



South-South Knowledge Sharing on Agricultural Mechanization

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the Ethiopian Agricultural Mechanization Forum

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Conference Proceedings¹

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¹Presentation slides from keynote address and from all sessions are available at IFPRI's ESSP website ([this link](#)).





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Executive Summary

The conference had three broad objectives: (A) Exchange experiences and promote cross-country learning on agricultural mechanization with the aim of informing Ethiopian and other African stakeholders; (B) Strengthen the network of African mechanization stakeholders, identify emerging policy-relevant research topics on agricultural mechanization, and outline future networking opportunities; (C) Bring together researchers and analysts with policy makers to disseminate policy research results and encourage dialogue to better understand the role of agricultural mechanization that leads to equitable economic development, improved food security, and poverty reduction.

The conference consisted of various sessions, each with unique objectives. The **opening session and keynote address** provided the key policy and historical contexts, setting the tone and overall directions of the dialogues of the conference. The three **sessions on international experiences** provided insights into how agricultural mechanization has evolved in countries with different agroecological, social, institutional and political settings, and what common lessons can be transferred to African countries. The **session on emerging issues in Africa** highlighted the issues around the potential of smaller tractors and machines, challenges and opportunities for South-South mechanical technology transfers, under-appreciation of the private sector's roles, and institutional innovations for reducing transactions costs in custom-hiring markets. The **panel session on the roles of the private sector** highlighted various examples of how the private sector in Asia led the growth of agricultural mechanization and it also revealed that while African governments foresee private-sector led growth in the long-run, they feel the need for extensive interventions due to concerns about market failures common in early stages of mechanization. The **panel session on perspectives by international actors and donors** provided further insights into agricultural mechanization's place in development aid and its integration with youth, sustainability and other issues.

The last **session, reflections on the conference**, synthesized the key messages and issues from the conference into five categories. First, significant variations were observed in **defining and characterizing mechanization**, and the importance of both broad and narrow definitions of mechanization was emphasized. Second, the key **reasons for promoting mechanization** were identified –efficiency gains, addressing farm labor scarcity, and faster land preparation. Third, key **types of mechanization** were identified, namely the types of machinery, functionality, locations of production, historical contexts that affect mechanization. Fourth, key **outcomes of mechanization** were identified for future research, including labor-saving / labor productivity, farm size, efficiency gains, and intersectoral linkages. Fifth, the dialogue centered on **how to mechanize** and on the roles that should be played by governments (including subsidies, reducing transaction costs, regulations, and the roles of different tiers of government) and the private sector (including agglomeration of services). Within these frameworks, the conference brought to light the following areas to address in the future: the impact of mechanization, business models of custom-hiring service provision, the role of animal traction, roles of farmers' groups, and appropriate roles of government and the private sector.

Overall, the following were the main messages of the conference:

- The private sector plays the central role in agricultural mechanization development and hiring services are crucial for reaching smallholders in both Africa and Asia.





- Governments in Asia rarely promoted mechanization directly but rather facilitated private sector-led mechanization through reform, liberalization and market coordination.
- Governments can help fill knowledge and capacity gaps, for example by conducting soil mapping to determine the appropriateness of different machine types. They can also provide demonstration/education on the use of new technology as well as promoting service provision business models.
- When direct government interventions are necessary, they must consider sustainability; for example, subsidies should be designed with clear exit strategies.
- Since Africa is still at an early stage of mechanization, government interventions can be justified for overcoming market failures and mitigating the uncertainty and market risks faced by the private sector. However, such interventions should be designed such that they do not lead to significant policy distortions and government failures.
- There is unlikely a single “right” formula for government involvement in mechanization beyond facilitative and coordinative roles. Governments that want to play a more proactive role in mechanization need to learn from Asian experiences, as well as learning-by-doing from their own mistakes. Monitoring and evaluation of ongoing interventions will be important for making necessary adjustments.





Day 1 (October 31)

Opening Session

The opening session was started by Dr. Bart Minten, Program Leader of IFPRI-Ethiopia, followed by the remark by Mr. Dominique Davoux, Head of Agriculture and Rural Development, EU-Ethiopia. Mr. Davoux's remark highlighted, among others, the following issues:

- Progressing structural transformation
- Importance of smooth integration of the youth
- Key challenge in agricultural mechanization in Ethiopia
 - Presence of smallholders
 - Limited arable land
 - Figuring out mechanization options for Ethiopian agroclimatic conditions, climate change

Opening Statement was then made by Mr. Ato Tesfaye Mengiste, State Minister, Ministry of Agriculture and Natural Resources, The Federal Democratic Republic of Ethiopia, conveying the remark by H.E. Dr. Eyasu Abraha, Minister of Agriculture and Natural Resources (Ethiopia). Mr. Mengiste highlighted, among others, the following issues:

- The conference is important in terms of content and timing as agricultural mechanization is part of the core agenda towards achieving the goal of the agricultural sector in Growth and Transformation Plan (GTP) II
- Economic growth has been progressing but agriculture has remained traditional, and needs growth from productivity improvement
- Mechanization has the potential to increase labor productivity and reduce harvest losses. However, the progress of mechanization has been slow in Ethiopia, with the current level at 0.1 kwh / ha
- Women's benefits need to be addressed
- The conference will help the staff in the Ministry to identify the core policy-relevant issues for the development of the sector.

Mr. Ato Tesfaye Mengiste then officially declared the opening of the conference

Keynote: Why history matters

The keynote address made by Dr. Stephen Biggs and Mr. Scott Justice in the last part of the open session. Dr. Biggs walks us through rural and agricultural mechanization history in Asia from the mid-1960s to mid-1980s (from the age of open policy debates and data collection), mid-1980s – mid-2000s (closing of debates and data collection), and mid-2000s and 2017 where the revival of policy and academic interest happened. He also highlighted experiences from South East Asian countries in their mechanization history.





