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# Agricultural Machinery ahead of the Field

## From Fixed Asset to Flexible Service

**Rabobank International**

**Food & Agribusiness  
Research and Advisory**

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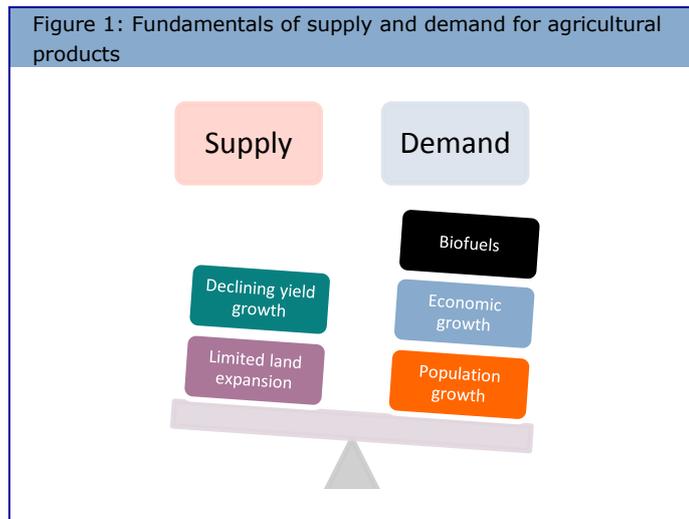
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To increase agricultural productivity, companies in the machinery supply chain need to change their business models. However, diversity among farmers means there is no 'one-size-fits-all' solution for increasing productivity. Likewise, there is no one business model for manufacturing and selling agricultural machinery. Ever larger farms in key markets for agricultural machinery, such as North America, Europe and Australia as well as new frontier regions in South America and the Black Sea region, are increasingly using on-farm management information and working with integrated farming solutions to optimise inputs. Machinery manufacturers can either take a leading role in developing integrated farming solutions—by tapping into the larger market of all farm inputs—or take a secondary role by contributing to integrated farming solutions led by others. Either way, they will need to consolidate further in order to fund R&D and to gain the critical mass to collaborate with other input suppliers. For equipment dealers, machinery sales will change from a one-off sale of a fixed asset to the long term provision of services.

**Introduction**

The fundamentals for the agricultural machinery market are favourable because machinery will play a major role in meeting the challenges in agricultural production that have emerged in the last five years (see Figure 1). Since 2007, agricultural production has had difficulty keeping up with demand for food, feed, fibre and biofuel. Consequently, global agriculture is running at full capacity without sufficient buffer capacity to absorb production setbacks, such as adverse weather conditions. As a result, agri-commodity markets are tighter and more volatile, and are expected to remain so for the coming decade. This is especially the case as population and income growth will result in 70 percent growth in food demand by 2050. This increase in demand will have to be met predominantly by increased productivity.

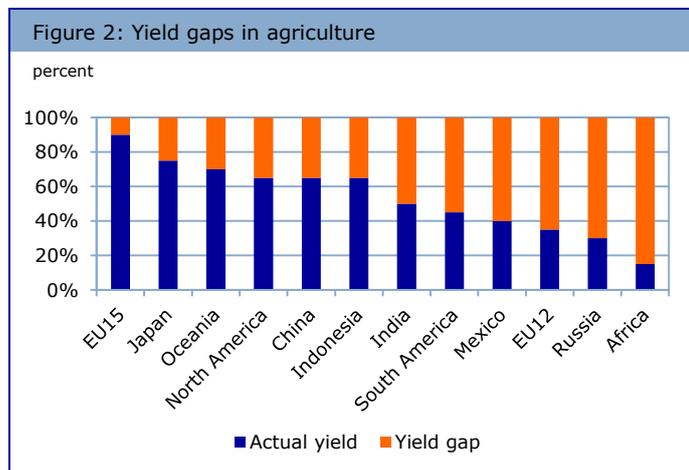


Source: Rabobank, 2012

**No 'one-size-fits-all' solution to increase productivity due to diversity among farmers**

Increasing productivity is complicated by the diversity among farmers. Diversity results from three factors. First, the farming industry is in different stages of development in the different parts of the world. This is illustrated by the range in yield gaps, which is the difference between potential yield under certain local climate and soil conditions and the average yield achieved.

