin, milk yield and calf strength were identified to be the four most important traits considered by farmer-buyers in the markets. Body size and fertility were equally found to be less important as compared to the four traits. Least important were colour and horn shape (Table 6).

Table 6 - Scores of traits of cows as set by the buyers in the markets

Buyer	Color	Age	Origin	Body size	Horn type	Fertility	Milk yield	Calf strength	Market
1	1(7)	6(2)	7 (1)	5(3)	0(8)	4(4)	3(5)	2(6)	Dano
2	1(7)	5(2)	7(1)	5(2)	0(8)	5(2)	2(6)	3(5)	Dano
3	2(6)	5(2)	5(2)	1(7)	0(8)	6(1)	5(2)	4(5)	Dano
4	2(6)	4(4)	1(7)	3(5)	0(8)	5(3)	7(1)	6(2)	Harbi
5	1(7)	3(5)	2(6)	4(4)	0(8)	5(3)	7(1)	6(2)	Harbi
6	1(7)	6(2)	7(1)	3(4)	0(8)	3(4)	3(4)	5(3)	Harbi
7	2(6)	6(1)	6(1)	4(4)	0(8)	3(5)	5(3)	2(6)	Roge
8	1(7)	7(1)	5(3)	4(4)	0(8)	2(6)	3(5)	6(2)	Roge
9	1(7)	6(2)	2(6)	7(1)	0(8)	4(4)	3(5)	5(3)	Roge
10	1(7)	4(4)	7(1)	6(2)	0(8)	5(3)	3(5)	2(6)	Ijaji
11	1(7)	3(5)	4(4)	2(6)	0(8)	6(1)	6(1)	6(1)	Ijaji

*Same as above.

Interesting is also the way farmers measure the different traits and set the preferences in order to decide on keeping or buying an animal. Mutual trust is the only tying and verifying means of the information exchanged between sellers and buyers which is the main source on most of the traits and characteristics considered. An effort was made to identify the means of measurement of the traits and the common levels of the traits according to the farmers themselves and the detail is given below in Table 7.

Table 7 - Means of measurement of the preferred traits and their common levels

Traits	Means of Measurement	Common levels
Age	Teeth and horn examination and discussion with the seller.	Ox: 5 years old and 1 year plowing experience Cow: 1-2 calves
Origin	Discussion with the seller and sometimes examination of the hair of the cattle.	Wollega, Chelia, Dano
Body size	Observation.	Small, medium, big
Calf strength	Discussion with the seller and examination of	Good, medium, bad

Traits	Means of Measurement	Common levels
	the frame of the cattle.	
Draft power	Discussion with the seller and observation of the obedience of the ox.	Very good, good, bad
Fertility	Discussion with the seller and examination of the body frame.	Good (1 calf/year), bad (1 calf in or more than 2 years)
Milk yield	Discussion with the seller and observation of the naval flap and the tits.	2 liter/day is maximum

Implications of the preferences

The dual purpose of ox keeping is clearly seen here as farmers highly rank traits related to draft power and calf strength. Farmers use oxen for plowing and mating cows up until the oxen are unfit for plowing and go for fattening and finally for (re) selling. Farmers attach less importance to skin color and horn type. Skin color is an interesting trait that white and black colors are excluded from the possibilities and farmers seem to be determined not to buy animals colored this way. Not many white and black colored cattle were seen in the market. This probably implies that such colors are being minimized by the community through deliberate evasion of them from the market. This practice might have its own impact on the color diversity of the cattle population of the district. Such actions must be studied in order to determine and understand the endogenous activities of the community to maintain or manipulate the diversity of the cattle population not only in the observable characteristics but also in the obscure genetic features.

Horn type was also particularly indicated by farmers as something related to communal beliefs than anything economic. It should be noted actually that some farmers within the district indicated horn type as an important criterion in selecting cattle in the markets due to the implication it has on price of cattle to be sold as some farmers primarily aim at fattening and reselling the oxen they buy.

The other important issue implied in these preferences is, although not yet strongly justified, the reconsideration and reprioritization of the animal breeding research and development agenda. This is very important as the focus so far has only been milk yield in Ethiopia.

Conclusion

Livestock are serving quite a number of livelihood products and services for the rural communities of Dano district. The semi-subsistence cattle production system is however constrained by different challenges limiting the level of production and productivity farmers are acquiring. Farmers aspire to bring about changes in the management of their cattle for higher production and productivity. Cattle keepers have unlimited access to local markets in and around the district but hardly get their animals to secondary and tertiary markets. Some physical characteristics are important criteria to buy an animal in the cattle markets.

Sustainable management of the valuable farm animal genetic resources of Ethiopia also entails comprehensive understanding about the trait preferences of livestock keepers and consumers and the implications thereof. This research accordingly came up with elicitation of trait preferences of farmers and farmer-buyers both on the farm and in the cattle markets. The lessons learned from the study can be summarised as follows.

- Farmers have clear preferences among the different phenotypic characteristics of the cattle population they want to buy and/or keep.

- The production and marketing scenarios have also shown that farmers do have unwavering interest in the traits inherently related to the basic products and services they expect from their livestock resources.
- Interventions to improve the genetic resources of livestock production systems such as that of central Ethiopia shall have a holistic approach so as to appreciate what the community is doing to strike a balance between maximizing the consumable output and conserving the resource.
- Research has a lot to contribute in the area of understanding and modelling the preferences for the different (productive and non-productive) traits of the livestock resource in the region and elsewhere in the country.
- Research would have to estimate the opportunity cost of the misguided cross breeding and artificial insemination going on in the country with no regard to the socioeconomic reasons and preferences of keeping versatile and yet less market oriented livestock species and breeds.

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Local and International Livestock Marketing Opportunities and Constraints in Ethiopia

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Abstract:

Decades long livestock marketing frustrations over malformed trade policies, uncertain ecologies for free grazing, cross-border trade restrictions, recurring droughts and lack of viable markets, poor transport and communication infrastructure and lack of market information services on prices during different seasons of the year, forced livestock producers and traders to be less competent in both local and international markets though there exists the potential to reinvent the marketing wheel for development.

Introduction

Ethiopia is known to have large livestock resource than any country in Africa. An estimated 44.3 million cattle, 23.6 million sheep, 23.3 million goats, and 7 million camel pack animals, among others, exist in private holdings (CSA, 2004 and Ayele, G. *et al* 2000), though these figures differ with those of the Food and Agriculture Organization reports (FAO, 1999), these figure can still be a bases of discussions. Like any other developing countries, livestock resources have multiple uses apart from being part of human diet and as a source of food and foreign currency earnings. It is also used as traction power in traditional farming systems.

The sector contributes about 40 percent of the agricultural GDP and 20 percent of the total GDP, which includes an estimated annual production of 288,000 tons of meat, 938,000 tons of milk, 16.7 tons of hides and skins. It also fetches an average equivalent of about Birr 218 million annually in foreign exchange (Aklilu, 2002 and Ayele, G. *et al* 2000). However, off-take rate is estimated to be 8%, the lowest in Africa (FAO 1998),

The sector's significance is enormous in the Ethiopian economy. Therefore, developing its marketing aspect is a matter of high priority and a necessity. In order to realize the sectors contribution, prerequisite standards and procedures (health service, feed quality and clean water) need to be adhered to before livestock and livestock products are finished for marketing. This contributes towards higher quality productivity and guarantees sustained and healthy livestock market supply as well.

The opportunities and challenges of marketing livestock at both at national and international markets need to focus on a series of activities that offers a platform for practical and in-depth analysis of the complex institutional, economic and social issues that have to be addressed in an increasingly competitive and globalized world markets. Livestock marketing is a multi-dimensional activity encompassing lots of uncertainties that are country specific, but with better policy facilitation, unforeseen circumstances and risks in marketing can be minimized. Issues of sanitary and phyto-sanitary standards, diseases related restrictions and export bans, poor transport and communication infrastructure, inadequate and untimely price and supply information and more importantly lack of understanding of the dynamics of marketing are some of the main impediments of transparent and fair livestock marketing.

The paper reviews current and past research with respect to some of the major themes that contribute to improving the efficiency of livestock marketing systems at local and international arenas. It also pinpoints the opportunities and challenges of markets. It calls for the need for a

strong theoretical understanding of the issues surrounding the dynamics of livestock marketing in Ethiopia and offers a basis for future work.

In Ethiopia, national livestock development projects and programs are replete with examples of failures. This has led to notes of skepticism being struck in commentaries on livestock marketing interventions. Precisely because many proposed grand visions have not been realized and micro/macro-level policies have been so controversial, and attentions turned to other initiatives (food security, safety nets, irrigation and resettlements projects/programs) at local levels; losing vision and flexibility to actually respond to local and international need and priorities of producing and marketing a quality livestock.

Current Livestock Marketing Scenario

Non-commercial and traditional ways of livestock production and marketing is the dominate practice in Ethiopia. Access and provision of livestock production and marketing support services (veterinary services, clean water supply, nutritious feed supply, better transport services and access to livestock market information), which are an intrinsic parts of livestock marketing are inadequate. Lack of such services and weak policy backing are seen as some of the major barricades to exploiting livestock resource potential of Ethiopia.

In (fig. 1), the traditional/non-commercial livestock producers sell low quality standard animals compared to relatively advance private abattoirs and local consumer markets through ad hoc driven transaction. Local individual traders and associations buy animals with better body conditions from the local markets and export to Middle East and North African through the nearest outlets without keeping sanitary and phyto-sanitary standards. While export abattoirs try to value-add the animals by providing better services before slaughtering and exporting the carcass to same destinations as the former. Tariffs are paid at all points of transaction adding up to the cost of production in the face of a stiff competition from world competitors.

Potential Ethiopian meat importers are loosing trust due to inconsistent supply. Export abattoirs are putting efforts in reducing animals cost of production by adopting weighing method of buying that is not preferred by local producers and sellers. Except very few fattening centers in and around major urban centers of the highland areas, most other parts of the country use free grazing systems that make fattening relatively difficult. In the process of improving the animals body conditions and keeping up with the standards of the demanding markets, livestock exporters spend significant cost that could have being avoided if production and marketing support services are adequately serving the interest of individual/group commercial producers and marketers in the face of strong policy support.

Lack of concrete and strategic policies addressing livestock marketing both locally and internationally exacerbate the whole exercise. Interventions aiming to improve the economic rate of return from livestock marketing in the current subsistence oriented mode of livestock production (see figure 1) will not automatically translate into increase in productivity, marketing and hence income, due to the underlying circumstances of producers susceptibility to daily difficulties and occasional shocks at household and community level as a result of water and feed shortage, disease and conflicts occurrences that reduce the value of an animal at both local and international markets. Therefore, there is little indication that prices of traditional life animal export will improve, though it can be salvaged by improving the quality demanded by the target

niche markets (You and Chamberlin, 2002; Diao *et al.,* 2003; You and Bolwig, 2003; Kiiza *et al* 2004)