Q&A session for the keynote

Following questions were raised in the Q&A session following the Keynote Address:

- Whether the keynote refers not only to agricultural mechanization on crop, but also livestock, needs to be clarified
- While the keynote address focuses on the small-scale mechanization, and refers to the relative efficiency of smallholders over large farms, there are also needs to identify rural mechanization strategies that are optimal from farm size dynamics perspectives
- Drivers of diverse patterns of mechanization technology adoptions should be investigated. For example, what led to differential mechanization growth paths between two-wheel tractor-led in Bangladesh, and four-wheel tractor-led in India and Nepal?
- Experiences specific to dryland/rainfed areas should also be compiled, as such experiences are likely to be particularly relevant to Africa where irrigated farming systems have not spread widely
- Definitions of mechanization should be discussed. In particular, whether mechanization is seen as a power / energy, or the process of operations (land preparation etc.), needs to be clarified
- Agricultural mechanization issues had been neglected in the 1980s and 1990s partly because a number of influential studies (for example by the World Bank, or some scholars) concluded that many developing countries had not been ready for mechanization
- IFPRI/CIMMYT organized study tour in Bangladesh in 2015 opened eyes for the potentials for two-wheel tractors in Africa. In Nigeria, 2wt has been promoted but the training on machine operations are found to be critical for further spread. IFPRI / CIMMYT should take up studies on how different types of machines are used efficiently in different areas

In response to some of these questions, following remarks were made by the speakers:

- Livestock has been an integral part of agricultural mechanization debate. The growing use of animal tractions is found in a crop-livestock integration system, and it is an important process of farming system evolution. There had been quite many programs on animal tractions that have been implemented in developing countries
- The lessons for the neglect of agricultural mechanization issues in the policy debates the 80s and 90s are that we need to pay more attentions to a broader spectrum of views in the research and development communities, not just the views of certain scholars
- It was unfortunate that the resulting neglect on agricultural mechanization issues in policy debate the 80s and 90s missed out the rapid growth in small engine mechanization that actually took place in Asia during this period
- Regarding farm size, it is still important to recognize that when mechanization started to grow in Asia in the 80s and 90s when farm size remained fairly small, and it is still the case today in some Asian countries from international perspectives. In countries like Bangladesh, agricultural productivity kept rising even though farm size has become smaller





- Drivers of the diverse mechanization growth patterns have still remained under-investigated, and those are exactly the issues that need to be studied by the research community

Session: International experience session 1

Four presentations were made reflecting on the experiences of mechanization growth in Bangladesh, China, Kenya and Ethiopia.

Highlights of the presentations:

Bangladesh

- Natural disasters that wiped out Bangladesh's draught animals in the 1980s prompted the government, with the help of donors, to lift import restrictions on farm equipment. The private sector, encouraged by tax exemptions, began importing affordable small-scale equipment. Although adoption of these small machines increased food production, there is low use of machines such as combine harvesters, seeders, rice transplanters, hand weeders, and reapers.
- Small-scale mechanization was suitable for Bangladesh's highly fragmented land.
- Bangladesh's success in mechanization is attributed to the vibrant private sector, academic engagement in policy processes, building of agricultural & rural development institutions, localized technology interventions and setting up physical infrastructure

China

- China's average farm size is about the same as that of Bangladesh, but even more fragmented
- Harvesting is the most commonly mechanized operation, followed by plowing.
- Highly mobilized mechanized harvesting service providers have emerged; they usually form a team with 3-4 small combines, and transport them on pick-up trucks. They move around the country from south to north following different harvest seasons and often travel more than 1,000 miles in 6-8 months a year. Working as teams gives service providers a better bargaining position and helps them overcome harassment in unfamiliar places. More importantly, working as a group reduces cost of spare parts and other services that are costly for individuals
- The government provides a uniform subsidy to any would-be buyer. Local governments also provide technical training on operation and maintenance, but their most important facilitative role is to help migratory service providers overcome coordination failures by setting up communications platforms and providing harvest calendars for different locations.
- China's experience shows that land fragmentation is not necessarily a constraint for mechanization and that mechanization services can be provided by non-farmers.





Kenya

- Results of a household survey indicates that hand tools are commonly used by farmers across different agroecological zones in Kenya. Tractors are mainly employed in the highlands while lowland production is characterized by ox plows. Only 2% of surveyed farmers own tractors, although the survey does not cover hiring mechanization services. Due to fragmentation and decline in farm sizes, the share of farmers who own tractors declined between 1992 and 2012.
- Growth in agricultural mechanization is dominated by animal traction, not tractors. Over the same period, the share of farmers owning trained oxen increased from 17% to 33%

Ethiopia

- The incentives for mechanization growth in Ethiopia include rising real wages and the rising cost of keeping livestock
- There has been a significant increase in machinery (tractors and combine harvesters) imports since 2010 (especially tractors). In 2011, METEC started having a big role in agricultural machinery imports - but demand declined recently
-
- Favored by previous mechanization history, the presence of larger scale farmers and commercial farmers, flat terrain and two cropping seasons, the south-eastern part of Ethiopia has seen higher uses of tractors & combine-harvesters
- Animal traction still plays a dominant role in crop production, and even in the places tractors and combine harvesters are used, farmers still use animal traction for second and third plowing (while tractor usually does the first plowing before the rain when soils are harder).
- Combine harvesters are highly mobile, while tractors mainly provide services locally
- Net yields are strongly correlated with use of threshing/harvesting machines, mostly combine-harvesters, because of significant reduction in harvest losses. The study did not find a significant correlation between yield and tractor plowing.

Q&A session for International experience session 1

The following questions were raised during the Q&A:

- What have been the policies on import duties for agricultural machineries in Ethiopia?
- What enables the success in China? Was this related to biophysical landscape, mechanization mobility, or cropping systems?
- In the Kenyan study that showed the trend of machine ownerships, is there information on the use of each type of machine?
- What about the potential for reduced tillage in China and elsewhere? While combine harvesters allow early plowing for the next season, it is also important to look at the linkage with reducing the tillage altogether.
- What are your policy recommendations for Ethiopia and Africa based on the various findings?



- The findings on the differential effects on yield in Ethiopia need to be clarified. These patterns have not always been the case in Asia
- What have been the roles of cooperatives in promoting mechanization, particularly in China?

In response to some of these questions, following remarks were made by the presenters:

- Agricultural machines are currently duty exempt in Ethiopia if the importers have a business license and their application for agricultural machinery investment is approved. Farmers and those without investment approval need to pay duties.
- The relationship between yields and tractors, combine harvesters are based on statistical analyses, which may be specific to the samples. In the case of combine harvester use, yields include the reduction in harvest losses that are high with traditional manual harvest technology. Focus-group discussions also suggest that farmers generally perceive combine harvesters to be yield-increasing, but not tractors.
- In Bangladesh, low-quality machines were still accepted because of their extremely low price compared with their durability
- In China, the government's enabling policies include
 - Road connection to all villages
 - Transport of agricultural products and machinery is exempt from tolls
 - Large scale land-leveling financially supported by the government, which allows equipment to move around easily
- Similarly, in China, plowing and planting for wheat and maize are often done jointly, which has reduced tillage in some places already (e.g., in the north) and could be further promoted.
- In China, cooperatives are promoted in some places and some own machinery. However, in most cases, while the machinery owners form cooperatives, machines are still owned individually
- Some policy recommendations should recognize that animal traction is still important in African countries. Also, it should be recognized that in Asia, animal traction and mechanized plowing are often used side-by-side (which is the case in Ethiopia too).