Yield gaps vary from over 80 percent in Africa to between 30 percent and 50 percent in South America and the Black Sea region and between 10 percent and 30 percent in the United States (US), the European Union (EU), Oceania and Japan (see Figure 2). Large yield gaps indicate significant potential to increase yields by adapting best practices from other regions to local conditions. An essential component in best practices is machinery. However, where yield gaps are small, yields can only be increased by pushing the boundary of productivity. This means taking the next step in productivity improvement, which requires simultaneous optimisation of inputs and more sophisticated management information. For example, soil quality, nutrient supply, disease and pest control, and water availability need to be tailored to one another and to circumstances in the field. Weed control, for instance, is no longer only a matter of simply choosing the right herbicides as seed variety, the presence of resistant weeds and the tillage system all need to be taken into account. The Rabobank report *Nature Finds a Way: The Rising Cost of Herbicide Resistant Weeds in the U.S.* (June 2012) states that in the US, glyphosate resistant weeds will require more mechanical weeding.



Source: The World Bank, 2010

A second factor resulting in diversity among farmers is the differences in farm structures in various countries and regions around the world. In South America, the Black Sea region, Australia and the US, average farm sizes are large, with farms with 500 hectares or more accounting for half of the land (see Figure 3). In China, India and Africa, the average farm size is only about one hectare, while the average farm size in the EU is 12.6 hectares. Farm size has implications for machinery purchases and farm operations. For example, on large farms, management and execution of tasks are separated. Thus, large farms require more management information to be processed in order to plan work and optimise agricultural production than small farms.

Share in agricultural land	Very small farms (<2 ha)	Small farms (2-50 ha)	Medium-size farms (50-500 ha)	Large farms (>500 ha)
Ukraine	<1%	3%	10%	87%
US	<1%	7%	26%	68%
Brazil	<1%	12%	31%	56%
EU27	3%	37%	60%	(44% > 100 ha)
India	39%	61%	(5% > 20 ha)	

Source: FAOCENSUS, USDA, Eurostat, 2012

Thirdly, the cost structure of farms varies amongst the different regions due to differences in agronomic practices and is subject to further change. For example in the Black Sea Region, input use is relatively low because of the very low purchasing power of farmers. However, it is increasing with the emergence of large agro complexes with access to capital

markets. Input use in the EU is relatively high because of the reasonably stable farming environment under the Common Agricultural Policy, and because of the relatively predictable rainfall and temperatures, which reduce the risk of crop failure.

In general, input use is increasing around the world, driven by the need to further increase productivity. But although agricultural machinery competes with inputs for farmers' spending power, machinery is needed to apply other inputs and to increase their efficacy.

#### **Implications differ per product/market combination**

The diversity among farmers means differences in the outlook for the various farm machinery product/market combinations. The new frontier regions with the largest farms, such as Brazil, Argentina, Russia and Ukraine, show strong growth in the large farm segment, which is rapidly adopting modern technology to close yield gaps. The main development is the adoption of best practices to catch up with peers in the developed world. To catch up quickly, these large farm operations also need to adopt innovative integrated solutions in seeds, fertilisers and crop protection chemicals. For medium-size farms in these regions, access to finance is a key bottleneck.

The mature markets, such as the US, Europe and Australia, are showing consolidation amongst farmers, resulting in growth in the large farm segment. This segment is the most interesting market for the newest technology that pushes yield boundaries. Affordability may become an issue for the small to medium size farm segment as this group is not able to easily recover the high costs involved in technology investments. As a result, selling to this market segment will require additional focus on cost rationalisation, which may result in further rationalisation of dealership structures.

Asia and Africa, with their small farm structure, are at a relative early stage in adopting modern agricultural machinery. These markets will grow fast as many farmers switch from 'backyard' to commercial farming. However, their machinery needs will differ from larger farms as small farms generally lack the scale required to afford the high tech solutions developed for the larger farms. However, there is a relatively small proportion of large-scale farms in Asia and Africa that provide opportunities for the sale of large-size farm machinery. These farmers will be targeted with an opportunistic selling approach because it will be difficult to establish profitable dealer networks for this relatively small market.

#### **The new market will impact the machinery value chain**

The productivity challenge and rising agri-commodity prices mean that a sustainable increase in productivity is even more urgent. Farmers' quest for productivity-enhancing technologies affects the full farm inputs spectrum. To begin with, fertiliser markets have changed from a buyers' market into a sellers' market. As a result, fertiliser prices are being driven by agri-commodity prices rather than fertiliser production costs. Expenditure on seeds and crop protection chemicals has increased. Finally, sales of most machinery companies have increased significantly as farmers invest in better seeding, application and harvesting technologies. The whole farm inputs complex is shifting gears to contribute to the productivity challenge and also to benefit from the increase in spending power of farmers made possible by the higher agri-commodity prices.