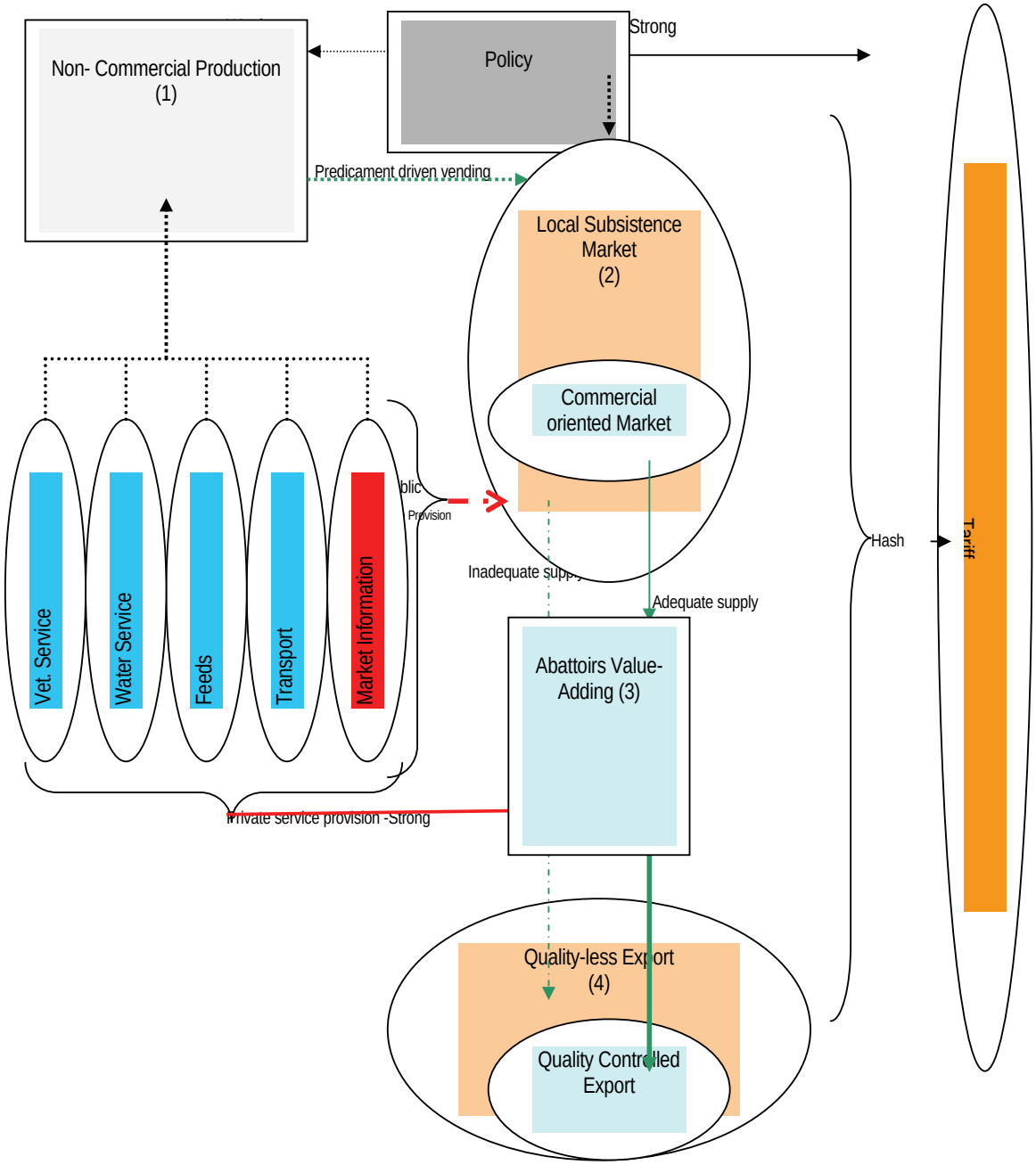

Figure 1:- Current Livestock Marketing Scenario in Ethiopia

Livestock market information dissemination is part of the function of all levels of any modern marketing and access to it will be able to influence individual best choices in order to exploit emerging market opportunities. In comparison with traders, traditional livestock producers have less access to markets and the effect can be observed in the market areas where traditional livestock producers are certainly been under-cut. Thus, it is of utmost and vital importance to improve the dissemination of market information on both local and international markets.

The Ideal Scenario of Livestock Marketing

Commercial oriented livestock production enables both public and private service providers to be more targeting to adequately serve the interest of their clients. These means that veterinary services, clean water and nutritious feed supply, better transport services and livestock market information is equally and adequately accessible. This encourages producers and traders to face the challenges and dynamics of marketing while minimizing the associated risks of marketing.

In (fig. 2), livestock producers are geared to meeting competitive market demands both locally and internationally while taking advantage of the available and accessible production and marketing support services. Producers and marketers adjust their costs by investing on where they have a comparative advantage in their level of marketing operation. Value adding process that could have otherwise increased the cost of production is assumed at production stage not at marketing stage.

The existence of strong policy support with flexible tariffs rates encourages the competitiveness of livestock and livestock products in the local and international markets. This will improve the economic rate of return of all livestock marketing actors and will automatically translate into increase in production, marketing and enhances the GDP of the country.

Local and International Livestock Marketing Opportunities

In Ethiopia, support to livestock development dates back to 1960s, following a series of projects and programs that were internationally supported (FAO 1995). Some of these projects included the Dairy Development Enterprise (DDE) for the Addis Ababa market in 1960 and the livestock and Meat Board (LMB) in 1964 with the objective of improving marketing infrastructure. This were later followed by four successive Livestock Development Projects in 1971, 1973, 1976 and 1988 that focused on commercialization of dairy enterprises around Addis Ababa, establishing slaughter facilities for provincial towns and cities, improvement of stock routes and market places for livestock and development of rangelands, including water and roads and increasing the coverage of veterinary services in the pastoral areas (Habte 1974; Geremew 1975; Ayele and Hillmann 1975; Ayele 1976; Getachew 1977; Negussie 1983; AACMC 1984; Dyce 1987).

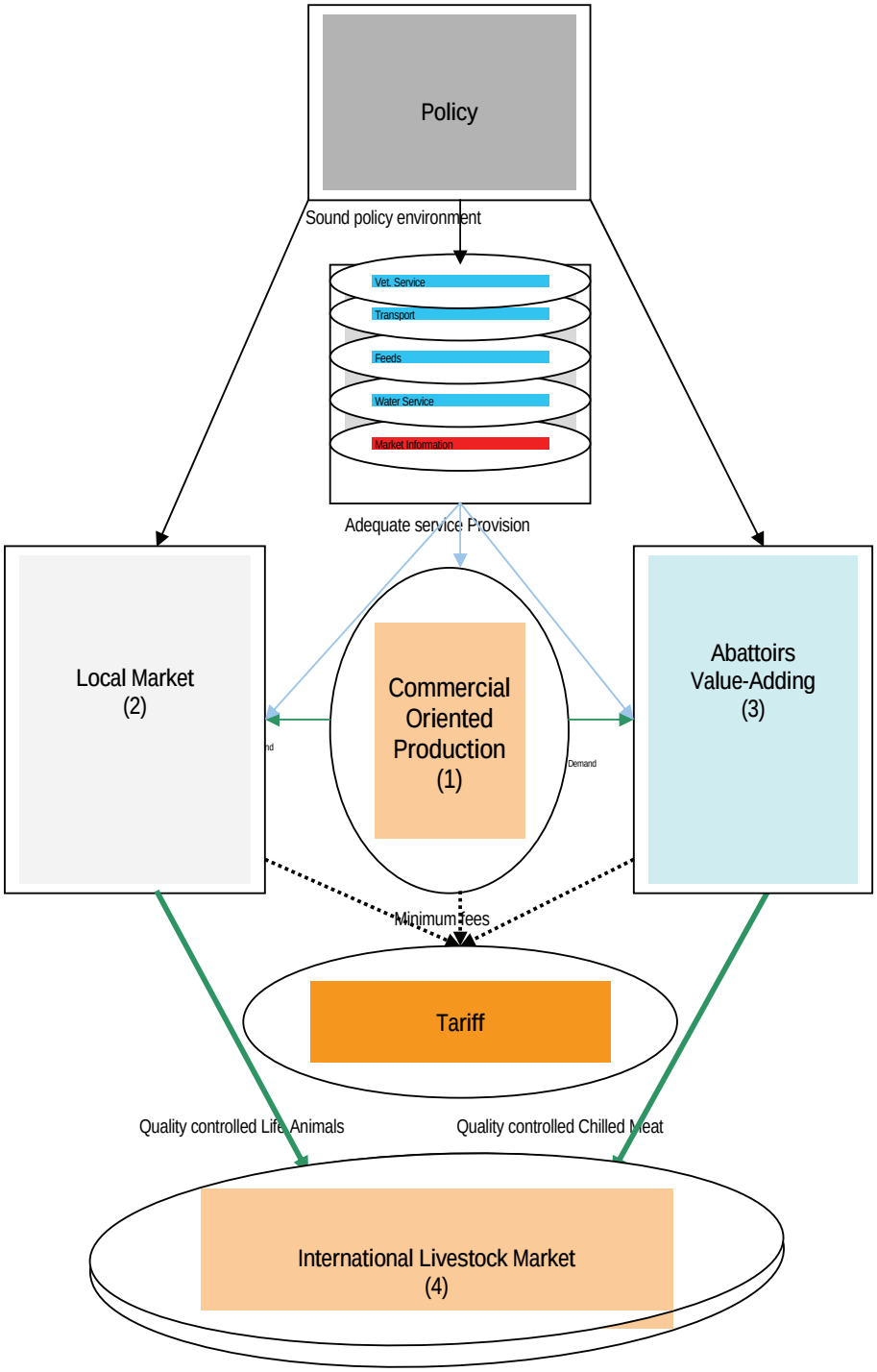

Figure 2:- Ideal Livestock Marketing Scenario in Ethiopia

All the interventions efforts were as aimed at realizing Ethiopian livestock potential and were trying to unveil the niche business opportunities of organic Veal *(Bekel)* meat, Hides & Skins, Cheese, Ghee and Camel Milk, and adhere to standards of the local and international markets preferences. Local opportunities are enormous as a result of a huge domestic market demand for livestock and livestock products.

According to FAO, domestic meat production has been increasing annually at a rate of about 2% for beef and 0.7% for mutton[5] while goat meat and camel meat production has remained static in the last five years[6].Due to the feeding habits of the local population, considerable amount of livestock meat and products are consumed domestically competing with export supply and demands. Thus, livestock product processing industries have niche business opportunity all the year round except during the Christian fasting period.

Livestock marketing sector has the capacity to absorb and provide employment to a significant portion of Ethiopia's large and fast growing population. As indicated by 2004 World Bank unemployment statistics, a significant percentage of Ethiopians under the productive age are jobless. It is also one of the countries with the lowest labor wage (less than two $ 2 per day) in the world. Therefore, livestock marketing sector can be a source of employment for job seekers and a cheap labor supply for the sector investors.

Liberalizing livestock marketing sector can partially protect the domestic market from domestic shocks by allowing its foreign exchange earning to be used for importing necessary agricultural inputs, food and non-food items in times of shortage. Tax break to potential investors will also encourage the export of livestock meat and products that could eventually have greater economic benefits and ability to withstand international market shocks. Bangladesh is a good example of a country that has pursued trade liberalization with considerable success (Dorosh *et al* 2005). The sector is capable to attract huge investment opportunities in live animal trading, abattoir, hides and skin production, bone crushing for ceramic household goods production and other related industrial products of livestock resource inputs due to its low competition rate currently. Realizing these potentials in livestock production, international investment will be encouraged to exploit the existing opportunities on both livestock marketing and other related activities facilitating healthy livestock production, transportation and marketing. Thus, local exporters will also be acquainted to the preconditions and international marketing standards, marketing procedures to establish trade linkage with international markets demanding Ethiopia livestock and livestock products

Geographic proximity of Ethiopia to the importing countries of East Africa, Middle East and North African countries and its well developed aeronautical infrastructural connection to these countries gives relative advantage in exploiting their organic meat demanding markets. The county is also a host for a huge population of black head Somali sheep that is highly preferred in Middle-East and North African countries.

Local and International Livestock Marketing Constraints

Despite the existence of amble opportunities, Ethiopian livestock producers could only develop more food aid dependency rather than diversifying their livelihood based on their current system of production and marketing. Major reasons for the country's livestock production and marketing support services decline are associated with the chilling experience of intervention programs and projects under such circumstances. Most of these programs and projects have not being impact oriented and most of them ended up in failure due to lack of understanding of the traditional/non-commercial mode of livestock production and marketing.

5 Within these, beef accounted for 65% of the total red meat production, mutton around 19% and goat meat 13%. Camel meat accounted for 2.5% of the annual red meat production.

6 The FAO consumption figures remain the same for the years 2000 and 2001 for some inexplicable reasons.

For the past few decades, the trends of livestock marketing policy decisions have being reiterating similar mistakes in solving major marketing impediments. The policy lacked livestock sector recognition as a major economic contributor of the country's economy and fully depended on crop production. It also lacked all other essential components of sanitary and phyto-sanitary standards, issues on cross-border trade and disease free zones. To just take cross-border issue as an example and the fact that malformed policy setting towards Ethiopian livestock marketing, pastoral communities have little idea on cross border restrictions in the process of either looking for better grazing areas during abnormal (dry seasons) periods of the year or marketing their livestock in order to buy food stuff for their households. Cases have been reported where military personnel are taking advantage of the pastoral ignorance and confiscating pastoral livestock in the pretext of being illegally traded on cross borders. In the process of such exercise, many pastoral households are internally displaced and been fed in the ration camps around urban center managed by non-governmental organizations.