Session: International experience session 2

Four presentations were made reflecting on the experiences of mechanization growths in Thailand, Ghana, India and Nigeria.

Highlights of the presentations:

Thailand

- Thailand has larger average farm sizes than the countries in the previous presentations. It is dominated by medium-scale farmers, who account for 50% of farmers and 50% of farmland.





- Locally-adapted and manufactured machineries widely substituted for expensive imported machines
- Minimal direct policy support other than creating an enabling environment for the private sector
- 2WTs have been increasingly adopted, substituting for the use of draught animals. 75% of the 2WT used are owned by farmers, while 85% of 4WT are owned by service providers, who may also be farmers
- The sustainability of mechanization in Thailand relies on private maintenance and repair providers
- From the demand side, mechanization is driven by farmer demand for small-scale labor-saving technology; from the supply side, it is driven by the small-scale domestic manufacturing sector that adapts generic technology to meet specific needs of farmers.

Ghana

- Mechanization demand has grown but with substantial variation across the country
- Determinants of rising in mechanization demand include urbanization, rising farm sizes among medium-size farmers, and rising rural wages
- Since the demand for mechanization is limited to land preparation at this stage, the potential for multifunctional use outside the plowing season is limited.
- The AMSEC professional services model is not profitable without huge subsidies
- Rather, farmer-to-farmer hiring services provided by medium scale farmers after they have plowed their own land helps them achieve profitable utilization rates. Medium-scale farmer's owning tractors provided hiring-out services to 100-120 other farmers on average, of which almost half were small-scale farmers with land less than 2ha
- Government can play facilitating roles in market coordination to help the private sector overcome the information asymmetry in the hiring-out market
- Promoting affordable smaller tractors suitable for local soil and farming conditions is the key. Supporting research and development focusing on such smaller agricultural machinery should be part of agricultural development strategy
- Where subsidies exist, they should avoid arbitrary selection of recipients and of types of subsidized machinery and increase transparency to eliminate rent-seeking behavior

India

- Between 1971/2 and 2012/3, the share of farmers using draught animals for crop decreased from 45% to 5 % while the share of those using tractors increased from 7% to 46%.
- Individual entrepreneurs were the most common providers of mechanization services
- Solar energy is getting attention as a source of power, particularly for irrigation
- The components of sustainable intensification include sustainable mechanization, optimal use of farmers' inputs and environmental management





Nigeria

- There has been a considerable increase in animal traction increased from the 80s to 2010.
- Despite policy support, mechanization levels in Nigeria are very low, although it is unclear if this is due to insufficient demand
- The mechanization process depends on labor, animal traction, farm size, and farming system
- As in Ghana, the private sector is most effective service provider of mechanization services
- The government could provide information on mechanization technologies
- The mobility of tractors, as in Ethiopia, is limited

Q&A session for International experience session 2

The following questions were raised during the Q&A:

- What have been the causes for divergent mechanization growth patterns between India and Thailand, despite the similarity in various aspects including the growth of domestic manufacturing? Why did the electric-pump grow in India while the diesel pump grew in Thailand?
- What were the contributions of training centers in Thailand?
- Is the farmer-to-farmer custom hiring service the most viable model? What types of farmers (large, medium, etc.) are the primary service providers?
- How can we integrate “job creation”, one of the important goals for governments including the Ethiopian government, into support for private-sector led custom-hiring service?
- What are the policy recommendations?

In response to some of these questions, following remarks were made by the presenters:

- Job creation may require a broader approach than only government support for custom-hiring service centers. This is because there are many pathways through which mechanization can affect the labor market. For example, if tractor adoption increases farm size and output but harvesting is not mechanized, it could lead to increased demand for harvesting labor. Promotion of both government-support and private-sector led custom hiring service may lead to increased employment for repair and maintenance by small-scale workshops. Mechanization may also reduce food production costs (through labor-cost saving), reducing food prices and increasing real wages, or allow workers to accept lower wages which could then increase the overall competitiveness of Ethiopia in the international market, which can lead to greater job creation
- The divergence between Thai mechanization growth from that of India, might have been (1) introduction of single-cylinder engines by the Japanese in the 1970s, which also affected subsequent innovation patterns; (2) that farmers preferred greater mobility of pumps for irrigating from canals, and thus preferred diesel to electricity from grids.



Session: Mechanization issues in Ethiopia

Four presentations were made on various agricultural mechanization aspects in Ethiopia.

Following messages were emphasized in each presentation:

Mechanization strategy of Ethiopia

- Of the 74 million ha of arable land, 14 million ha is currently cultivated. Rain-fed agriculture with about 3 million ha under irrigation
- Although mechanization dated back to the era of CADU, WADU, ARDU in the 1960s, mechanization practice in Ethiopia is minimal. Mechanization in Ethiopia context means mainly for land preparation, threshing, and harvesting
- Service delivery model is considered to be effective
- The vision of Ethiopia's mechanization strategy is "Raise Level of Agricultural mechanization expressed in Mechanization index from 0.13 today to 1kw/ha by 2025". To this end, four major components are identified: research and development, manufacturing and import, distribution and promotion, purchase and usage

Mechanization research in Ethiopia

- Mechanization is defined as the application of tools, implements and powered machinery (Clarke, 1997) where the power source could be human, animal, or mechanical.
- Early on EIAR's research were mainly directed to production of hand tools and animal-drawn equipment. Later, it also engaged in small engine driven equipment. Engaged in appliances are both for crop and livestock production. 2WT come to picture only in 2015.
- Agricultural mechanization is believed to solve youth unemployment by creating jobs in operating the machinery and its repair and maintenance.
- The institute plan to continue building its human capacity and direct its research to the production of medium scale motorized mechanization, reverse engineering, business incubation and strengthening PPP.

Profitability of modern agricultural mechanization from farmers and service providers perspective

- The findings are based on data collected from Arsi zone (Kulumsa). Five agricultural mechanization technology levels were considered; in all scenarios fertilizer application, broadcasting, and spraying activities are manual.
- Substantial yield increase by using the highest mechanization technology (H-2/AT) as compared to employing draught animals.
- The difference in total variable costs is large between animal draught and 2WT, but not so much as one employed higher technologies (2WT to H-2/AT) which brought about large increase in yield. However, from the service provider side, intermediate technology level is found to be more profitable.



