

**The development of agricultural mechanization in sub-Saharan
agriculture: the FEDERUNACOMA project. Marco Pezzini**

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*Regional Meeting on Advancing the Operationalization of the Framework for
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About FederUnacoma / CEMA

The Italian Agricultural Machinery Manufacturers Federation brings together, and represents in Italy and abroad, the associations of Italian manufacturers implements ([Assomao](#)), self-propelled machines ([Assomase](#)), tractors ([Assotrattori](#)), components ([Comacomp](#)) and gardening machinery ([Comagarden](#)). FederUnacoma's associates account for 80% of Italian production, with exports accounting for 60% of this production.

FederUnacoma is a member of CEMA, the association representing the European agricultural machinery industry. With 11 national member associations, the CEMA network represents both large multinational companies and numerous European SMEs active in this sector. The industry comprises about 7,000 manufacturers, producing more than 450 different types of machines with an annual turnover of about EUR 40 billion (EU 28 -2016) and 150,000 direct employees.

Both FederUnacoma and CEMA are part of the AGRIEVOLUTION Alliance, i.e., the global voice for agriculture equipment manufacturers. Made up of 15 agriculture equipment manufacturing worldwide associations and organizations, AGRIEVOLUTION's mission is to support our collective agriculture equipment manufacturing members around the globe, working to promote the benefits of mechanization in global sustainable agriculture.

CEMA-FAO alignment

- Since the early 2000s, several drivers, such as the rise in global food prices, the emergence of new suppliers of agricultural machinery, the demographic trends in Africa with increased urbanisation, in particular of youth and men, the increased investment by many African governments in agricultural productions and agri-food processing, have contributed to a renewed interest in agricultural mechanisation in Africa.
- Against this backdrop, while keeping in mind the need to seriously rethink the transformation of agriculture and sustainable mechanisation in Africa at all governance levels, FAO and the European Agricultural Machinery Industry Association (CEMA), forged a partnership in 2015 that aims to promote wider use of sustainable agricultural mechanization in developing countries.
- CEMA and FAO are working together to manage and disseminate knowledge on sustainable approaches to agricultural mechanization. The aim is also to jointly develop technical programmes to support innovation in mechanization and facilitate the implementation of sustainable mechanization initiatives at the field level.
- Tailored, inclusive, and integrated approaches to agricultural mechanization can make a real difference in increasing the welfare of farm households and create positive dynamics and opportunities for economic growth in rural areas.
- One the main focuses of the partnership is on capacity building activities in Africa, where human muscle remains the most important power source for smallholder farmers. For example, in sub-Saharan Africa, humans provide 65 percent of the power required for land preparation compared to 40 percent in East Asia, 30 percent in South Asia and 25 percent in Latin America and the Caribbean.
- Furthermore, since the early 2000s, FEDERUNACOMA actively launched and supported the idea behind the creation of a worldwide alliance in the agricultural machinery industry. In 2008, FEDERUNACOMA holds the inaugural AGRIEVOLUTION Summit in Rome. AGRIEVOLUTION is the global alliance of agriculture equipment manufacturers. Made up of 15 agriculture equipment manufacturing worldwide associations and organizations, AGRIEVOLUTION's mission is to support our collective agriculture equipment manufacturing members around the globe, working to promote the benefits of mechanization in global sustainable agriculture. The idea of an international coalition of associations has been

designed to share information and collaborate globally throughout the year. It was launched on the shared belief that in today's global agricultural economy, it is crucial that current issues and future challenges be viewed from a global perspective and be addressed on a global basis.

Main gaps and Enabling factors

Despite its potentiality, the agronomic yields in Africa remain low if compared with other regions of the world, and the gaps are widening.

Most farmers are smallholders, many of whom are poor. Africa has about 51 million farms of which 80% (or 41 million) are smaller than 2 ha in size (Lowder, Skoet, & Raney, 2016), and their numbers are still increasing in most countries (Headey, 2016; Jirström et al., 2011).

A significant lack of the infrastructural and skills for the agricultural use of water although the availability of the water resource.

A significant lack of training in good agricultural practices able to reach the yield per hectare of some areas less advantaged from a geo-climatic point of view.