The country also lacks federal and regional institutional arrangement that could promote, assist, and advocate for livestock marketing. The only department (livestock and fish marketing) that could have assumed the responsibility is being restructured every now and then. Thus, unusual exploitation of breeding stock (female stock) through informal exports and the decline of government veterinary services has been accompanied by reduced disease reporting , particularly from remote areas due to lack of capacity (Cately *et al.* 2004). This has raised several false alarms and concerns that led to livestock and livestock product bans on Ethiopian exports to middle-east countries.

Traditional livestock production and management approaches used in Ethiopia also pose a threat to marketing. natural rangeland dependency and free grazing system and have led to the production of poor body conditioned and unhealthy animals that are less competent in international markets due to lack of controlled diets and sanitary standards. Ecological degradation and recurring droughts are intensifying and natural feed is depleting vigorously.

Poorly developed transport and communication infrastructure, financial services and inefficient market intelligence systems are also other impediments of livestock marketing in Ethiopia. Absence or undesirable terms of financial services, loans, grants and insurance to livestock traders and producers have alienated a segment of the market participants. For instance, half of Ethiopian populations are Muslims who do not take or pay interests due to religious prohibitions and there is no single bank in the country that provides Islamic banking services that is free of interest. This has lead to exclusiveness to large portion of livestock traders who could have otherwise contributed to the sector development. This has been exacerbated by lack of accurate, reliable, understandable and affordable livestock marketing information system that could provide timely information on different market prices, supplies, disease and the like on a regular basis. The need for a system that generates and disseminates accurate market information, which can provide timely data about a broader variety of markets, and can reach a greater number of market participants to make markets more transparent has being there ever since (Schubert, 1993). But a unified system is still lacking though there are attempts underway.

Land ownership has been an issue of concern in Ethiopian policy towards investments. The constitution clearly indicates that "land belongs to the government". Citizens and other users can only lease from the government. Under the lease clause no one is allowed to buy or sell land. These have raised a caution of dis-incentive for both local and international investors who could have fully participated in the sector development. Contrary to these are generous incentives and subsidies provided to competitors by other countries and the existence of trade barriers and high

tariffs in the western countries offer undue competitive advantage at international markets while devaluating those from developing world adding up to country specific problems.

Way Forward

There following are guide to minimizing constraints and maximizing opportunities of Ethiopian livestock marketing

- Vision is needed to move from traditional production towards a market-led focus.
- It is possible to diversify community livelihoods based on marketing of livestock assets
- Interventions need to focus on understanding the priority needs of livestock producers and traders – No blanket interventions.
- Reiterating past mistakes need to stop. Livestock marketing policies need to learn from the past failures
- Most donor interventions are mostly geared on food security, safety nets and other development activities; they should also consider livestock marketing as important area of concern
- Livestock marketing sector should realize business as usual will not work anymore and recognize the need for Market-Led Development (MLD) not Production Led Development (PLD)
- Livestock marketing Development model needs a more holistic intervention approach encompassing the whole marketing chain – (policy, infrastructure development, research, production etc.)

Gabre-Madhin (2005), Coulter (2005) and others have provided a broad overview of the many entry points for public policy for market development, centered on the three "I"s incentives, institutions and infrastructural investments.

- *Incentives;* This largely relates to policy reform to level the playing field and create space for the private sector as discussed above.
- *Institutional arrangements;* These include contract enforcement, market networks and coordinated value chains, grades and standards, and market information services.
- *Infrastructure;* Public investment in roads, communications, and critical marketing infrastructure.
- In order to minimize livestock marketing constraints and maximize opportunities, federal and regional governments can play an important role in facilitating livestock market development. These roles include:
- Investing in basic market infrastructure such as transport, communication, and market information systems and liberalizing its uses
- Investing in institutions that support the development of urban and rural financial services and insurances that expand the availability of credit, in particular through mortgage systems and title deeds. Property rights should be clear and enforced so that there is effective collateral for creditors and debtors over rights and responsibilities.
- Investing in capacity building, technical support, and education to facilitate the use of modern livestock production and marketing systems to domestic producers, traders, and industrial processors.

Effective marketing development and use of such infrastructure and services is clearly not going to effectively work without active public policy support. There are many barriers to

participation, especially for small-scale producers, traders, and processors, and the public sector can play an important role in reducing these barriers and facilitating use.

A preferred strategy is to encourage private sector to exploit marketing opportunities by making long-term investments in public goods relating to the enabling environment for finances including credit market development, communication systems, market intelligence systems, regulations, and support for locally or regionally-based commodity exchanges and insurance systems. There may also be a role for policy support for market intermediaries that provide access to risk management markets for small-scale operations, particularly in the early stages of developing these markets. Perhaps the most important the governments can provide is a predictable policy environment that does not destroy the incentives for private individuals and enhances trade and market-based opportunities.

Linkages between livestock producers and processing/marketing systems should be strengthened to ensure sustainable supply of healthy livestock while expanding and diversifying markets.

Conclusion

Change in livestock production perception from subsistence to commercial with adequate, favorable and enabling policy environment and marketing infrastructure and services will go a long way to attract local and international investments. Private sector involvement in the provision of veterinary, water, financial and market information services will also add more value to the market competitiveness. All of these could ease current constraints and open lucrative marketing opportunities in the livestock sector to achieve its potential and contribute its share to Ethiopian economy.

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Knowledge Management in Ethiopian Agriculture

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This paper covers the following general topics in and around knowledge management.

1. Knowledge and Knowledge management
2. A rational for agricultural knowledge management in Ethiopia
3. A suggested approach in knowledge management implementation, and
4. Some notes on IPMS activities in knowledge management area.

Knowledge Management in Ethiopian Agricultural

Agriculture will remain the dominant sector of Ethiopian economy and the largest source of foreign exchange earner for the foreseeable future. Therefore, the development of Ethiopian agriculture will have direct impact on the overall development of the country. This paper will attempt to make the case that establishing a conducive and systematic environment for active leveraging of the collective knowledge of agricultural stakeholders in Ethiopia will play a vital role in the country's agricultural development.

Knowledge and knowledge management

Knowledge and the proper application of it have emerged as the differentiating factors among organizations (and indeed among countries) competing in world markets. In the context of this paper, knowledge is defined as the combination of data and information, to which is added expert opinion, skills and experience. The result of knowing something is to have an actionable understanding. Knowledge may be explicit (codifiable) or tacit (intuition, experience, know-how). It can also be possessed individually and/or collectively.

Humans have been applying knowledge to do everything from routine to complex endeavors since time immemorial. However, serious discourse in valuing knowledge as an asset that can be nurtured and leveraged only started to appear recently. Despite this fact, *knowledge management (KM)* has emerged as a distinct management discipline. Simply defined knowledge management is *a* systematic discipline of policies, processes, and activities which empower organizations to apply knowledge to improve effectiveness, innovation, and quality

Since knowledge is essentially a human attribute, a knowledge management system is not an attempt to "manage" knowledge in people's heads. It is rather a discipline that creates an enabling environment that fosters better knowledge and experience sharing so that organizations can leverage their collective knowledge. It focuses on how organizations identify, capture, share, create, and use knowledge.

Ethiopian agriculture in the knowledge age

Most farmers and pastoralists in Ethiopia produce using means of production and methods that haven't changed much in ages. The result is the low productivity and low production outputs that plague the country and stunt its growth potential. This is partly a testament to the

fact that promising research outputs and validated agricultural development models (from both domestic and foreign sources) seldom reach most of the farmers who can benefit from them. To cite a couple of examples; access to information on prevailing market conditions is hard to come by for most of our farmers. Even at market days, most producers don't have a good indication of the going rate for their produce at bigger markets not far from them. Globalization is intensifying competition in all commodities – affecting markets for both domestic and export commodities. The prospect is that this phenomenon will only get more intense, making those unprepared to face it more and more disadvantaged.

On the other hand, Ethiopia has diverse agro-climatic conditions suitable for a broad spectrum of agricultural development endeavors. It has unexploited indigenous knowledge and resources with attractive potential returns in domestic and international markets. However, these potential resources are seldom harnessed effectively and thus meaningful and sustained transformation of the Ethiopian agriculture sector is a dream that is "so close and yet so far".

Among the multitude of things that need to happen to bring about rapid agricultural development, proactive leveraging of the collective knowledge of Ethiopia's agricultural development stakeholders is paramount. We assert this can only happen if there is a concerted effort to harness this wealth in a systematic manner and agricultural knowledge management system can play a positive role in this respect.

Why KM in agriculture?

Knowledge plays a significant role whenever innovation and growth are pursued in a competitive and complex field. Agriculture today is just such a field. A demand-driven agricultural knowledge management system facilitates access to and adoption of appropriate technologies and processes from research and development institutions based in Ethiopia and elsewhere. The resulting benefits are many including:

- Being adaptive to changes in the agri-food value chain
- Learning from organizations with good research output and innovations record.
- Benefiting from indigenous knowledge
- Being responsive to farmers and pastoralists needs and requirements
- Addressing inertia due to lack of information among farmers and pastoralists
- Creating a capable agricultural management regime with a good development process supporting them, and
- Developing a loyal and capable workforce that is nurtured by broad-based collaboration and cooperation of practitioners.

If we agree on the premise that development of an agricultural knowledge management system will have a positive impact on the development of Ethiopian agriculture, the next logical question will be "how do we develop such as system?"

Just like any systems development, there can be many approaches. In this paper, we suggest one approach based on the experiences of the IPMS-Ethiopian Farmers[7] project. Our suggested approach envisions six steps that are important to implement a knowledge management system. These are:

7 Improving Productivity & Market Success of Ethiopian Farmers project – implemented by International Livestock Research Institute on behalf of the Ethiopian Ministry of Agriculture & Rural Development.

1. Developing a knowledge management strategy that is aligned with and supportive of the overall organizational strategy
2. Defining the sign posts of where an organization is in terms of its ability to leverage knowledge and where it want or needs to be and thus determine what needs to be done to get there
3. Selecting appropriate knowledge management framework that is easily understood and realistically applicable
4. Selecting appropriate knowledge management tools that serve as enablers to implement the bigger concept
5. Understanding and adopting and/or responding to the role of organizational culture to the success of knowledge management, and
6. Appreciation of the value of starting with a pilot implementation

In the next few pages we will look into each of these points a bit closer.

Developing a KM Strategy

Strategy is basically the fundamental and long-term approach or action plan an organization employs to achieve its organizational objectives. A knowledge management strategy is no different. It is the major approaches an organization will follow to achieve the goal or objective of making knowledge management a reality within the organization. One of the fundamental tenets of a KM strategy is that since the whole idea of leveraging knowledge rests on the fact that doing so will help an organization to be better positioned to achieve its overall objective, it also makes sense that the strategy for knowledge management should be developed with a clear insight that it should be aligned with the overall business/organizational strategy.

For a knowledge management strategy to have any chance of cusses, it is important that the initiative is supported at the highest level of the organization. This is because a KM implementation will ultimately require an investment in human resources, technological enablers (tools) and most important, a shift in organizational culture and all these cannot happen without a committed and visible support at the highest level of an organization.

It is also important to involve a good cross-section of the organization in order to develop a system that addresses KM needs in a comprehensive manner.

There is one other fundamental decision that needs to be made when considering a KM strategy. That is whether the major thrust of KM efforts will be on codification or personalization.

Codification focuses on the identifying, capturing, sharing, and use of information in databases, repositories, portals, user guides, and other artifacts. If the KM strategy advocates this approach, then major efforts of the KM implementation will be on how the organization can develop and deploy such systems and make then easily available to potential beneficiaries. On the other hand, personalization focuses on connecting people-to-people (in person or virtually). It takes the view that most knowledge is in people's heads and that it is difficult to "capture" this tacit knowledge in manuals, books, databases, etc. This view instead advocates that it is best to create a conducive environment that promotes interactions among relevant groups and individuals in order to facilitate knowledge sharing.