Mechanization in Ethiopia: Experience in the private sector

- The private sector in Ethiopia is involved in import and distribution, rental services, and domestic prototype development. The number of imported machinery is in general very low. Prototype development is focused on row-planters (for teff in particular), although there are long standing experiences in threshers and maize shellers.
- Introduction of *Berken Maresha* reduced runoff and soil loss, especially in the central and northern part of Ethiopia, where the traditional *maresha* accelerated land degradation by plowing along the slope.
- The private rental providers are found to be more effective.
- Some of the challenges mentioned are lack of skill and credit, policy support (tax), land fragmentation, customized tools.

Q&A session for Ethiopia session

Following questions were raised during the Q&A:

- What types of tillage equipment is recommended for soil pulverization?
- Regarding gross-margin analyses of different
 - While the results suggest that small-tractors have higher gross-margin than larger-tractors, are they consistent with the conditions in Ethiopia where 4wt plowing fees is higher than 2wt plowing fee
 - 4wt with 2wt should be compared with multi-purpose functions, particularly of 2wt, rather than plowing alone
 - Imputed costs of labor and other inputs should also be included
- Let private-sector decide the right quality – testing / quality testing often becomes bottleneck, rather than raising efficiency
- Mechanized pumping on water, that is emerging in parts of Ethiopia, must also be covered

In response to some of these questions, following remarks were made by the presenters:

- In many places of Ethiopia, 2wt is not profitable due to hard soil
- Assessing the potentials for tractors with 50 hp or above is still important, because most soils in Ethiopia seem too heavy for tractors below 70 hp
- For gross-margin analysis, figures and parameters are based on data that come from training center run by GIZ
- Utilizing existing extension systems is important, as it is easier to promote mechanical technologies through them
- Regarding the appropriate types of tilling equipment in weak soil areas for pulverization:
 - PTO-driven implements are not recommended
 - Pull-implements, such as chisel-plow, tine-cultivators are more appropriate
- Regarding the need for testing facilities, standardization should somehow still be facilitated by the government, if not involving regulations



Day 2 (November 1)

Panel Session 1: Roles of the private sector

Following points were highlighted by each panelist in this session.

Mr. Sadid Jamil, Managing Director, The Metal Limited, Bangladesh

- Land preparation in Bangladesh is fully mechanized and both 2WT and 4WT have been used. They import these 2 Wheel Tractors from China and 4 Wheel Tractors from India.
- Initially they faced lack of demand/market because farmers couldn't afford buying them and it is also difficult for farmers to access loan from financial institution. They then introduced credit facilities and this allowed them to increase their sales significantly. Last year they managed to sell 2500 tractors. The company pick up the credit from the bank, facilitate credit sale and they then collect the money and give back to the banks
- Importer / retailer identifies one guarantor from the nearby village, for each borrower, in the event of default
- The ownership of machines remains with the company, until all payments are received from the customer, thus machines themselves serve as collateral
- This was meant to bridge the gap between farmers and banks that were not interested in providing loans directly to farmers
- Assessing the customers' credit-worthiness remains a challenge, but nevertheless sales have increased
- The mechanism is similar to car-sales in USA
- Private importers/dealers in Africa should have either strong linkage with financial institutions or they themselves should provide credit sales to speed up mechanization process in their countries

Mr. Lokesh Singh, Co-founder and Chief Operations Officer, FarMart, India

- They work in matching the people with farm equipment with the farmers who needed to use the machine hiring service
- Call-center base approach is taken; while platforms were initially designed for smart-phone app, the ownership of smart-phones were relatively low among farmers who tend to be older
- The firm takes care of land measurement, reservations, payment collection, and collect commissions from the transactions
- In India, there are sufficient number of tractors, but number of equipment is not

Mr. Melvin Samarasinghe, Chairman, Foundry Development and Services Institute, Sri Lanka

- The agriculture in Sri Lanka is mainly rain fed. Small engines, heavy machines and water pumps are being produced in the country. But farmers do not know how to select their machine and what machine for which setting. Their company provides training for farmers and machinery owners on which machine to use and how to use it



- Some of the noticeable small-equipment spreading in dryland include 5 hp tillers that are used to open up the soil in upper hills of Sri Lanka
- Currently, 95% of the harvesting is done by machines and farmers are using small tillage in vegetable production as well
- Training / demonstration to show farmers how / use these small equipments are often important; in Sri Lanka, most of such training is provided by the private sector

Mr. Chombe Seyoum, Managing director, Gedeb Engineering PLC, Ethiopia

- He talked about the evaluation of agricultural mechanization in Ethiopia and mentioned some of the bottlenecks
- The approach to agricultural mechanization in Ethiopia changes with the government and the economic approach they have been following
- During the previous regimes agricultural mechanization was promoted and used with large commercial farmers or/and state farms and didn't focus on small scale farmers
- With the current government though the private sectors are encouraged to participate there are two main bottlenecks
 - lack of financing
 - farmers need to have investment license to get a duty and tax-free privilege
- Even with the traditional method of farming, Ethiopia is among the top producers of some cereals in the world thus if mechanization is further encouraged it will fasten our process of achieving food security and transition to industrial economy

Mr. Patrick Aboagye, Deputy Director, Agricultural Engineering Services Directorate Ministry of Food and Agriculture, Ghana

- Private sector must eventually lead the sector in Ghana, but the private sector is currently constrained because, importing tractors is costly due to relatively small overall market size
- The government therefore needs to step in to bring tractors at lower price through mechanisms like concessional loans
- As a result, the government started having a concessional agreement with other countries to get these machines in the country. The service provider then can access the machine and give the service to the farmers.
- But the challenge has been that the price set vis-à-vis the machine they are not paying back because the farmers are not paying for the service and there is no efficient after sale support. So the tractors are not fully utilized.
- Based on the experiences accumulated in the past, as well as IFPRI's research, Ghanaian government has recently modified its support programs in a number of ways;
 - Improved programs by adding subsidies on seed, fertilizer
 - Support private sector to obtain other machines (planters, sprayers, harvesters, and threshers)
- The government is also working on building the capacity of mechanics. Last year, over 1000 tractor operators trained on maintenance and proper handling of tractors and other machines. The private sector is also able to conduct its own market research and identify opportunities and machinery requirement of specific farmers





Abdullahi Abubakar, Deputy Director, Engineering & Mechanization Division, Federal Ministry of Agriculture and Rural Development, Nigeria

- Issues and programs are similar to Ghana
- 110 Agricultural Equipment Hiring Enterprises (AEHE) have been set up across the country, with each enterprise owning minimum of 3 tractors (which has been reduced from previous requirements of 5 tractors)
- In addition, the government of Nigeria currently tries to support land clearing in the South, which requires larger equipment like bulldozers, higher-hp tractors (ranging 75 – 80 hp)
- Beneficiaries are selected through due-diligence
- Equipment is provided by vendors, preferably manufacturers who have outlets in the country
- To increase the utilization of tractors, the government came up with another program in which the ministry of agriculture works in partnership with the Agriculture bank of Nigeria (government owned) to select and provide tractors to the private service providers through credit and payment on installment basis (they pay only 20% at the time of buying)
- To make sure spare parts and repairing services remain available, manufacturer representatives have to stay in the country for 2 years