In the traditional agricultural machinery markets such as North America, Europe and Oceania, pushing the boundary is the key theme for the farm machinery value chain. Fast-developing technology provides fertile ground for a new generation of agricultural machinery referred to as precision farming. The mechanics of current machinery have been fine-tuned, and it is now time to make it smart. For instance, soil data, satellite images, water availability data, pest monitoring data and temperature measurements can be combined in expert systems to provide management information for the timing and dosage of tillage, irrigation, pest management and harvesting. Coupling management information with self-steering and/or precision machinery enables tailored and precise execution of on-farm tasks with better results. Farming is becoming more precise, but more interestingly, various inputs are now being optimised simultaneously instead of separately.

The increasing size of farms, availability of new technologies and emerging opportunities to combine machinery and other inputs to further enhance agronomic practices result in demand for integrated farming solutions instead of separate stand-alone machines and inputs. Two examples in the dairy industry illustrate the potential for integrated farming

solutions. Animal feed consisting of supplements, such as compound feed and concentrates combined with hay, can be better tailored to animal requirements with a baler that can measure the nutritional value of each bale of hay. The automatic milking system has created an opportunity to link the milking machine to an integrated cow management system that monitors the cow's health, milk quality, and feed ration, and provides management information for the entire dairy farm operation.

Optimisation of inputs to push the boundary of production escalates the importance of sophisticated management information. Measuring yield down to the square metre will become crucial, and this information will be increasingly linked to soil data and input use for continuous yield improvement. This means that agricultural machinery purchases will be linked to the use of other inputs. For instance, seeds, crop protection chemicals and specialty fertilisers can be combined in a seeder to boost the germination rate and the first growth phases of plants. Farm consolidation will accelerate this development as management and execution of farm work are decoupled on larger farms because these activities are no longer done by the same person. As a result, management and supporting on-farm management information are becoming increasingly important in operational and strategic decision making.

The effect of these developments is that farm machinery manufacturers, and also manufacturers of seeds, fertilisers and crop protection chemicals will gradually change their business models from selling separate products to selling best practices, which combine several products. Furthermore, it will not be possible for all to excel in each product/market combination. This will result in various degrees of specialisation on specific crops or groups of crops.

### **Two options for agricultural machinery manufacturing**

In the key markets for agricultural machinery, such as North America, Europe and Oceania, machinery manufacturers are developing in two directions. One group is taking the lead in developing integrated solutions based on, for example, a full range of tractors and farm implements, including tailored essential inputs such as seed, fertiliser and/or crop protection chemicals from either preferred suppliers or in-house manufacture. Agricultural machinery manufacturers in this group will need to consolidate fast in order to be able to increase R&D expenditure to develop smart machines that work optimally with other tailored inputs, and to achieve the critical mass needed to partner with other suppliers. The rewards for this group can be large because they are tapping into a larger market of farmer spending on all farm inputs, with significant upward margin potential as traditional bulk products such as fertilisers are transferred into a farm-specific solution.

Alternatively, machinery manufacturers can choose to play a secondary role in the integrated solution by specialising and excelling in a smaller product range. Key success factors for these players will be innovation and the ability to develop alliances with suppliers of farm inputs and other machinery manufacturers to become part of an integrated solution led by others. Most machinery manufacturers are expected to fall into this group because they have less knowledge about the interaction of seeds, fertilisers, pesticides, climatic conditions and the role of machinery that, for example, integrated seeds and chemicals players with a stronger research base in these areas would have. Most manufacturers also do not have a full range of, for instance, tractors and farm implements as a starting point for an integrated solution. For example, in sugar cane, new plant genetics and a new chemistry have created the need for new planting technology and enabled mechanised planting.

### **New skills for agricultural machinery manufacturers**

Either way, the role of machinery manufacturers is expanding. For example, manufacturers of hay harvesting machinery are employing nutritionists to increase their understanding of how to make good quality feed. Similar actions can be expected from agricultural machinery manufacturers serving crop farmers. Better understanding of plant development and weed and pest control is crucial to making their machinery smarter. However, new technologies also bring new challenges. Developing software and resolving software problems requires service engineers with a different skill set to that needed for dealing with mechanical problems.

The transition from providing a single machine to providing an integrated service requires agricultural machinery companies to develop alliances with other players in the supply chain. In these alliances, farmers, farm machinery manufacturers and other input suppliers will share on-farm management information and expertise on optimising crop growth and animal rearing. Generating and accessing the right data and having the expertise to use the data effectively will increasingly become success factors.

#### **The future of the machinery market: Open for all or broken up into families?**

It is difficult to predict whether the market for machinery will remain relatively open with standardised technologies. In today's market, interfaces are standardised, which means tractors can be hooked up to any brand of farm implement. Frequently used inputs, such as fertilisers and seeds, also meet standardised characteristics. In this regard, the market can be characterised as open for all and facilitates innovation by both small and large companies. But some new developments suggest this may be changing.