What works for a given organization will depend a great deal on the specific culture, industry, and state of affairs within the given organization. Most organizations will do both codification and personalization – with the emphasis being to one or the other. It is rare, if at all, that an

organization will follow one approach exclusively. Organization that invest heavily on codification may also have several initiatives geared toward increasing interaction among their staff while those that invest a lot on personalization and interactions among their staff will also have initiatives on codifying what they believe are important knowledge assets.

A knowledge management strategy should also address the human resource aspect of how KM will be implemented in the organization and where within the organization these stewards or champions of KM will be placed.

Defining the sign posts

In order to determine the extent of work that needs to be done to get a functional knowledge management system in place, the organization needs to assess the current state in terms of its ability to leverage knowledge and articulate where it needs to be to make the effort worthwhile. These assessments need to be both honest and realistic since to do otherwise will be an exercise in futility.

Here are what some points to consider when doing this. Like any major initiative, a KM implementation will require input in terms of people, process, tools (technology), and will operate in an existing organizational ecosystem. All we need to do is make an honest determination of the organization's readiness in terms of cultural, technological, and key operational and business issues that may be impacted by a KM initiative. We also need to map current knowledge and collaboration patterns within the organization. This assessment will help determine the starting point for the KM initiative. For example, a good electronic communications infrastructure may be deemed important to the success of a KM initiative. If the assessment shows that there isn't currently a functional e-mail system in the organization, implementing such a system may be starting point in the technological aspects of the KM initiative.

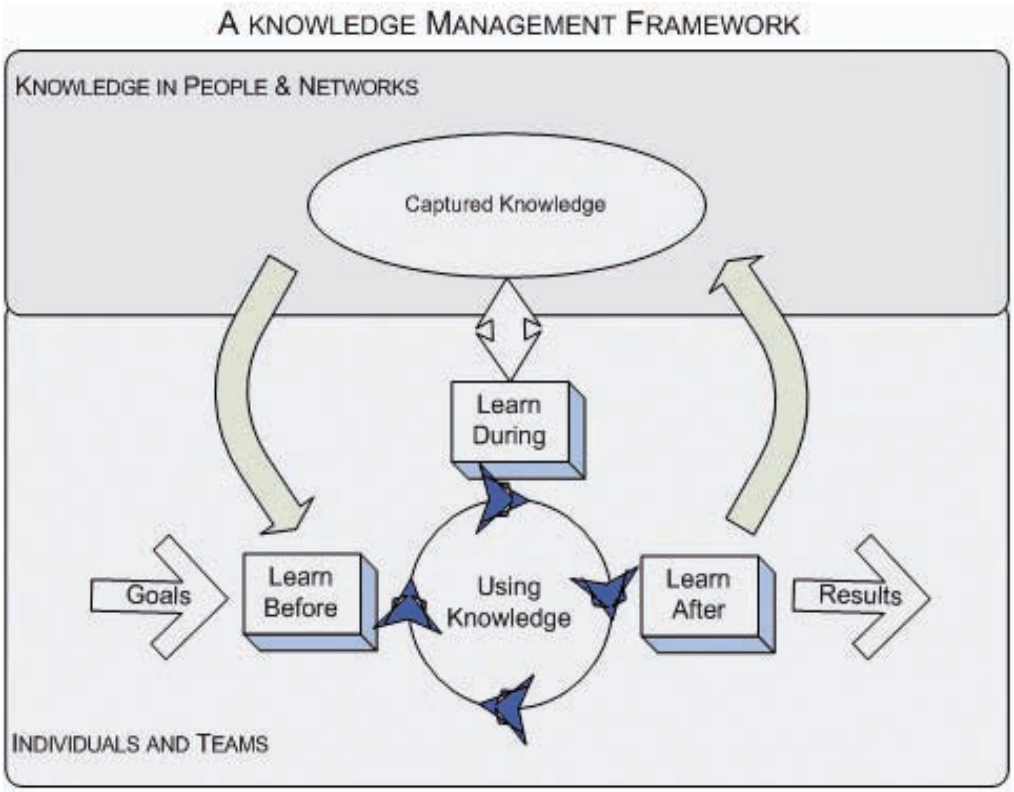
Likewise, to determine the desired state after the implementation one needs to realistically outline what can be done given the scope, resources, and time allotted for the initiative.

A quick analysis of the gap between where the organization is at the start of the KM initiative and what can be expected given the resources available to implement the KM initiative will bring out the possible tasks that need to be accomplished within the KM initiative and ultimately the overall scope of the KM initiative.

Selecting appropriate KM framework

The challenge in implementing any new initiative is often where exactly and how one can start the process of implementation and then how to keep doing what needs to be done in a consistent manner and in a way that everyone involved understands easily. When it comes to a knowledge management initiative, understanding how a knowledge management strategy translates into daily operational tasks may not be immediately clear – at least the first time around. One way to tackle this challenge is to use a common and holistic framework that encompasses all the major undertakings that need to be done in an easy to follow manner. Following is one such framework proposed by Collison and Parcell[8] in their book "Learning to Fly" – a milestone book on knowledge management.

8 Learning to fly, Chris Collison & Geoff Parcell, 2001, 2004 Capstone p 33



This framework encompasses all aspect of learning processes within the context of higher level organizational objectives (goals) and expected business results. At its core, the framework puts learning and asking the right questions about learning at every stage of major work processes. That is before embarking on an important task or project, during the execution of the task or project and after the completion of the task or project. Before starting a project, finding out if anyone else (within or outside of the organization) has done a similar project and learning from that experience base may enable the project team to reuse existing and validated approaches and save time to concentrate on activities that have not been undertaken before. The "learning during" aspect of the framework is an invitation to continually assess and improve approaches to executing a task based on continual reviews of what has been done to date and how that is measuring up against established standards. The "learning after" aspect of the framework deals with taking the time and effort needed to document lessons learned in the execution of a project or a task because there may be time when we need to do a similar project. Identifying who could make use of our experience in a given project and making sure the lessons get passed on in one form or another are all addressed in the "learning after" process. As depicted in the framework diagram, these activities are not sequential and may be iterative.

In order to create the necessary link between the learning before/during/after circle and knowledge utilization, in terms of accessing what has already been captured and in capturing new knowledge, we look into networks and communities of practice. Networks and communities of practice are the glue the create and sustain the linkage between those who have the knowledge and those who seek to leverage it – roles that may interchange from time to time among the various actors in the network or community of practice, depending on the task at hand.

Selecting appropriate KM tools

Numerous tools and methods have been developed or adopted to serve as enablers in knowledge sharing and knowledge management in general. It is useful to review tools and methods employed by others and see if some of these will be applicable or adoptable to a situation at hand. The following section highlights some of the tools available for each stage of a knowledge process – including identification, creation, storing, sharing, and using of knowledge. Along with the tools, an indication is given as to what will be the critical factors in terms of organizational culture readiness in order to apply these tools and where the starting point for each will be in terms of people, technology, or organizational setup. These tools are adopted from a set of tools suggested by a multi-country European project conducted under the auspices of "European Committee for Standardization".

The following indicators have been used to indicate the degree of importance of the various organizational culture factors and starting point for implementation.

XXXX	Indispensable for success
XXX	Highly important
XX	Very important
X	Important
	Not important

Identify Knowledge								
	Organizational Culture Factors Relevant for KM					Starting Point for Change		
Tool	Willingness to learn	Openness	Constructive when dealing with power	Trust	Self-responsibility	People	Organization	Tech-nology
After Action Review		XXX	X			X	X	
Lessons learned		XXX	X			X	X	
Debriefing		XXX	X			X	X	
Know-how balances		X	X			X	X	
Technology scouts	XXX						X	
Knowledge portfolio	XX	XXX			X	XXXX	X	
Knowledge maps	XX	XX				XX	XXX	
Knowledge broker	XX			XX	XX	XXX	XXX	
Balanced scorecard		X					XX	
Patent evaluation		X					xx	

Create Knowledge								
	Organizational Culture Factors Relevant for KM					**Starting Point for Change**		
Tool	Willingness to learn	Openness	Constructive when dealing with power	Trust	Self-responsibility	People	Organi-zation	Tech nology
Best Practices	XXXX	XXX		XX		XX	XXX	
Brainstorming	X	XX				XX		
Cognitive	X	X				XX		

External	XX	X		XXXX	X	XXXX		
External Benchmarking	XXXX	XX				X	XXX	
Internal	XXXX	XXX			X	X	XXX	
Open Space					X		X	
Success stories	XXX	XXX		X	(X)	XX	XXX	
Think Tanks	X				X	X	XXX	
Suggestion	XX	X	X	XX	XX	XX	XXX	
Knowledge	XX	XXXX	X		X	XXXX		
Workshops	XX	XXX	X		XX	XXXX	X	
Library	X						X	X

XXXX	Indispensable for success
XXX	Highly important
XX	Very important
X	Important
	Not important

Store Knowledge								
	Organizational Culture Factors Relevant for KM					**Starting Point for Change**		
Tool	Willingness to learn	Openness	Constructive when dealing with power	Trust	Self-responsibility	People	Organi-zation	Tech nology
Databases	X						XX	XXXX
Document Management System	X	XX				X	X	XXXX
Who's Who database		XXX		X			X	XXXX
Experience	XX	XX		XX		XXXX	X	XXXX
Minutes		X				XXX	XX	
Yellow Pages	X	XXX		X	X	X	XXX	XXX
Data Warehouse	X						XXX	XXXX
Specialist	XX				X	X	XX	
Handbooks	XX				X	X	XX	

Share Knowledge and Use Knowledge								
	Organizational Culture Factors Relevant for KM					**Starting Point for Change**		
Tool	Willingness to learn	Openness	Constructive when dealing with power	Trust	Self-responsibility	People	Organi-zation	Tech Nology
Telephone conference	X	XXX		XX		XXX		X
Video conference	X	XXX		XXX		XXX	XXXX	XX
Info Center	XX	XXX	X	XXXX	X	XXXX	XX	
"Blackboard"		X					XX	
Internal knowledge market	XX	XXXX				X	XXX	
Hotline		X				X	XXXX	X

Intranet	X							XXXX
Employee Journal		X			(X)	X	XXXX	
Newsgroups	XX	XXXX		XX	X	XXXX	X	
Circular			X				XX	
Knowledge Fairs (internal)	X	XXX					XXXX	

The tools listed above are meant to be general indicators of the multitude of tools available and are not meant to be exhaustive. As you can see, some of the tools are everyday artifacts and require no special preparation to apply them immediately. Some will also require good understanding of their use and applicability in order to get the most out of their implementation. However, it suffices to say that in any knowledge management initiative one needs to choose what tools the organization can and will employ to facilitate knowledge sharing and knowledge leveraging.

Some of the tools mentioned above require an ICT infrastructure or platform to be applied. At this point, it is probably good to highlight the role of ICT in knowledge management. ICT has emerged as an important enabler in facilitating the effectiveness and efficiency of almost all business processes today. Knowledge management is no exception .However, it is important to remember that ICT should be a means to an end and not the end product in and of itself. Just like having an automated financial management system does not translate into having a good financial management system, so is true for knowledge management. Having an intranet, an e-mail system, or computerized databases does not automatically translate into having a good knowledge management system – since as stated earlier knowledge management is about knowledge sharing and creating an environment conducive to knowledge sharing. And people are key determinants in this equation. ICT will help but ICT by itself will not make it happen. In order to leverage ICT tools for positive impact, one needs to have a clear ICT strategy in place. Some things to think about when developing the ICT strategy within a knowledge management context include going for a strategy that:

- Addresses today's needs without ignoring the future
- Adheres to accepted standards to ensure maximum compatibility and sharing
- Ensure a clear upgrade path to make scaling up easier
- Focuses on making whatever will be developed easily accessible for the intended users
- Ensures data integrity and security is maintained

Knowledge management and organizational culture

Organizational culture is probably the most important determinant for the success of a knowledge management initiative. What do we mean by organizational culture? In short, organizational culture can be defined as the learned way of perceiving, thinking and feeling, shared and transmitted among organizational members." (Schein, 1984). It can be seen as 'the way we do things around here. It is a social and behavioral manifestation comprising features such as:

- The values and beliefs of staff
- How people are and feel rewarded, organized and controlled
- The work orientation of staff, the way work is organized and experienced
- The degree of formalization, standardization and control through systems

- How authority is exercised and distributed
- The value placed on various functions within the organization
- Tolerated scope for individuality and creative expression, risk-taking and initiative
- Notions and concepts on the importance and use of time and space
- The organizational rites, rituals and stories
- Organizational 'language' (phrases and words that have a special meaning or significance to that organization).