Tamru Habte, Director, Mechanization Directorate, Ministry of Agricultural and Natural Resources, The Federal Democratic Republic of Ethiopia

- Ethiopia have diverse agro-ecological zone with different soil conditions and the crops produced are many, we use different approaches of mechanization
- Farmers in Ethiopia are dominantly smallholders ploughing with oxen; we have very few commercial farmers who use power machines and own high-power machines
- There are also small farm owners who voluntarily consolidated their land especially in South-east part of the country for the sake of using mechanization through custom hiring service for plowing, harvesting and transportation
- This approach is mainly used for wheat and the government is also promoting this approach to be used in other crop types and many regions
- The government also started to organizing people who have know-how in the area to have access to the machine and provide custom hiring services
- Number of smallholding farmers using mechanized system can be increased

A few questions were asked by the government officials on the panel

- What type of support the private sector in Asia have received from the government?
- Why is it better to provide credit through dealers, instead of providing it directly to farmers, even though the former involves more steps?
- How Asian private sector can come up with the program to bring more equipment to African countries including Nigeria?





In response to some of these questions, following remarks were made by the presenters, as well as general audiences

- On machine financing
 - Farmers often have easier access to finance by going through distributors, because banks usually decline to extend credit to individual farmers (due to high monitoring costs and other transactions costs)
 - Relatedly on financing, leasing system is often used in Sri Lanka
 - Finance for harvester, tractors are often done through leasing provided by the private companies
- On support from the government
 - Private sector should come forward: government should follow
 - Subsidies can be given in the beginning but can be stopped
- The private sector should do the business and government should support in terms of duty and tax exemption and extension of grace period; start-up capital; subsidy to the farmers and credit facilities to for service providers)
- Dealers/Importers should also should start selling through credit
- There should be strong linkage between research output and private business strategy

Further questions were raised as well from the audience:

- Definitions of the private sector
 - Farmers are also private sector
 - Give farmers also the choice where to get equipment, services, farmers' access to credit is still important
- What may be the issues associated with using public funds to conduct research that helps the private sector? What have been the relationship between the private and the public sector in Asia?
- International development funds have been channeled into Africa, but do not always reach the private sector or the farmer. What has been the experience in Asia?

Session: International Experience Session 3

Three presentations were made reflecting on the experiences of mechanization growths in Sri Lanka, Myanmar, and Tanzania.

The following messages were emphasized in each presentation:

Sri Lanka

- Mechanization started with irrigated rice farming and was further popularized by the formation of state-run tractor pools. Liberalization since the 1970s has increased the use of 2WT and 4WT for rice and other field crops.
- Although they were introduced 30 later, 2WTs were more popular than 4WTs until the last decade. Since then, this trend has reversed due to the preference for 4WTs for large landholdings and improved infrastructure.





- Factors affecting machinery use: large tracts of contiguous land, labor shortages, flexibility of machines (2WT and 4WT) that can be used for various activities
- Mechanization filled the gap created by the migration of agricultural labor to other sectors; high yielding and high-value crops with the use of technology were also a driver of mechanization. However, import policies and rugged terrain posed a challenge.
- The majority of machines are imported but locally manufactured machines and modified versions of imports are also available.
- Few people own machines and hiring service charges are thus considered very high.
- The low cost of imports discourages local manufacturing

Myanmar

- The rapid rise of mechanization in Myanmar was investigated using data from two household surveys (Delta Aquaculture –Agriculture survey and Rural Economy and Agriculture Dry Zone survey)
- In the Delta, machines replaced draught animals particularly for land preparation; use of combine-harvester is also picking up rapidly
- In the Dry Zone, farmers combine use of tractors and draught animals for land preparation for non-paddy crops
- Machinery is becoming more common and diversified by type. Ownership of feed cutters hasn't changed much since 2000; however, there has been a significant jump in ownership of water pumps and tractors since the economic reform in 2010. The largest jump, in terms of value, has been for 4WTs
- Rental services are found to be essential for smallholder farmers' access to machinery. Service providers maximize their efficiency by traveling between the Delta and the Dry Zone which have different cropping seasons.
- Rural-urban migration was the key driver of mechanization on the demand side.
- On the supply side, the prices of water pumps and 2WTs have been decreasing, led by increased imports from China, which makes investing in agricultural machinery profitable
- The recent policy reform in the financial sector that allows all private banks to do business in agriculture, including financing agricultural equipment, played an important role in reducing financial constraints for machinery investment. Formalization of land use rights by the government played a key role as it allows farmers to use land certification issued by the government as collateral.
- There are no tariffs or restrictions on type of machinery imported

Tanzania

- Although tractors are used for the land preparation of nearly 50% of cultivated land in some areas, they were only used for 14% of cultivated nationally. Although tractor imports increased since 2005, hand tools are used for more than 60% of cultivated land
- The demand for tractor use comes from all types of farmers, though medium-scale farms are increasing relative to small farms.





- Since the structural adjustment in 2005, the trend in number of 4WTs in use has despite declining trend noted in the previous decade. Nonetheless, survey results indicate that 73% of 4WTs are over 15 years old – less than 10% of them were found to be younger than 10 years, most of which were bought second-hand
- Ownership of 65% of the 4WTs is confined to six adjacent regions and the movement of these tractors for hiring services is limited to areas along good road infrastructure.
- Draught animals are used predominantly in the six drier regions. Lack of pasture, availability of tractor hiring services, and donkey meat exports pose a threat to draught animal use

Q&A session for International experience session 3

Issues discussed in the Q&A session include:

- Impact of mechanization in terms of yield, area cultivated, etc.
- The role of government in the case of Myanmar
- Profitability of mechanization from farmer's point of view
- Evolution of technology in the case of Tanzania is hand tools → draught animals → tractors vs the proposed direct jump from hand tools to tractors
- Experience of inter-region (inter-country) mechanization services, if any
- Public sector roles in addressing various constraints in Sri Lanka

Session: Emerging issues for agricultural mechanization in Africa

Four presentations were made on (1) Experience of CIMMYT and its partners with two-wheel tractors and other smaller scale rural equipment in Africa; (2) Brazil and South-South Cooperation; (3) Challenges and opportunities in Africa; (4) Innovative uses of modern communication technologies in mechanization: The case of Hello Tractor.