A significant lack of know-how for harvest, post-harvest, and adequate storage facilities in order to reduce food losses especially with regard to challenges due to climate change

A significant lack of know-how for a transformation able to increase the added value.

A significant lack of funds for the production, which creates deficiencies in the whole agri-food chain and increases the uncultivated marginal lands

Gender disparities, typically women are disproportionately concentrated in 'lower skill' and lower paid positions.

The Governance is not able to attend in training and directing the actors involved in the logistics, to link national, regional and international markets.

Main Gaps

Food security is actually one of the main concerns. This is due to several causes:

- One of the main drivers of the surge in consumers' demand in Africa is the continent's growing population.
- **37% of the African population is urbanized**, and the UN foresees that by 2050 the urban population share will reach 56% (UN, 2014).
- African countries and public authorities should consider to measures to mitigate potential food shortages or food distribution system disruptions in case rural and urban population suffering from natural and human-made disasters.

How mechanisation can support sustainable agriculture

The European Agricultural Machinery industry is aware of the challenges we're facing today, with an unprecedented critical convergence of population growth, dwindling natural resources and the impacts of climate change.

What we know right now is that there is a pressing need to increase global food production to feed the growing, and increasingly urban, global population. We know that agricultural production must increase by 70% by 2050 at a global level, according to FAO's figures. At the same time, the planet is suffering from a continuing degradation of the natural resource base, with soil and water resources which are jeopardized by conventional agricultural practices involving intensive and excessive soil tillage. Especially in developing countries, this leads to low productivity on family farms resulting in low family income and an inability to invest in appropriate agricultural mechanization inputs. This means that doing "business as usual" is not an option on the table if we want to avoid widespread food shortages.

In the last decades, the growing interest in conservation agriculture has been leading the agricultural machinery industry to line up.

(Conservation Agriculture is a complementary set of three general principles which are adapted locally to become compatible with the location specific environment. These general principles are minimal soil disturbance, maintaining a permanent organic soil cover, maintaining biodiversity in crop production)

The implementation of the Conservation Agriculture involves the adoption of specific equipment. It means an uptake of specific technologies dealing with the reduction of tillage, appropriate sowing and fertilizer delivery practices.

The use of CA mechanization allows the reduction of significant amount of energy consumption compared to the technology used for tillage-based agriculture - approximately half the energy is expended.

Mechanization in its broadest sense has great potential to increase productivity and improve livelihoods along the all agri-food value chain. This will include post-harvest operations such as storage and processing. It can also include food processing from simple packing of fresh produce for supermarket chains to more industrial type processing.

For sustainable mechanization initiatives to work, complimentary action on two levels is needed: national (/regional) and local are important:

- a) At the macro-level, the objective is to enhance food security of the countries, in terms of food availability levels, i.e. volume, but also in terms of differentiation, infrastructure or support need-ed to enable national food security policies in the countries involved;
- b) On the other hand, at the micro or local levels of intervention, the national policies should meet the potential (both agricultural and human) and the needs of communities at local level.

Discussing the solution: the dual approach

Such components will define an overall framework in which macro, meso and micro levels of intervention can be designed, converging to a series of complementary objectives:

Top-down

- Review Food Security targets, plans and policies for each country involved (these are the responsibilities of African Governments), in light of the smallholder farm sector demand for appropriate mechanization, not only for crop production, but also for processing and along the entire value chain. This also means that the public authorities should consider the more appropriate agronomic and mechanisation measures to meet primary food security objectives.
- Formulate an inclusive policy connecting of all the stakeholders to bring about the enabling factors in terms of development. These factors are:
 - **Agricultural potential** (sustainable and productive agriculture), unleashing the potential of sustainable intensification for each country or region,

- **Human potential** (active population in the primary sector or related sectors), mobilisation universities, extension services, African Farmers Unions (PAFO and regional/national farmers' associations, AGRA, - ACT, local public and private organizations) to foster access to education, training, tangible or intangible resources (knowledge, processes, tools, etc.); Define an access to innovation strategy to endow local communities and businesses with the appropriate tools to realize their potential within the national or regional food security framework;
- **Financial framework:** financial support should be sought and provided by institutions such as the World Bank, IFAD, the FMI, EU, EIB, or AfDB, in order to set appropriate measure to foster investments in the enabling factors. Entrepreneurs will need to have access to the correct equipment, and this should involve facilitating their access to financial credit.