There will also be subcultures (groups which exhibit cultural characteristics, i.e. values, norms and practices that differ from the main organizational culture and from other subcultures). One common manifestation is "departmental differences", which can lead to the phenomenon of departmentalization or so-called "silo thinking". All these are strong elements that influence the degree of success of a knowledge management initiative negatively or positively depending on how they are understood and addressed by those implementing such an initiative.

Since organizational cultures develop over a long period of time, the intricacies and nuances are hard to easily decipher and harder to change. Therefore, during the start of a knowledge management initiative, it may be best to try to focus and adopt the positive elements of an organizational culture and go about bringing about organizational culture change once the benefits of small changes and "quick wins" start to roll in and win new "friends" and champions of the initiative.

Starring with a pilot

The final point that will be addressed in this paper is the value of staring with a pilot implementation. Whenever something new is afoot, people want to see and feel that this new thing actually works before committing all the way. Therefore, starting small makes the process more manageable and error correction easier. It also provides a "learn as you go" opportunity. However, what is developed for pilot implementation should be scaleable. If we do miracles in an environment that cannot be duplicated economically outside of the confined environment, then the success will be limited to the pilot project and we would have been engaged in a futile exercise.

IPMS experience in knowledge management

It has been almost two years since the IPMS Ethiopian Farmers project embarked in a knowledge management initiative. The task the project undertook is to develop a functional knowledge management system interconnected at Federal and Woreda levels with a limited knowledge management type efforts at Regional levels. This indeed is an ambitious undertaking in that the challenges, opportunities, and modalities of implementation at each level have turned out to be very distinct. The efforts so far have resulted in some localized successes. To cite a few examples that are currently being practiced at various levels:

- The project, in collaboration with the Ministry of Agriculture and Rural Development has developed and deployed a web-based portal named Ethiopian Agriculture Portal, which will be used as a gateway for diverse agricultural resources in Ethiopia and elsewhere. To make this a reality, the project has also invested in upgrading the ICT infrastructure of MoARD at the ministry's headquarters data center. To get the maximum intended benefit of this system, the

project is in the process of organizing a "content managers" group that will be comprised of selected experts from the ministry and partner organizations. This group will be the focal point for coordinating the quality, relevance, timeliness, consistency, and frequency of content uploaded into the portal. The portal is designed to support collaborative and distributed content contribution. It is also designed in such a way that content contributors need not be web technology experts.

- Woreda Knowledge Centers have been setup in all project pilot learning Woredas (PLW). The effectiveness of the centers in functioning as venues for knowledge sharing varies from Woreda to Woreda. However, the project is learning valuable lessons that will positively impact these and other future endeavors in this area.
- Some of our pilots learning Woredas have established communities of practice groups and are slowly developing a culture of deliberate knowledge sharing.
- National and Regional agricultural technology exhibitions have been held and these events have been found to be excellent opportunities for knowledge sharing among farmers as well as extension practitioners. Some Regions are adopting this concept and employing it with very positive results.
- Periodic study-tours and experience sharing exchange visits of both policy makers and farmers are being facilitated by the project as well as partners and stakeholders in our project sites.
- Institutional setups such as Woreda Advisory & Learning Committees that may help make KM a sustainable endeavor are in place in our pilot learning Woredas and the results have been progressively encouraging.
- The project also uses other one-time as well as regular activities that promote knowledge sharing. These include stories and/or articles in print and electronic media to actively share WHAT we have been doing, HOW we are doing what we do and the IMPACT of our activities

In summary, most of what has been discussed above follows a generic approach to implementing knowledge management. The reason behind this is that although the implementation of a knowledge management system varies depending on the specific circumstances of the implementing organization, the basic concepts are very similar. We thus felt that it is better to stick to general principles and let it serve as an introduction to the discipline. In any case, those who will embark on such an initiative will need more information than can be given on a short paper on the subject. For all Ethiopian agricultural practitioners and organizations that are interested in pursing this potentially rewarding endeavor, I recommend the book "Learning to Fly" as a good introductory text written by a dynamic duo who have done it successfully both in industry and not-for-profit organizations.

Promoting Milk Quality in Smallholders' Cooperatives: Evidence from Ethiopia

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Abstract.

In emerging and globalising markets quality and price of dairy products are becoming more important than ever. The scope of this study is to identify effective measures to improve the quality of milk of Ethiopian dairy cooperatives, so that they can better compete in the marketplace. Empirical evidence suggests that policy-makers should regulate size and location of dairy cooperatives, and promote investment in laboratory facilities for milk quality grading.

1. Introduction

Ethiopia has a large potential for milk production. The country has one of the largest cattle populations in Africa, estimated at 38.5 million animals (FAO, 2005). Two-thirds of the country's territory is characterised by vast plateaus ranging from 1400 up to more than 3000 meters above sea level. The typical topography of the Ethiopian Highlands provides a suitable microclimate for high-yielding dairy cows. Biophysical attributes, like the availability of vast grazing areas, mild slopes and highly fertile soil, adequate rainfalls patterns (1000-1900 mm/year) and temperature (0-30°C) offer a relatively disease-free environment with high potential for animal feeding (Ahmed, 2002).

In addition to the national potential for milk production, Ethiopia is also witnessing increasing opportunities at regional markets. Population growth, urbanisation and income growth in sub-Saharan Africa are occasioning a massive increase in demand for food of animal origin (Delgado, 1999). FAO-IFPRI-ILRI projections indicate that dairy consumption in the region is estimated to grow by an average 3.8 percent per year; such a projected growth rate is the second largest in the world after India (4.1%) (Delgado, 1999).

Therefore, dairy commercialisation has the potential to become a key source of income flow among Ethiopian smallholders (Holloway, 2000). Policy makers believe that the formation of dairy cooperatives could serve as a catalyst for integrating dairy smallholders into national and regional markets. According to the Ethiopian Federal Cooperative Commission (FCC), in Ethiopia today there are 95 dairy cooperatives, and many others are about to be formed.[9] However, national, as well as international policy-makers, are still unsure how to build and support these cooperatives, so that they can better compete in the marketplace.

With the intention to fill part of this policy gap, this study presents an overview of existing dairy cooperatives, and identifies some measures to improve the quality of their milk supplies. The remainder of this paper is structured as follows: section 2 provides a definition of milk quality; section 3 presents the theoretical model for milk quality management; data characteristics and

9 The Federal Cooperative Commission is the governmental agency responsible for cooperative legislation and policy.

sampling methods are described in section 4 and 5; section 6 presents the analytical model; findings and implications are discussed in section 7.

2. Milk Quality

Most literature on quality management agrees on defining product quality as the level of fitness for use (Juran, 1990). When it comes to milk, such a definition implies enormous complexity, which in this study is reduced and stylised for analytical purposes. The milk quality attributes considered in this study are total bacterial and somatic cells count, fat and protein content. The scientific, economic and societal relevance of these choices is discussed in details in the following sub-sections.

2.1 Fat and Protein Content

Milk is a complex emulsion of high nutrient density, providing large amount of energy, as well as essential amino acids and micronutrients, particularly needed in less-developed countries where diets are mainly based on staple grains or root crops (Falvey, 1999).

The nutritional value of milk is mainly determined by water, protein, fat, sugar (lactose), vitamins, and micronutrients (Walstra, 2006). Variability among milk components is largely inter-dependent, both from a qualitative and quantitative point of view (Harding, 1996).[10] However, most variation occurs in fat and protein content, affecting milk nutritional value but also the profitability of butter and cheese making (Walstra, 2006).

Fat and protein content are expected to respond to farming conditions and technology, such as breed and individual genotypes of herds, quality and quantity of feed, time of milking, animal welfare and mastitis (inflammation of the mammary gland), cow age, lactation stage, climate and seasonality, (Harding, 1996).

Total Bacteria and Somatic Cells Count

Milk is a highly perishable commodity.[11] Milk is in fact an ideal terrain for bacterial growth. Bacterial contamination of milk contributes to an increase in the public health risk related to potential outbreaks of food poisoning and diarrhoeal diseases, as well as other known and unknown infectious diseases (Harding, 1996).[12] The risk of bacterial milk-borne diseases is particularly relevant in less developed countries (LDCs), where food-borne diarrhoeal diseases represent the leading cause of illness and death, killing approximately 1.8 million people annually, most of whom are children (WHO, 2002).

Total bacterial contamination of milk has an impact on public health, but also on processing profitability, as well as on the shelf life of final dairy products. As a matter of fact, the higher the bacterial contamination, the faster is the spoilage process in milk and related dairy products,

10 Modifications in one component affect most of the other components.

11 Under standard environmental conditions (15 degrees Celsius), raw milk is characterised by a shelf life of approximately one day. However, in tropical countries where environmental temperature is often above 20 degrees Celsius, the shelf life of milk can be shorter (Harding, 1996).

12 Known milk borne infectious diseases are: typhoid fever, scarlet fever, septic sore throat diphtheria, tuberculosis, and brucellosis. Unknown diseases can result from bacteria mutation or cross-contamination. (Harding, 1996).

and the lesser is the capacity of milk casein to precipitate and form the cheese-mass (Harding, 1996).[13]

Bacterial contamination of milk can occur inside or outside the udder. Intra-mammary bacterial contamination is usually associated with the presence of mastitis (inflammation of the mammary gland), particularly widespread among high-yielding cows. Mastitis is usually associated with reduced volume and nutritional value of milk yields, as well as casein coagulation (Walstra, 2006). The degree of mammary infection can be evaluated by counting the number of somatic cells (inflammation cells) per unit of milk yield. In case of mastitis, the number of inflammation cells passing directly from the blood stream to the milk increases.

Intra and extra-mammary contamination of milk can be caused by poor animal welfare, contact with other animals, poor hygiene of the barn, milk containers, milking machineries and cooling tanks, as well as inappropriate practices for milking and handling the milk (Walstra, 2006).

3. Theoretical Model

The theoretical approach presented in this section is largely based on the micro-economic model proposed by Weaver and Kim (2001). Weaver and Kim (2001) categorise measures to manage the quality of milk into quality standards, *s*, price premiums, *p*, and farming inputs, *fi*. Given the incidence of random quality altering events, *a*, milk quality, *q*, can be defined as a function of:

$$q = f(fi, p, s \mid a) \qquad (1)$$

The adoption of quality standards that regulate minimum quality requirements for milk trade can discourage producers from bringing unhealthy or adulterated milk into the market.[14] In a market setting where milk quality can be observed and graded, milk quality can also be priced. When milk price is set proportional to milk quality, producers have an economic incentive (price premium) to improve the quality of their milk. The availability of appropriate farming inputs (live animals, artificial insemination, bulls for natural breeding, grazing land, roughage and concentrate feed, veterinary care, training, etc.) is necessary to enable farmers to manage milk quality.

4. Sampling Methods

The sample used in this paper includes 7 dairy cooperatives, randomly selected from a list provided by the Federal Cooperative Commission (FCC). Figure 1 (annex) and Table 1 show the spatial distribution and the characteristics of the sample sites.

13 Main protein component in milk.

14 Milk can be easily adulterated through water addition or cream removal.

Table 1: Dairy Sample, Ethiopia 2005.