Experience of CIMMYT and its partners with two-wheel tractors and other smaller scale rural equipment in Africa

- Land preparation can be crucial for yield increase
- Average land size is decreasing in some African countries. The rural populace is familiar with and has a fair skill set on how to operate and maintain small-engine tools
- CIMMYT's trial with direct seeder (particularly for maize) establishes that, as compared to the conventional broadcasting, the former saves time and increases yield significantly. Here, there is an added advantage of fertilizer placement exactly where needed
- How to increase service providers' profitability has to be given more consideration: could be technological (manufacturing the attachments locally, expanding supplementary irrigation, etc.) and/or institutional (policy, finance, etc.)
- 2WT's attachments have to be modeled to fit the soil types of Africa; although there is a lot to learn from Asian countries, Africa's infrastructure and biophysical conditions have to be taken into consideration





Brazil and South-South Cooperation

- The program was launched in 2010 with the goal of influencing both policy and machinery sale through the provision of technical cooperation and concessional loan.
- The program was modelled after the Brazil's own program of mechanization financing which succeeded in transforming small family farmers into mechanized commercial farmers.
- The drivers for Brazil to expand South-South Cooperation are to expand market for Brazilian manufacturers, and deepening Brazil-Africa cooperation relations
- Most of the Cooperation was in the form of providing hardware (particularly tractors), rather than soft component
- In the case of Mozambique, about 500 tractors, all of which are of the same specifications, were provided across the entire country
- The scale of the machinery distributed was not adequate to small-holder farmers and they were supporting the emerging medium to large commercial farmers and those with good soil conditions. This has implication for mechanization for agrarian structure, soil and ecosystems

Challenges and opportunities in Africa

The challenges:

- Policy makers don't see what is going on in small scale farming business;
- Problem with scale appropriate technologies;
- Low level of local manufacturers
- Misconception held on small vs large economies of scale
- 4WT misrepresented in Africa

Opportunities

- Could source innovation through private sector
- Backstopping and organizing professional associations
- R & D institutions design outsourcing innovations

Innovative uses of modern communication technologies in mechanization: The case of Hello Tractor

- Hello Tractor aims to fill the information gap, by linking tractor owners and farmers needing tractor services
- In Nigeria, a typical farmer plan late and this leads to a massive loss of yield because labor cost higher and unavailability when they needed the most
- Hello Tractor also facilitate tractor utilizations for tractor owners, by providing maintenance support, job booking, remote monitoring, through ICT and mobile technologies in Nigeria
- It monitors the locations and movement of tractor fleets, area serviced, and operators, through GPS devices attached to the tractors





- Farmers who do not have smart phone send us text messages and we use GPS to locate that request with the nearest smart tractor in the market
- There are 514 tractors operating in Nigeria and 250 farmers serviced per tractor per year

Q&A session for “Emerging issues for agricultural mechanization in Africa”

Following questions were raised during the Q&A:

- How can the promotions of two-wheel tractors in African can be scaled up?
- How have these small-scale initiatives have been communicated to the policymakers?
- Promotion of two-wheel tractors should be market-driven
- Brazilian South-South cooperation
 - Regarding the Brazilian South-South cooperation, how can government make sure tractors received under the concessional loans are actually used
 - What do you recommend other African countries planning to receive mechanization-related cooperation from Brazil under More Food International program?
 - Development aid has political aspects and cannot separate them from development goals
- In some cases, energy efficiency of small engines may not be higher than larger engines

In response to some of these questions, following remarks were made by the presenters, as well as the general audiences

- For scaling up the promotion of small-scale machineries including two-wheel tractors, it is important to target the right areas with sufficient demand potential
- Sustainability is important: mechanization can be a way to make sustainable farming system work
- Currently collaborating with the Ministries in respective African countries on the promotion of 2wt and small-scale
- Brazilian South-South cooperation
 - Programs might have started on the wrong-footing, that led to some of the undesired outcomes like the supply of single type tractors across all agroecological zones
 - Countries like Nigeria can learn from the lessons in other countries
- Using small tractors, farmers often pay less per ha for mechanization services than larger tractors, indicating the potential economic efficiency of small-engines compared to large-engine machines
- Hello Tractors in Nigeria also work with the public-sector program; for example, they work with NIRSAL (Nigeria Incentive-Based Risk Sharing System for Agricultural Lending)

Panel Session 2: Perspectives by international actors / donors

In this session, panelists provided respective views as the following:





Mr. Dominique Davoux, Head of Agriculture and Rural Development, EU-Ethiopia

- EU has a plan to support mechanization program but not directly as the direct support before didn't bring the intended result
- EU's target is looking at the small-holding farmers with the ability to integrate the youth
- We all agree that we need mechanization but we need to back it with innovations, researches to integrating agriculture with better planning to attract the youth
- We are planning to support financing the public private partnership
- We are looking at the way of financing private sector to better integrate the smallholder farmers through loan guarantee, agricultural insurance, contract farming arrangements, leasing and integrating financing to the solution and skill gaps both from the private and public side
- We are also looking at
 - land management and land administration and access
 - market facilitation and using system application
- EU is planning to use different strategies across Africa depending on the countries settings
- As part of the national program, we also finance research on agriculture mechanization but sometimes it can be on application and sometimes on pure agronomy research

Dr. Tatek Woldu, Agricultural Mechanisation and Technology for Smallholder Productivity (AMTP), Senior Agricultural Expert, GIZ, Ethiopia

- GIZ has been promoting agricultural mechanization to increase farmers' productivity and profitability as well as employment of the youth
- We are currently active in Arsi zone, south-east of Ethiopia and we are demonstrating improved agricultural mechanization which encompasses land preparation, seedbed making, raw planting in partnership with the private service provider
- We also support the policy frameworks of mechanization in which we are supporting knowledge exchanging and policy dialogue and closely working with the ministry of agriculture in supporting to implement the mechanization strategy
- **Our future plan:** the service hiring market in Ethiopia is not up to the standard. For example, the price of plowing is set on the basis of the hectare not on the basis of soil type as a result farmers are not receiving quality service. Therefore, we can work together/support research on evaluating the service hiring market in Ethiopia
- Some of the public institutions are graveyards of machines so it is interesting to focus on efficient utilization of the existing machines than importing new ones
- Youth employment is also one area we are interested to work with
- GIZ is an implementing institution not a financing agent but we still provide technical support and help in procurement of fund from our financing agent, BMZ

Mr. Josef Kienzle, Agricultural Engineer, Sustainable Mechanization Theme' of FAO, Rome