The development of integrated farming solutions, such as the automated milking system, indicate that the agricultural machinery market is set to develop into separate markets, each dominated by a platform or 'family'. Machinery can be easily used with other brands within a family but cannot be linked to machinery and inputs from other families because of mismatching interfaces and/or patent protection, for example. Also, some large tractor manufacturers are no longer allowing their dealers to sell other brands (brand purification), which limits the number of outlets for smaller farm implement manufacturers. These developments entail a more risky environment for smaller companies that need to ensure they have access to a platform or family in order to sell their products and stay in business.

#### **Dealers will have to redefine their contribution to the value chain**

The competitive arena for machinery dealers in traditional agricultural machinery markets is also changing. Consolidation is happening in their supplier and offtaker base and among their competitors. Furthermore, technological development is making agricultural machinery products more complex and interlinked with other inputs. As a result, dealers, especially those in mature markets, are becoming service providers to farmers and are leaving behind the role of a fixed asset sales office.

For example, in the US, dealers are creating precision farming teams to support farmers by handling all available data to optimise yields. Thus, dealers are playing a more comprehensive role than they did traditionally. The dealer provides the farmer with integrated solutions consisting of a wide range of agricultural machinery products, operating tools, consulting services and potentially other inputs needed to enhance agronomic practices.

The best opportunities for dealers to add services are to be found in management information, operational risk management and fine-tuning agronomic processes. As more information is made available to farmers (e.g. water availability and demand, optimal and actual fertiliser and crop protection chemical use, product quality, yields and health status of animals), it will become increasingly difficult to process and use this information to their advantage. The dealer can help the farmer make better use of available information to improve productivity and reduce costs on the farm by providing advice. Dealers can also become data centres that share on-farm management information with other suppliers of farm inputs so products can be better tailored to farmers' needs. Furthermore, sharing information from farmers with offtakers can help reduce costs in other parts of the value chain. Another way dealers can support farmers is to lower the operational risks of farming by offering machinery to farmers as part of an integral service solution at a fixed hourly, weekly or monthly rate.

#### **Market opportunities for traders in used machinery: Export to less mature markets**

Part of the value proposition of the dealer to the farmer and the machinery manufacturer is the trade-in service for used machinery, which may be challenging but also offers opportunities. Traditionally, used machinery could only be sold on the domestic market but cross-border trade is now increasing. However, import barriers and growing competition from locally produced machinery complicates exports to some destinations. Ongoing technological innovation and the increasing role of information technology will accelerate the replacement rate thus increasing the urgency of what to do with used machinery. Market opportunities exist for dealers able to match demand in less mature markets with used

machinery from mature markets. Manufacturers will also have to respond to the growing challenge of used machinery as they will increasingly be held responsible for all they produce from manufacturing to disposal.

### Machinery organisers emerging

A role is emerging for agricultural machinery organisers to liaise between large farms and agricultural machinery manufacturers. Their key competency will be to provide turnkey solutions for the entire farm operation, including all agronomic practices. This business model is already common practice in, for example, the construction of fertiliser plants, where one company is responsible for designing the plant, purchasing machinery, and managing the construction process. The same company can also be hired to fit an existing plant with the latest technology. There is market potential for machinery organisers to provide turnkey solutions to the larger corporate farms as farm operations increase in size (some to over 100,000 hectares), especially in the new frontier regions, such as the Black Sea region, South America and potentially Africa. Companies that already provide agronomic consulting services and related products to large farms are in a position to broaden their product portfolios and become machinery organisers.

### Conclusion

The scarcity and volatility in agri-commodity markets is driving changes in the agricultural machinery value chain. The need to sustainably increase yields is becoming more urgent than ever. There is no 'one-size-fits-all' solution because of the great diversity in farm sizes and farm practices. In the main markets for agricultural machinery, such as North America, Europe and Australia and new frontier regions in South America and the Black Sea region, machinery is becoming an integral part of the all-encompassing solutions to increase productivity. The role of information in operating machinery and on the farm in general, will only increase as more information becomes available for use in enhancing agronomic processes. Agricultural machinery manufacturers need to consider the options of either taking the lead in developing integrated farming solutions that include other inputs such as seeds, fertilisers and/or crop protection chemicals, or developing alliances with others that take this lead role. Either way, they have to consolidate further to develop the critical mass to fund increasing R&D and to become a valuable partner for other input suppliers to develop integrated solutions for farmers. Machinery dealers will have to revise their product offerings and will evolve into service providers, selling farmers a service that is part of an integral solution rather than a stand-alone fixed asset. A part of this service that should not to be underestimated is finding a solution for the growing surplus of used machinery.

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