Site (Dist. from capital)	*Region* and Zone	Altitude (MASL)[15]	Number of Cooperatives	Farmers Interviewed and Milk Supplies Taken
Dessie (400 km North-East)	Amhara South Wollo	2700	1	25
Debre Zeit (50 km South)	Oromo South Shewa	1600	1	50
Dejen (200 km North-West)	Amhara East Gojam	2400	1	25
Selale (40 & 80 km North)	Oromo North Shewa	2500	2	50
Asella (200 km South East)	Oromo Arsi	2500	1	25
Harar (500 East)	Oromo-Somali Harerge	1400	1	25

All sample sites are located in the high-potential Ethiopian highlands. The sample is diverse covering three regions and five zones. The number of members interviewed per cooperative was set in proportion to the overall number of cooperative members. The data collected include information on cooperative management as well as members' performance. Cooperative management was investigated by interviewing cooperative managers (chairmen and members of the executive boards) and members. Information from members' was gathered at the milk collection centres, by interviewing each second member during milk collection activities.

Two small samples were taken from the bulk milk of each member interviewed. All samples were delivered to the laboratory within 12 hours from collection. Sample collection followed standard sampling procedures.[16] Milk samples were analysed using international laboratory grades and standards (ILRI 2000).[17] Milk samples were gathered and analysed within a one-month period, so as to reduce the influence of uncontrollable seasonal factors on milk attributes.

Data Descriptives

Ethiopian dairy cooperatives are distinguished into primary and secondary cooperatives. The latter are defined as unions (joint-ventures) of two or more primary cooperatives. The typical primary dairy cooperative in Ethiopia is 13 years old (established in 1993), and counts approximately 54 member-farms, located in a range of 10 km around the cooperative headquarters.

15 Metres Above Sea Level

16 Standard sampling procedures involve: the sanitation of the equipment (planger and diper) with clean running water, and operator hands with alcohol (70 percent); milk bulk stirring, before pouring the milk sample into a sterile container properly labelled; and immediate sample storing in an icebox.

17 ***Somatic Cells count (SCC):*** Collect 0,01 ml of milk with a sterile-standardised loop and spread it homogeneously over a microscope slide (the surface must be divided by a grid characterised by 4 square surfaces of 1cm per side). Once the milk layer has dried up, add Ethanol 96%. After 15 minutes add Tolouidin Blue 0,2%. After 5 minutes wash the slide with tap running water. When dried observe the slide with a microscope (100 times enlargement). Count somatic cells (eosinophiles, linfocytes, neutrophiles, basophiles, mastocytes, etc.) in twenty different fields (A). Given the dimension of the microscope zoom (F; in this case = 0.0346), the somatic cells count (N) is equal to: N= A x 10000 / F.

Total Bacteria Count (TBC): Collect 1 ml of milk with a sterile-standardised loop and dilute it progressively (1/10 - 1/100 - 1/1000 - 1/10000 - 1/100000 - 1/1000000) with "Peptone Water". Collect 2ml of the 1/1000 solution and 2ml of the 1/100 and pour it in 4 Petri dishes. Add 12-15ml of "Standard Plate Agar" in each dish. When the solutions in the dishes get solid, transfer them in an incubator for 48 hours, with a temperature of 37°C. Finally, the number of bacterial colonies grown can be counted. If the colonies are too many, compromising the accuracy of counting, repeat the same procedure using more diluted solutions.

Milk Fat Analysis (Gerber method): Heat the milk samples up to 37°C, then add 10ml of Sulphuric acid 90%, 10.94 ml of milk, and 1ml of Amyl alcohol in a Gerber butyrometer (8%; 10.94 ml) and shake it. Heat the butyrometer for 3-5 minutes at a temperature of 63°C, then centrifuge it for 4 minutes at 1100 RPM (revolution per minute), and heat it again for 3-5 minutes at 63°C. Read the fat percentage on the scale of the butyrometer.

Milk Protein Analysis (Protein Formaldehyde Titration): Pour 10 ml of milk in a white ceramic container and add 0.4 ml of potassium oxalate 0.4%, and 0.5 ml of phenolphthalein solution 0.5%. After two minutes add NaOH until the solution shows a light pink colour. Then add 2 ml of neutral formalin 40%, which cancels the colour obtained. Add NaOH until the solution shows the same pink colour previously obtained. Compute the protein percentage, multiplying the number of ml of NaOH used by 1.78, or by 1.38 to obtain the % of casein.

The headquarters of primary dairy cooperatives are usually situated in or close to urban areas. In these headquarters cooperative employees collect, bulk, process and market the milk supplies received from member-farmers on a daily basis. At the same time, the cooperative headquarters distribute feed on credit, coordinate services (artificial insemination, veterinary care, training, credit, etc.) and provide market information to their members.

Before collection, cooperative employees screen most of the milk supplies using on-the-spot tests (alcohol and specific gravity test), which measure milk quality as good or bad, not continuously.[18] Milk supplies that do not comply with the quality standards imposed by these tests are rejected, even if the rejection rate appears to be negligible. At the moment, these tests are the only instruments available to regulate milk quality of members. The lack of laboratory facilities for milk grading implies that the price received by cooperative members does not depend on milk quality attributes.

In fact, milk price fluctuations in Ethiopia are associated with location, seasonality, and the calendar of the orthodox Christian church. The latter involves at least four prolonged fasting periods, during which almost 40 percent of the national population abstain from consuming products of animal origin. Considering spatial and seasonal fluctuations, the average price received by cooperative members can be estimated at 1.8 birr per litre of milk (almost 0.18 Euro). Characteristics of cooperative farmers are given in Table 2.

Table 2: Cooperative farmers, Ethiopia 2005.[19]

Variables	Mean (N=189)	Std. Dev.	Min.	Max.
Herd size	2.1 heads	1.2	1	7
Daily production	11.6 l	11.5	1	73
Cow productivity	6.1 l/day	4.2	0.25	23
Price received	1.8 birr/l	0.7	1.13	3.75
Farmer Age	45.6	12.2	19	80
Female Farmers	33%	0.47	0	1
Farm-Coop Distance	2.6 Km	2.8	0.001	10
Total Bacteria Count (Tbc)	608 million cfu[20]/ml	2.34e+09	200	1.0e+10
Somatic Cells Count (Scc)	811329 cells/ml	1506899	0	1.30e+07
Fat content	4.0%	0.9	2	9
Protein content	3.0%	0.3	2	4.18

The typical cooperative farm is owned by a male farmer with an average age of 46. These farmers own a couple of cows (either indigenous zebus or crossbred cows), which produce 12 litres of milk a day on average.[21] This milk is characterised by high bacterial contamination, high somatic cells count, and poor protein and fat content, compared to standards and secondary data from both developing and developed countries (Figure 2 and 3; annex).

18 ***The alcohol test*** involves the collection (with aid of a syringe) of 1 ml of alcohol (70%) and 1ml of milk, which are then poured in a small glass and shaken. When milk is heavily contaminated by environmental bacteria, or produced by cows that are at the end of the lactation period, affected by mastitis, or metabolic disorders, the milk colloidal suspension becomes unstable. The alcohol-milk solution instantaneously highlights these defects showing protein coagulation and precipitation. The alcohol test is a low cost, simple, and quick technique for a gross evaluation of milk hygiene and freshness. (ILRI, 2000).

The specific gravity test is meant to detect undeclared water addition and cream removal from the milk supply. These types of adulterations are common commercial frauds that diminish safety and nutritional value of the milk supply. Both adulterations can be revealed by immerging a lactometer in samples of milk. The lactometer is a floating device that provides an instantaneous estimation of milk density (specific gravity), given a standard milk temperature. (ILRI, 2000).

19 Source: author's survey 2005.

20 Colony forming units.

21 Ethiopian cooperative farmers have heterogeneous herds, composed by zebu cows and/or crossbred cows. The latter have hybrid genotypes, which are usually formed by different proportions of Frisian and Zebu genes.

6. The Empirical Model

Considering the data available, the structural equation (1) is assumed to have the following empirical form:

$$q_i = \alpha_0 + \alpha_1 \ln coopage_i + \alpha_2 \ln dist_i + \alpha_3 \ln memb_i + \alpha_4 \ln memb^2_i + \alpha_5 \ln age_i + \alpha_6 gender_i + \alpha_7 union_i + \alpha_8 alcohol_i + \alpha_9 sg_i + \alpha_{10} \ln scc_i \quad (2)$$

Where q_i refers to individual quality measures (total bacteria contamination, fat content and protein content) as well as an overall quality measure, generated by factor analysis, of the milk produced by cooperative farmer, i,. The availability of appropriate farming inputs is expressed by the age of the cooperative (years), coopage; the distance between farms and cooperative headquarters (km), dist; the number of members, memb, per cooperative as well as its square, $memb^2$, as a linear relationship between milk quality and cooperative size is not expected; age and gender of the cooperative farmer and a dummy for union (secondary cooperative) membership. Milk quality standards are described by dummies for the usage of alcohol, and specific gravity, sg, tests. The incidence of quality altering events is captured by the scc term which measures the incidence of mastitis in cooperative herds (number somatic cells per ml of milk).

Price premiums are not included in the reduced equation (2), since laboratory facilities for milk quality grading are extremely scarce in Ethiopia, preventing both private agents (cooperatives, traders, and processing and retailing firms) and public institutions from pricing the milk quality of cooperative farmers.

Since cooperative farmers lack the information to assess the quality of their milk, milk quality cannot influence farmers' behaviour; endogeneity across right and left hand side variables is thus expected to be minimal. To reduce the high variability (heteroskedasticity) of milk quality, variables were converted into their logarithmic form. Finally, skewness and kurtosis tests indicate that both dependent variables and residuals are normally distributed at five percent significance level.

7. Results and Implications

Results from the estimation of equation (2) are given in Table 3. Estimation findings using the overall quality measure suggest that milk quality is highest when a dairy cooperative counts approximately 67 members, and when member-farms are located further than 2.6 km from the cooperative headquarters.[22] Smaller cooperatives (less than 67 members) are likely to have less bargaining power and visibility vis-à-vis public services, NGOs and the market. Cooperatives with more than 67 members may instead be constrained by difficulties in holding management accountable to the members (i.e., shirking behaviour), inappropriate political activities, or financial irregularities. In both cases farming inputs and market information available to the members diminishes, as does milk quality. Options to optimise dairy cooperative size, may involve joint-ventures between small cooperatives (unions or horizontal integration of two or more cooperatives), or the partitioning of big ones.

22 The optimal number of members is computed by dividing the coefficient for the number of members by the coefficient for the square number of members, multiplying the result by 0.5 and taking the exponent.

Table 3: Estimation results

Explanatory variables	Dependent Variables			
	Overall Quality	**Fat Content**	**Protein Content**	**Total Bacteria Count**
Quality altering events:				
lnscc	- 0.01(0.01)[a]	- 0.01(0.00)***	- 0.00(0.00)	0.02(0.04)
Quality standards:				
sg	- 3.08(1.00)***	- 0.96(0.32)***	- 0.36(0.16)***	0.34(3.41)
alc	- 0.67(0.30)***	- 0.26(0.09)***	- 0.05(0.05)	1.15(1.03)
Inputs provision:				
*ln*dist	0.31(0.08)***	0.08(0.03)***	0.05(0.01)***	- 0.60(0.28)***
*ln*memb	20.0(6.10)***	7.95(1.92)***	1.50(0.97)*	3.95(20.5)
*ln*memb^2	– 2.40(0.21)***	– 0.97(0.24)***	– 0.17(0.12)*	– 0.58(2.51)
*ln*coopage	– 0.31(0.69)	- 0.26(0.22)	0.04(0.11)	- 0.92(2.34)
*ln*age	0.15(0.17)	0.06(0.05)	0.01(0.03)	1.09(0.60)**
gender	– 0.00(1.04)	- 0.01(0.03)	0.00(0.02)	- 0.22(0.35)
union	– 0.12(0.15)	- 0.09(0.05)**	0.01(0.02)	- 2.90(0.54)***
R-squared	0.3878	0.3589	0.3225	0.2782
N	187			

[a] standard error in parentheses

* denotes significance at 15% level

** denotes significance at 10% level

*** denotes significance at 5% level

When farms are located closer than 2.6 km from the cooperative headquarters, the space available for the herd may become limited, reducing animal welfare, and thus the quality of milk yielded. In fact, the great majority of cooperative headquarters are located in or close to urban centres, where land is scarce by definition. Consequently, dairy cooperatives need to find effective measures to engage rural, rather than urban farmers. As observed in Debre Zeit and Harar areas, options may include the establishment of small cooperative centres for milk collection, as well as the relocation of dairy cooperatives in rural areas surrounding cities and towns.