- Mechanization should be economically, socially and environmentally sustainable. That is why we don't see mechanization as an end by itself. It must go hand in hand in





intensifying agriculture with combating climate change and youth employment. Thus, a single agricultural program should be an integrated program

- FAO is advising the government on agriculture including on the mechanization strategies. The core of the mechanization is that the farmers must have choice. This doesn't go hand in hand with the government procurement
- Therefore, the companies selling the machines should make sure they provide adequate after-sale service warranties and training facilities

Following issues were also discussed after the panelists' remarks:

- GIZ should work on capacity building and should promote machines from suppliers other than the GIZ affiliated companies to allow farmers to get access to scale appropriate technologies
- It is agreed that they have training facilities in the area where they are currently active so they will aggressively develop capacity aspects of the mechanization process. It is also mentioned that countries should find technology relevant to their condition

Session: Reflections on the conference

In this session, issues and questions discussed during the two-day conference were first organized into the following framework with five major categories:

1. What is mechanization and its characterization?
 - a. Significant variations in characterization of mechanization
 - b. Importance of defining mechanization broadly or narrowly, as such definitions affect subsequent discussions
2. Why mechanization?
 - a. Productivity, efficiency gains
 - b. Address farm labor scarcity
 - c. Faster land preparation
3. What type of mechanization?
 - a. Types of machinery
 - b. Functionality – single / multiple
 - c. Imported / locally produced machinery
 - d. Importance of historical contexts
 - i. Government policies
 - ii. Policy environments
 - iii. Resource environments
4. What are the potential outcomes of mechanization?
 - a. Labor-saving, labor productivity
 - b. Farm size
 - c. Yield
 - d. Efficiency gains
 - e. Intersectoral linkages
 - i. Provision of technical services
 - ii. Emergent subsectors





- f. Migration
5. How to mechanize?
 - a. Various processes
 - b. Various challenges
 - c. Roles of government policies
 - i. Subsidies
 - ii. Reduction of transaction costs
 - iii. Reasonable regulations
 - iv. Roles of different levels of government (central vs local governments)
 - d. Private sector
 - i. Agglomeration of services

Furthermore, the following outstanding issues were identified:

- Questions about the impact of mechanization
 - Correctly attributing the changes due to mechanization
 - Impact of mechanization on the environment
 - Impact of on income and agricultural and non-agricultural employment
- Business models of custom-hiring service provision
- Animal traction
 - Is animal traction necessary for the transition to machine power or can this step be skipped?
- Roles of farmers' groups
- Roles of government
 - Subsidies
 - Roles of extension systems
 - Regulations
- Roles of the private sector
- Hans Binswanger's 21 generalizations (Binswanger, Hans. (1986). Agricultural mechanization: A comparative historical perspective. *World Bank Research Observer* 1(1), 27-56.)
 - Which of them should be re-visited?

The following comments were also received from the general audience:

- Need to come up with methodologies to analyze broader contexts in which agricultural mechanization plays roles beyond farm-level
- Gender and youth employment aspects of mechanization should also be included in future research
- How to mechanize should be treated as mainly the role of agricultural research institutions, not the government
- Energy policies, which had been important for mechanization growth in Asia, need to be integrated into the debate in Africa
- Inter-sectoral relationships within the macro-context
- The extension system should also be strengthened to transfer technology to farmers
- Insurance and safety issues of machines





- Code of conduct in procurement of machines by the private and public sector
- Identification of major drivers / prohibitors of mechanization
- Definitions of mechanization should not be re-invented, since much work has already been done on this
- Identification of appropriate regulations to improve the quality of service provision
- Context matters. We cannot use one size fits all models, even for one country. A country can apply different types on mechanization models depending on the specifics of different regions
- Importance of learning from Asia not only about tractors, but also about mechanization for livestock and agro-processing

Finally, following **summary** was provided by the conference organizer:

- There is a consensus that the private sector plays the key role in agricultural mechanization development
- There is also a consensus that hiring service markets are the best way to reach smallholders
- Asian, governments have facilitated mechanization development led by the private sector rather than directly intervening.
 - Reform and liberalization that reduced restrictions on the private sector (e.g., Bangladesh in the 1980s and Myanmar in the recent years)
 - Market coordination (e.g., China and Thailand)
- Government can help fill knowledge gaps, which has been repeatedly mentioned both by presenters and in discussions
 - Conducting soil mapping exercises and providing demonstration are two examples of public goods
- Government interventions need to focus on sustainability. Where subsidies are pursued, there should be a clear exit strategy
- Africa is still at an early stage of mechanization, meaning that some market failures are inevitable. The private sector does face substantial uncertainty and market risk. However, in overcoming such market failures through government interventions, possible policy distortions and government failures also need to be considered
- There is unlikely to be a one size fits all formula for mechanization development in Africa. While lessons can be drawn from Asia, African governments will need to undergo a learning-by-doing process to successfully promote mechanization.





Appendix: Conference Agenda



Led by IFPRI



South-South Knowledge Sharing on Agricultural Mechanization

International Conference Organized by IFPRI, CIMMYT, and
the Ethiopian Agricultural Mechanization Forum

with Support from
European Union

USAID Feed the Future

CGIAR Research Program on Policies, Institutions, and Markets (PIM)
Gesellschaft für Internationale Zusammenarbeit (GIZ)

Hilton Hotel, Ball Room I, Addis Ababa, Ethiopia
October 31– November 1, 2017

Objectives:

- Exchange experiences and promote cross-country learning on agricultural mechanization with the aim of informing Ethiopian and other African stakeholders
- Strengthen the network, identify emerging policy-relevant research topics on agricultural mechanization, and outline future networking opportunities
- Bring together researchers and analysts with policy makers to disseminate policy research results and encourage dialogue to better understand the role of agricultural mechanization that lead to equitable economic development, improved food security and poverty reduction

October 31 (Tuesday) (Day 1) (Moderator: *Bart Minten, Program Leader, IFPRI-Ethiopia*)

8:00 – 9:00 Registration

9:00 – 10:30 Opening session

Welcome remark

Bart Minten, Program Leader, IFPRI-Ethiopia

Dominique Davoux, Head of Agriculture and Rural Development, EU-Ethiopia

Opening statement

Ato Tesfaye Mengiste, State Minister, Ministry of Agriculture and Natural Resources, The Federal Democratic Republic of Ethiopia

Keynote address (Chair: *Bart Minten, Program Leader, IFPRI-Ethiopia*)

“Rural mechanization: Why history matters”

Speakers

Stephen Biggs, Research Associate, School of Oriental and African Studies, University of London, UK