Bottom-up

The dual approach suggests the need to take stock of the current practices and actual requirements of the farmers. This should be done on the basis of an evidence-based to identify the best options to match country-specific mechanization needs, in line with the overall objectives of Food Security Plans and the perceived needs of local communities. Therefore, a series of investigations prior to action are needed to:

- Collect baseline data on the current knowledge, attitude, and practices,
- Define widely accepted agricultural sustainability and productivity metrics,
- Identify and assess the readiness and potential of local communities to contribute to the objectives,
- **Take into account current agricultural practices along the food value chain** (types of cultivations, storage and agri-food processing, levels of food security met, margins of improvement towards sustainability, productivity, and reduction of post-harvest food loss),
- **Consider current available equipment and asset management** (instruments and machines used, structure of ownership, maintenance and management capacities, acquisition, or commissioning practices, etc.)

For mechanization to work on the ground, the involvement of local communities is of fundamental importance. This bottom up approach would define the critical training needs to reach the minimum level of competence.

We believe that the dual approach (“top-down and bottom-up”) will answer to specific and different kinds of requests of mechanization, but the major result will be the level of food security for the country involved and the concrete development of economic units (small farm, village...). These will be able to produce the sufficient agricultural good for themselves, bring to the market the extra production and start their own viable economic development.

Reaching these two goals will require on the one hand training from the local institutions (Ministries of Agriculture) in defining Sustainable Agricultural Mechanization Strategies and how to implement them; and, on the other hand, the involvement of local agricultural universities for the necessary agronomic practice as well as the engagement of a larger range of stakeholders to encourage growth not only in terms of mechanization, but also of management.

The conservation of natural capital (especially soil, water and forests) requires a renewed focus on sustainable land management. Supply chains for sustainable mechanization options need to be strengthened to encourage increased demand. Because of rural-urban migration and the impact of pandemic diseases, female-headed farm families are becoming more prevalent, especially in SSA.

Improving women’s access to farm power through the provision of suitably designed equipment needs to be addressed by the actors in the farm power provision supply chains.

Promoting mechanization in agriculture means that more tasks can be completed at the right time, more efficiently and saving labour and energy. However, the equipment has to be compatible with the social, economic and environmental conditions in which it will work, in order to achieve sustainable crop production intensification.

An example of this type of equipment that can easily adapt to the context of developing countries is the range of low-cost smaller horsepower tractors. This type of tractor can be attached to planters designed to operate on soils under zero tillage regimes by depositing seeds directly into the soil with minimal disturbance.

Compared to traditional tillage-based practices, direct seeding is far more energy efficient and less time consuming. It also reduces input losses and drudgery and, over time, achieves better

crop yields when combined with adequate conservation agriculture practices. The effect on the environment is also very positive as soil erosion and compaction are eliminated and biodiversity is enhanced.

Direct planters are also well suited to animal traction which can also be used to pull small carts for transporting people and of goods. Low horsepower tractors, and indeed stationary engines, can also be used by smallholders to power other agricultural equipment, such as pumps, threshers and mills, improving farming conditions and productivity and coping with problems such as labour shortage and inadequate processing times.

Other examples of hand operated equipment that have a huge impact on labour efficiency are improved maize shellers or pumps for water lifting.

Conclusions

Mechanization is to be viewed as a means to achieve two main objectives: sustainability and food security. The mechanizations of the agricultural processes can and should be adapted to the specific needs of the local communities and of entire regions, depending on the policy goals set by the Public Authorities. This suggests that high-level stakeholders should take in great account the need to apply a dual approach to address the challenges ahead. Sustainable mechanization involves the application of different forms of skills, power sources (from manual to engine), equipment, along the agri-food value chain. As a result, mechanization must meet farmers' needs effectively while improving productivity and competitiveness. The recommended dual approach brings with it a significant value since it considers economic, financial, social, environmental and cultural issues at stake. It recognizes that mechanization can be provided to smallholders in a number of different ways if both the public and private sectors work together to nurture an attractive environment where the private sector can do business and provide the necessary financial and appropriate training support.