Finally, empirical evidence suggests that tests measuring milk quality as good or bad, and not continuously, are unreliable and ineffective. These tests are often misused.[23] But more often they impose quality standards that lie below the actual quality of milk, preventing cooperative farmers from improving further the quality of their supplies. On-the-spot quality tests need to be replaced with grading techniques. These would allow a more precise observation of milk quality, creating the opportunity to price the quality of members' milk.

We can conclude that the appropriate cooperative size and location, and milk quality grading and pricing may stimulate members to upgrade the quality of their milk, and to better compete in the marketplace.

However, the fragility of consumer's willingness to pay for milk quality may discourage dairy cooperatives or other private agents involved in the supply chain (itinerant traders, processing and retailing firms) from accomplishing these tasks, justifying the intervention of public

23 The specific gravity test, in particular, is usually applied without measuring milk temperature. Since milk density varies according to milk temperature, the results of the specific gravity test should be consider only Since milk density can vary a lot according to milk temperature, if milk temperature is not constant

institutions. In particular, governmental and non-governmental organisations are recommended to regulate and promote the establishment or relocation of dairy cooperatives in the rural areas surrounding cities and towns, so that the urban consumers can still be reached; regulate dairy cooperatives' size (approximately 67 members), and promote joint ventures between small dairy cooperatives, and the partitioning of big ones; invest in public facilities (laboratories) for grading the quality of milk produced by cooperative farmers on a regular basis; and support the adoption of price premiums and quality standards based on the quality grades observed.

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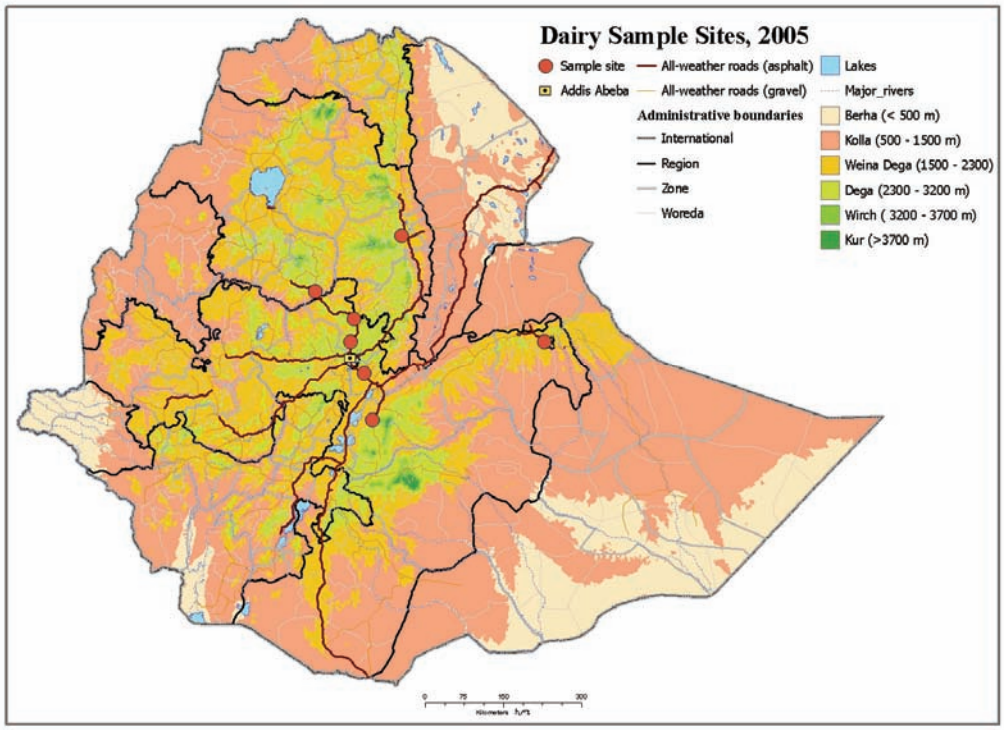
Annex. Figure 1



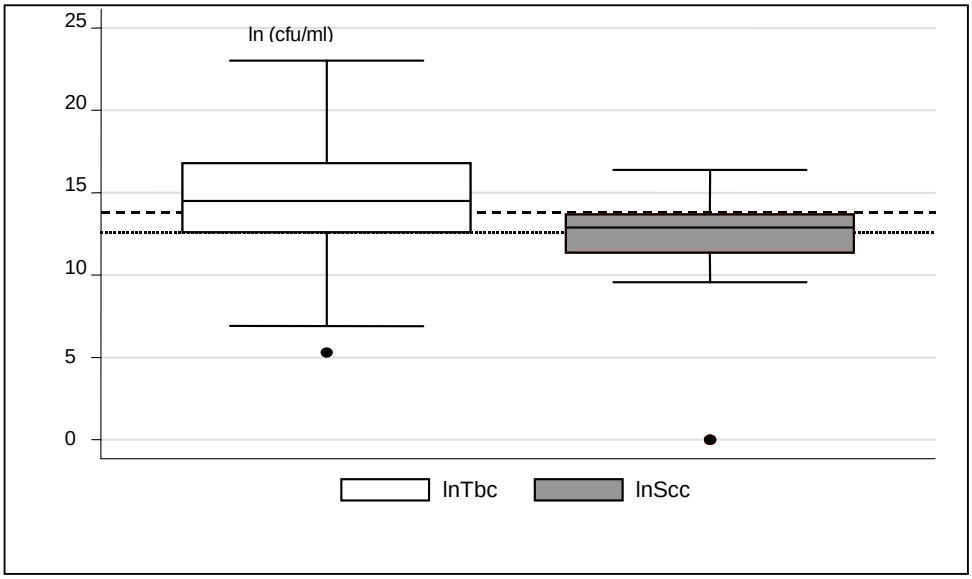


Figure 2: Total bacteria contamination (TBC) and somatic cells count (SCC) in milk produced by cooperative farmers, Ethiopia 2005.[24]

24 Total bacterial contamination (TBC) is measured by counting the number of bacterial colonies in 1 ml of milk (CFU/ml). The somatic cells count (SCC) increases when cows are affected by mastitis (inflammation o the mammary gland). SCC is measured by counting the number of inflammation cells in 1 ml of milk. Both the units used for measurement are here expressed in logarithms so as to reduce sample's variability. The standards included in the graph corresponds to the public standards adopted in USA and EU (EUFIC & FDA, 2005) for TBC (1000000 cfu/ml or 13.8 ln(cfu/ml)) and SCC (300000 cells/ml or 12.6ln(cells/ml)) in raw milk.

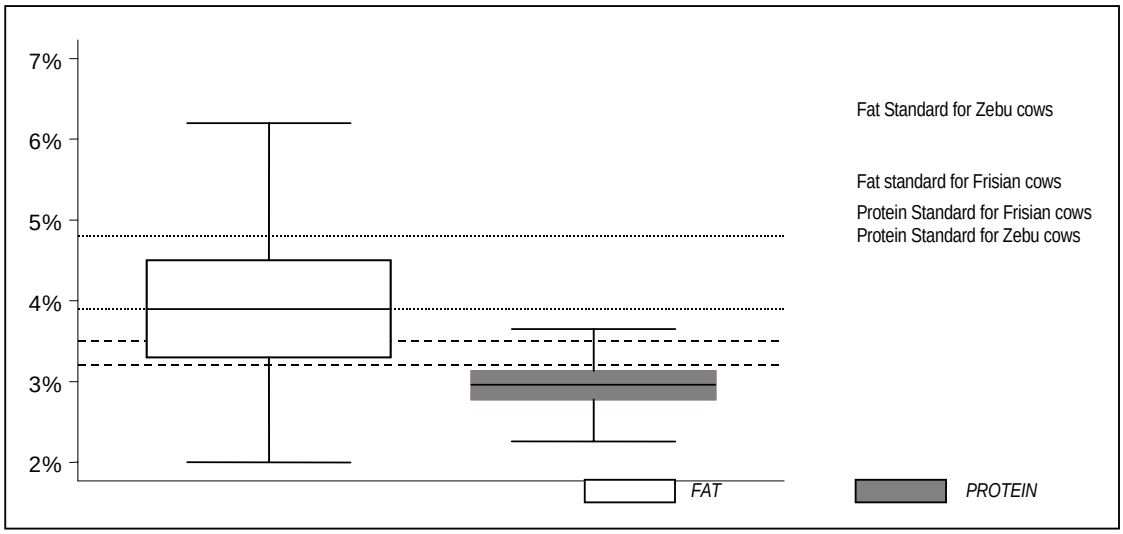


Figure 3: Fat and protein content in milk produced by cooperative farmers, Ethiopia 2005.[25]

25 Fat and protein standards included in the graph are an average of secondary data from both developing and developed countries world-wide (Falvey et al., 1999; Walstra et al., 2006).

Could Cooperatives Be A Panacea For Ethiopian Livestock Sector?

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Abstract

The Ethiopian economy is highly dependent on agriculture. Agricultural production including livestock depends largely on smallholder agriculture. Despite the fact that there is a large number of livestock, the livestock sector is operating with low capacity and the demand of agro-industries is not fully satisfied. Not only are the smallholders focused on subsistence farming, but also they keep their animals as insurance. However, when there is collaboration and cooperation of different stakeholders in this sector, there is a possibility to overcome the current limitations. In this paper, we try to show the importance of cooperatives for Ethiopian livestock sector by providing two different examples from an international and a local case.

Key words: cooperatives, Danish pork production, dairy -Ada Liben, Ethiopia

Introduction

The Ethiopian economy is highly dependent on agriculture. Agricultural production including livestock depends largely on smallholder agriculture. Despite the fact that there is a large number of livestock[26], the livestock sector is operating with low capacity and the demand of agro-industries is not fully satisfied. Not only are the smallholders focused on subsistence farming, but also they keep their animals as insurance. However, when there is collaboration and cooperation of different stakeholders in this sector, there is a possibility to overcome the current limitations.

The ever-increasing demand for meat and milk are putting pressure on the livestock sector but mainly on the producer side. Thus, the livestock production in developing countries is not *business as usual* but there is a need towards a more coordination along the supply chain. However, the speed of change is highly variable among countries, depending on the levels of economic development and the socio-political conditions (Costales et. al., 2006).

In this paper, we try to show the importance of cooperatives for Ethiopian livestock sector by providing two different cases of different countries. For more information on cooperative development in Ethiopia there are two recent reports by USAID, the first titled "Revitalizing Market-Oriented Agricultural Cooperatives in Ethiopia" and the other "Evaluation of Agricultural Cooperatives in Ethiopia (ACE) Program Activities" which also provide case studies both from Ethiopia and other African countries. In Ethiopia, ACDI/VOCA has assisted Ethiopian cooperatives since 1997 in their transition from a socialist orientation under Derge regime to a free market, business-driven approach. "Revitalizing Market-Oriented Agricultural Cooperatives in Ethiopia," illustrates in detail how the Lumme Farmers' Cooperative Union and the Kolba Primary Cooperative accomplished this transformation[27]. The aim of this paper is not to provide a history of cooperative development in Ethiopia. Moreover, by providing the first

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26 The livestock population in Ethiopia is estimated to be the largest in Africa and ninth in the world.

27 For more information; http://www.coopdevelopmentcenter.coop/CDO%20case%20studies.htm#ACDIVOCAEthiopia

case we aim to show how a small country livestock sector with high transportation costs and other problems were overcome with help of cooperatives. The second case is a success story on how a dairy cooperative was organized and possible lessons for the livestock sector in Ethiopia.