Scott Justice, Agricultural and Rural Mechanization Specialist, CIMMYT-Nepal

Q&A and Discussion





10:30 – 10:45 Group photo and tea break

10:45 – 12:30 International experiences session 1 (20 minutes each presenter; Chair: *Scott Justice, Agricultural and Rural Mechanization Specialist, CIMMYT-Nepal*)

Bangladesh

M. A. Sattar Mandal, Senior Advisor to FAO-Bangladesh

China

Xiaobo Zhang, Senior Research Fellow, IFPRI-USA / Professor, Beijing University, China

Kenya

Hugo De Groote, Principal Scientist and Agricultural Economist, CIMMYT-Kenya

Ethiopia

Bart Minten, Program Leader, IFPRI-Ethiopia

Q&A and Discussion

12:30 – 13:30 Lunch

13:30 – 15:15 International experiences session 2 (20 minutes each presenter; Chair: *Xiaobo Zhang, Senior Research Fellow, IFPRI-USA / Professor, Beijing University, China*)

Thailand

Robert Cramb, Professor, Queensland University, Australia

Ghana

Xinshen Diao, Deputy Director of Development Strategy and Governance Division, IFPRI-USA

India

Gajendra Singh, Consultant, India; Emeritus Professor, Asian Institute of Technology of Thailand

Madhusudan Bhattarai, Consultant / Former Principal Scientist, ICRISAT-India

Nigeria

Hiroyuki Takeshima, Research Fellow, IFPRI-USA

Q&A and Discussion

15:15 – 15:30 Tea break





15:30 – 17:30 Mechanization issues in Ethiopia (20 minutes each presenter; Chair: *Amdissa Teshome, Ethiopian Agricultural Mechanization Forum*)

Mechanization strategy of Ethiopia

Wondiye Gezahegn, Mechanization Directorate, Ministry of Agriculture and Natural Resources, The Federal Democratic Republic of Ethiopia

Mechanization research in Ethiopia

Bisrat Getnet, Agricultural Engineering Research Directorate, Ethiopian Institute of Agricultural Research

Profitability of modern agricultural mechanization from farmers and service providers perspectives

Daniel Hess, Agricultural Mechanization and Technology for Smallholder Productivity, GIZ

Mechanization in Ethiopia: Experience of the private sector

Melesse Temesgen, Aybar Engineering PLC, Ethiopia

Policy issues: Taxation and financing

Nega Wubeneh, AGRA-Kenya

Q&A and Discussion

17:30 – 19:00 Reception





November 1 (Wednesday) (Day 2) (Moderator: Xinshen Diao, Deputy Director of Development Strategy and Governance Division, IFPRI-USA)

8:00 – 9:00 Registration

9:00 – 10:30 Panel Session 1: Roles of the private sector (Chair: Abebe Fanta, Professor, Haramaya University, Ethiopia)

Panelists

Sadid Jamil, Managing Director, The Metal Limited, Bangladesh

Lokesh Singh, Co-founder and Chief Operations Officer, FarMart, India

Melvin Samarasinghe, Chairman, Foundry Development and Services Institute, Sri Lanka

Chombe Seyoum, Managing director, Gedeb Engineering PLC, Ethiopia

Patrick Aboagye, Deputy Director, Agricultural Engineering Services Directorate Ministry of Food and Agriculture, Ghana

Abdullahi Abubakar, Deputy Director, Engineering & Mechanization Division, Federal Ministry of Agriculture and Rural Development, Nigeria

Tamru Habte, Director, Mechanization Directorate, Ministry of Agricultural and Natural Resources, The Federal Democratic Republic of Ethiopia

Facilitator

Guush Berhane, Research Fellow, IFPRI-Ethiopia

10:30 – 10:45 Tea break

10:45 – 12:00 International experiences session 3 (20 minutes each presenter; Chair: Hiroyuki Takeshima, Research Fellow, IFPRI-USA)

Sri Lanka

Fred Abeyratne, Consultant, former Senior Programme Analyst, UNDP-Sri Lanka

Myanmar

Benjamin Belton, Assistant Professor, Michigan State University-Myanmar

Tanzania

David Kahan, Consultant, former Agribusiness Specialist and Principal Scientist, CIMMYT-Ethiopia

Geoffrey Mrema, Professor, Sokoine University of Agriculture, Tanzania

Q&A and Discussion

12:00 – 13:00 Lunch





13:00 – 14:45 Emerging issues for agricultural mechanization in Africa (Chair: Abebe Fanta, Professor, Haramaya University, Ethiopia)

Experience of CIMMYT and its partners with two-wheel tractors and other smaller scale rural equipment in Africa

Frédéric Baudron, Systems Agronomist, Southern Africa Regional Office, CIMMYT-Zimbabwe

Brazil and South-South Cooperation

Lidia Cabral, Research Fellow, Institute of Development Studies, UK

Challenges and opportunities in Africa

Scott Justice, Agricultural and Rural Mechanization Specialist, CIMMYT-Nepal

Innovative uses of modern communication technologies in mechanization: The case of Hello Tractor

Jehiel Oliver, CEO Hello Tractor, Nigeria and USA

Q&A and Discussion

14:45 – 15:00 Tea break

15:00 – 16:00 Panel Session 2: Perspectives by international actors / donors (Chair: David Kahan, Consultant, former Agribusiness Specialist and Principal Scientist, CIMMYT-Ethiopia)

Panelists

Dominique Davoux, Head of Agriculture and Rural Development, EU-Ethiopia
Josef Kienzle, Agricultural Engineer, Plant Production and Protection Division, FAO, Rome

Tatek Woldu, Agricultural Mechanization and Technology for Smallholder Productivity (AMTP), Senior Agricultural Expert, GIZ, Ethiopia

Mark Fynn, Agribusiness Advisor, African Union, Ethiopia

Facilitator

David Kahan, Consultant, former Agribusiness Specialist and Principal Scientist, CIMMYT-Ethiopia

16:00 – 17:30 Reflections on the conference (Chair: Alemayehu Seyoum Taffesse, President, Ethiopian Economics Association (EEA) / Senior Research Fellow, IFPRI-Ethiopia)

17:30 – 17:35 Words of thanks; logistical announcement for field trip (Bart Minten, Program Leader, IFPRI-Ethiopia)





November 2 (Thursday) (Day 3)

Field trip to Itaya/Assela (Oromia region)

| | |
|---|------------------|
| Meet in the lobby (international participants): | 6:45 am |
| Departure: | 7:00 am (Hilton) |
| Arrival: | 10:00 am (Itaya) |

Field visit and discussion with:

1. Representatives of cooperative
2. Farmers
3. Mechanized hiring service providers

Lunchboxes will be provided

| | |
|----------|------------------|
| Leave: | 2:00 pm |
| Arrival: | 5:00 pm (Hilton) |