A success story from Denmark

The aim of this section is to provide an overview of two different countries which the livestock sector is very important. In doing this, there is summary table below to give a clear picture of how the two countries have different factors that are crucial for the livestock productions such as land, feed cost, processing, labour and export markets. Evidently, Denmark is a developed country and has very different conditions than Ethiopia. However, comparing the factors below, the Danish livestock industry should not be competitive in the world markets:

FACTORS[28]	DENMARK	ETHIOPIA
LAND	Land in Denmark is scarce and highly priced	Land in Ethiopia is not scarce and not as highly priced
FEED COST	Danish feed cost is inflated by the effect of the European Union's common agricultural policy	Ethiopian Feed Costs are not inflated and the price of feed is not one of major the constraints
PROCESSING	Processing lines in packing plants are far slower, so that fixed costs must be spread over a lower throughput	For the processing, vacuum packing has been started to be used recently.
LABOUR	Labour costs are high	Labour costs are cheap
EXPORT MARKET &TRANSPORTATION	Denmark is much further from the lucrative Japanese market, resulting in higher transportation costs	Ethiopia is not far from Middle East and the transportation is not high compared with exporting to other close by African countries

Looking at the above factors, Ethiopia should be a success story. However, this is not the case at all. Despite the above factors and plus the fact that the pork industry in Denmark is not heavily supported by EU subsidies, it is the world's largest exporter of pork. We will try to explain why Danish Pork sector is a successful one, the role of the cooperatives and possible lessons for Ethiopian livestock sector might be. In short, the reason behind this success lies in the fact of how the *industry is organized* and the vertical co-ordination of activities through the whole supply chain.

A short summary of how Danish pork production is organized is given below :

> Ninety-seven percent of Danish production is channelled through three farmer-owned co-operatives that slaughter and process their members' hogs. All the co-ops belong to *Danske Slagterier* (DS), an umbrella organization that undertakes marketing activities on behalf of the industry, and conducts research on breeding, production, processing, and markets. *Communication* and *co-operation* are the watchwords of the Danish industry. *Danske Slagterier* gathers intelligence on consumer preferences in key markets and uses this information at all stages of the chain, improving quality and responding to consumer needs. It was market research, for example, that determined that Japanese consumers prefer pork that is deep red/pink in colour. This led to research both in controlling meat colour through genetics and in methods of objectively grading carcasses on the basis of colour. Ultimately, these initiatives will enable the industry to produce "Japanese-quality" hogs specifically for that market. Through close

28 The factors for Denmark are gathered from Hobbs et. Al. (2000) while the Ethiopian factors are based on authors' own interviews in Ethipia.

working relationships with—or ownership of—processing and distribution firms, processors are able to tailor their products to the needs of particular markets and market segments. The emphasis is on meeting the needs of specific markets. Sophisticated carcass-grading techniques provide feedback to farmers on the quality and suitability of individual carcasses. Traceability, food safety, and quality assurance are all top priorities, and are all facilitated by close vertical co-ordination along the chain.

This summary of the case is taken from Hobbs, et al (2000) For a more detailed explanation the Danish experience, see Hobbs et al (1998), and Hobbs (2000).

As can be seen from this example, a global perspective and thus access to international market has helped Denmark to flourish in this livestock sub-sector. Further, the Danish Pork Industry demonstrates how cooperatives can be essential in organizing the members and also the importance of an umbrella organization which has information on what the market wants. On the other hand, this case provides important lessons for Ethiopia for showing the importance of communication and co-operation, especially for organizing the smallholders in Ethiopia.

Although the global perspective and international markets are important for livestock sector, there is much demand for dairy from the local market in Ethiopia with its ever growing population of 77 million[29] today. Next, we explain how an Ethiopian dairy cooperative was organized and how it is linked with the smallholders as well as the other organizations.

Ada'a Dairy Cooperative[30]

In September 1998, thirty four retired Air Force veterans in the Ethiopian town of Debre Zeit set up a dairy cooperative for small-scale dairy production. Owning on average more than twenty animals each, together they were able to collect and sell milk. The remarkable accomplishments of the cooperative can be seen from the below table.

Table 1. The accomplishments

Year	1998	2005
No. of members	34	787 total 375 women
Capital, Birr	3,400	1,600,000
Number of cows	400	3,000
Milk collected per year, litres	257,037	2,568,219

In 2005, the number of members has reached in total 787; 375 women. The members are smallholders who are collecting and selling over 2.5 million litres of milk per year. On the other hand, the number of cows has increased from 400 in the start to 3000 in 2005. Mostly the cooperative aims to ensure supply of safe, hygienic milk, to increase productivity of dairy cows and to create job opportunities. The main major problem is he lack of milk processing plant which they can use to supply quality dairy products, including butter and cheese to urban consumers in towns up to 100 miles away including Addis Ababa. One of the problems they face supplying the local market is related with the religious practices in Ethiopia. Every year from late February to mid April is the big fasting period with little ones throughout which in total is

[29] According to US State Department, the population of Ethiopia is 77 million in 2005. http://www.state.gov/r/pa/ci/bgn/2859.htm

[30] The information on this cooperative was collected on a study visit in April, 2006 and the cooperative manager was interviewed.

around 220 days throughout the year. The fasting days prohibit the Christian consumers not to consume any livestock products including milk and milk based products such as cheese and butter. Even more for smallholders who lack the capacity to keep their milk cool, the two fasting days per week represents an enormous challenge. One of the ways to overcome these difficulties was to look for an outside to sell their products. Addis Ababa was the logical choice since it 50 km away and its growing population of over 5 million. Moreover, how the cooperative is dealing with these challenges is one of the lessons that can have implications also for other livestock sub-sectors.

The cooperative has smallholder members who are bringing their milk to one of nine collection points in this area. In these collection centres, the milk is checked for microbial quality and for any evidence of adulteration or de-fatting. Because of the guaranteed quality of their product, there is also demand to buy fresh milk from these collection centres. This said, trust both from the consumers and also from the supply side is established by this cooperatives' way of organizing things.

Besides providing income for the smallholders who lack the opportunity to sell their products by themselves, the cooperative also provides artificial insemination services. With the financial gains, the cooperative was able to hire a doctor since the service from government was sometimes not available on time. As can be seen from this example, besides vertical coordination of the value chain, they are involved with providing support to their members. Moreover, the dairy co-operative model offers a more holistic and participatory involvement of different actors. Researchers from the International Livestock Research Institute (ILRI) stationed at Debre Zeit[31], who have been advising the co-operative since its start are also involved in training processes. ILRI's other roles are advising and organizing; project preparation, research and quality control service. Other partners include Bureau of Agriculture who they have linkages on market information and government issues. Bureau of Cooperatives help on the regional bases and thus they can get credit from Oromia Cooperative Bank. VOCA, an NGO, provides training. Ethiopian Institute for Agricultural Research (EIAR) with research and Debre Zeit Agricultural Research Center with research and training. In fact these two organizations are also in collaboration with IPMS (Improving Productivity and Market Success) who also arranged a training program in modern dairy farming, dairy processing, and marketing. The aim of this training was the establishment of market-linkages between these rural farmers and this Cooperative[32]. Genesis Farm, a private company also has business relations with this cooperative.

Conclusion

We tried to provide two different cases of livestock production through cooperatives. The Danish example was provided to show how all the constraints of a small country livestock sector with high transportation costs and the overall problems of market information were overcome. On the other hand, the Debrezeit dairy cooperative is an encouraging example. Briefly, some of the lessons are :

31 For more information, see Tegegne (2003).

32 http://www.ipms-ethiopia.org/IPMS-NEWSLETTER/IPMS-NEWS/innovative_extension.html

: "*At the end of the training program, the desired marketing linkage was established between the rural dairy farmers and Ada'a Dairy Cooperative and a provisional joint committee was established to facilitate and finalize the agreement. As a result of this arrangement, Ada'a Dairy Cooperative currently collects milk from four new rural sites.*"

- A guaranteed income for poor smallholders
- Creation of interactions with many different actors provide their expertise
- Development of social capital in the communities
- Reducing the quality concerns of consumers and providing healthy products
- Focus not only technical innovations but also institutional ones such as creating new markets

The above benefits are just the outcome of a well-functioning cooperative in the dairy sector in Ethiopia. However, there is still much need for further cooperation and collaboration in the livestock sector. As emphasized in the beginning, the speed of change is highly variable among countries, depending on the levels of economic development and the socio-political conditions. This is also the case for Ethiopia. In conclusion, since livestock sector has an immense potential in Ethiopia, support and incentives from the policy side is also required to attain better competitive advantage especially in international markets.

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Closing Remark made on the 14th Annual Conference of ESAP

Mebrat Alem, Addis Ababa, 07/09/2006

Distinguished Guests,
Representatives of Pastoralists and Farmers,
Our development partners,
Conference participants,
Colleagues,
Ladies and Gentlemen:

It is, in deed, an honour and a privilege to be given the opportunity to make a closing remark of the 14th Annual conference of the Ethiopian Society of Animal Production (ESAP).

This conference is unique in that it brought livestock producers, for the first time, to be with us, express development issue from their point of view and listed to what the professionals and development partners and conference participants say regarding livestock development issues including those they raised and in general interact with the people threat directly or indirectly influence livestock development policy and strategy.

During the last three days various papers pertaining to different issues of livestock development were presented. Presentations dealing with the cross cutting issues were presented and discussed at large during the plenary sessions while research results were dealt with in the group0 discussions.

Dear conference Participants,

Let me draw your attention to the length of the time allocated to the plenary presentation. One and half days! This was also the first time that this much time was allocated to the plenary session. A full day was rarely allocated in the preceding conference.

There are three main reasons for this particular conference to have allocated more time than ever before.

- The cross cutting issues addressed have become more important than ever before.
- The society has realized that it has to increase its role in the development agendas the government attaches top priority to.
- The professionals are concerned more than ever before in the development of their beloved country and hence remain standby, like a soldier, to serve their country in terms of development and economic warfare and deliver their share whenever the need and the opportunity arises

Remember have mentioned two unique performances this conference has achieved so far and there still is more.

It is also for the first time that our society has had brownbag sessions. SNV, IFPRI, AARC, NVA and Land O'Lakes and World Wide Sires, on the Tuesday and Thursday brownbag sessions enlightened us regarding what and how they do and intend to do the development intervention they are undertaking while ASARECA-AARNET did so regarding what opportunities are available for us to exploit and how.

The surprising achievements go on, web site, entering an agreement with ILDP, etc.

Conference participants,
Ladies and Gentlemen,

Not only do we unanimously agree that it is time to transform agriculture from subsistence to market oriented. We also agreed that the transformation is, indeed, long overdue. What is expected of the society as a society and its members as individual professionals in their respective responsibilities is to advise the governmental and non- governmental organizations and private sectors based on thorough analyses of the opportunities and risks/challenges as well as the objective realities globally and of course nationally. As H.E the State Minster stated, in his opening speech, mutual existence has become as important as never before. For mutual existence to take root and flourish, transparency is a pre-requisite or otherwise.

Ladies and Gentlemen:

To transform subsistence agriculture in general and livestock in particular to market oriented requires transformation of people's attitude and orientation .As an organization of professionals ESAP also needs to be transformed. And I am very happy that his was what we have witnessed in the last three days. ESAP has been transformed literally from subsistence to make market-oriented. We have witnessed that it has undertaken SPM study and from now on, it will plan and implement its activities accordingly.

We all to put our efforts and develop our country in an integrated and sustainable way and ESAP can play in identifying the gaps the professionals under its umbrella are needed to fill and availing them.

Let me take this opportunity, on behalf of the workshop participants and the society as well as my own, to express my heart-felt gratitude to SNV,ASARECA-AARNET and Land O/Lakes and World Wide Sires not only for having enlightened us to their activities but also for sponsoring so many inputs for this conference and of course the food and drinks they generously provided us within also hope that the programmes they are implementing has benefited from the discussion that followed their presentation.

I would also like to thank the Ethiopian Agricultural Research Institute allowing us to use the conference hall, the syndicate rooms and associated facilities. Thanks also go to the many professional like Ato. Ephrem Getahun and Ato.Girma Tadesse who happily and relentlessly delivered marvelous work without which the conference would not have earned the respect and success it has registered currently. I have no doubt that they will continue to do so.

Those who work behind the screen and whose names go unsang do also deserve a big thank you.

Last but not least, all I can say is that we cannot thank Dr. Tadelle, the mastermind and chief engineer of the transformation of the society we have witnessed in just a year, and all his colleagues in the executive committee members enough.

We, the members of this society have to take advantage of the opportunity our society has now created and scale up our role in the making of transformed and prosperous Ethiopia in our respective professions and responsibilities. Today is the day we make a vow to join hands to deliver what is required by our country.

Thank You!