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Defining and Meeting the Demand for Agricultural Machinery in China: A Case Study of John Deere

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Abstract

This paper examines the experience of a major American-based machinery manufacturer, Deere & Co. in China and how the changing structure of Chinese agriculture and government policy in China toward the machinery supply chain appear to offer evidence of a growing market for farm machinery in China. The findings of this research demonstrate the rapid change occurring in each of these areas as well as the features unique to the Chinese market. Any business that wants to expand into the Chinese agricultural machinery market must carefully consider the dynamics of these issues.

Keywords: China, Machinery markets, John Deere

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Introduction

China's economy has grown rapidly during the past two decades, and there has been a surge in demand for food products at a time when labor is bid away from rural areas into urban centers (National Bureau of Statistics of China 2007b). With fluctuating grain prices and stress on agriculture worldwide, China now subsidizes rather than taxes agriculture as it did in the past so that incentives exist to increase agricultural production (Gale, Lohmar, and Tuan 2005). The need to increase agricultural production will have profound and lasting impacts on the sectors providing inputs to Chinese agriculture. One of these key sectors is the agricultural machinery industry. Currently, there is minimal machinery usage in rural China, but with the movement of labor into more industrialized urban areas, there is an emerging need to replace that labor by farm mechanization (National Bureau of Statistics of China 2007a). China also wants to increase its production efficiency in agriculture; defined as more production per hectare of land.

Mechanization will play a key role in accomplishing this goal. Relatively little is known about the demand for agricultural machinery in China. However, some studies suggest that these factors have made the market for agricultural machinery in China grow rapidly and project that this market will continue at a rapid pace (Metha and Gross 2007). Our approach is to analyze the strategic approach of a large international agricultural machinery manufacturer to address market opportunities in China, especially related to interacting with Chinese agricultural policy.

Our objectives for this research are twofold:

1. Identify and assess Chinese agricultural policy and economic factors and their impact on agricultural machinery markets.
2. Analyze John Deere's business strategy, to identify key elements used in meeting agricultural machinery demand in China.

To accomplish these objectives, we begin with a description of some of the trends and governmental policies affecting the demand for agricultural machinery in China. They point to a convergence of factors that promote continued and increasing investment in agricultural machinery. Next, we present a qualitative case study of a successful multi-national corporation (MNC), Deere & Co., to explore the features of the emerging market for agricultural machinery in China and how demand for agricultural machinery is met. The problem we address is: What is the impact of Chinese agricultural policy on agricultural machinery markets? How does John Deere successfully compete in this market? Challenges within this market are discussed, along with how Deere & Co.'s Chinese operations have dealt with them. Our findings will be helpful to others who want to develop policies and business strategies to enter a challenging emerging market, such as the agricultural machinery market in China. We present our research in the following sections: Background, Procedures, Results, and Conclusions.

Background: Chinese Agricultural Policy and Economic Factors

Only a few research studies have examined how technology has affected agricultural production in China (e.g., Jin et al. 2002; Van den Berg et al. 2007). One reason is because open markets are just emerging within the country and because publicly available data are limited and scarce. However, several factors are converging to positively influence the demand for agricultural

production equipment, including changes in land tenure rights, a shift of labor to urban areas, demand for grain products, increasing farmer income, availability of credit, and government policies, including taxes and subsidies. We begin by characterizing the typical farm in China, and then address each factor in turn.

Typical Chinese Farm

One determinant of the use of agricultural machinery is farm size. Economies of size suggest that machinery will only be used if there is a large enough farm area to spread its cost over the asset's useful life in a cost competitive way. According to the *2006 Chinese Agricultural Yearbook*, the average Chinese farm is 2.08 *mu*[1] per farmer, which is equivalent to 0.34 acres. This is very small in terms of farm size worldwide (Gale, Somwaru, and Diao 2002). Small farm size is due to the dissolution that took place in 1978-84 of the collective system. This is when the household responsibility system (HRS) placed local townships and villages in charge of land allocation to farmers and rural residents (Lohmar, Somwaru, and Wiebe 2002) and established land tenure rights.

Land tenure rights were first established for a 15-year contract period and later extended to a 30-year period. After the expiration of this contract period, rights may be renewed or possibly reallocated by local officials. In 2002, the Rural Land Contracting Law was passed and spells out in more detail how this 30-year land rights tenure is to be protected from political, frequent reallocations by local governments. It also strives to ensure fair compensation to farmers when reallocation does occur. Land tenure rights affect farmers' capital purchasing decisions. As farmers perceive less risk of change in their tenure assignments (or in other words, increased stability), they are more willing to invest in capital goods (Feder et al. 1992).

Shift of Labor to Urban Areas

While average farm size is quite small, demographic changes in China have led to an increase in the amount of land tilled by an individual farmer. In recent years, rural Chinese have been segmented into two groups. One of these groups chooses to move to urban areas to seek employment and higher wages, and rents their allocated land rights to those who want to continue to work as farmers. According to Zhang, Ma, and Xu (2004: p. 1071):[2]

> The Labor-transfer process here is initiated and regulated by the demand for labor in the off-farm sector. This demand-regulated labor transfer creates the subsequent supply-driven dynamics in land rental markets: when the demand in off-farm labour markets increases, more laborers leave agriculture and relinquish their land rights, creating the supply that spurs land rental transactions.

China's land policy has also been liberalized, making it easier for farmers to rent or lease land tenure rights to others. This allows farm sizes to increase, a necessary characteristic for many capital inputs with relatively high fixed costs and economies of size. Thus, farmers grow their rural operations and income by increasing the size of the land they farm when they rent others'

[1] A *mu* is the Chinese unit of land measurement. 15 *mu*=1 hectare or 6.07*mu*=1 acre.
[2] From this point forward, indented paragraphs are extended direct quotes unless otherwise noted.

land. Investing in agricultural machinery becomes more economical as the cost of capital is spread over larger land areas.

Demand for Grain Products

As farms become larger, labor-intensive crops become less practical. Mechanization is not only more affordable but much more productive because land can be "sized" to optimize the efficiency of equipment and other capital and management. Van den Berg and his colleagues (2007) use a county in China's Zhejiang province as a case study in determining impacts of increasing farm size and mechanization on rice production and rural income. They concluded that as farm size increases, rice production with increased mechanization becomes the best way to concurrently increase grain production and rural incomes. Increasing both grain production and rural incomes are two emphasized agricultural policies in China.

Chinese consumers are demanding protein-rich diets more than ever before (Hsu, Chern, and Gale 2002; Pingali 2006). The movement of the Chinese labor force into urbanized areas also has an effect on these dietary trends (Huang and David 1993). As the demand for protein-rich foods such as beef, poultry, and pork increases, the demand for grains used in livestock feed also increases. While it is true that grains for consumer consumption will decrease as protein increases, the efficiency at which livestock convert grain feeds into food is much less than in grain production itself (Fuller, Tuan, and Wailes 2002). This increasing grain requirement will continue to drive the need for increased efficiency in agricultural production to meet that demand.

The Chinese population is not only increasing its meat consumption, but also its dairy product consumption (Chen 2003). In 2000, 8,274,000 tons of milk were produced, and in 2005, 31,934,000 tons of milk were produced showing milk production almost quadrupling in six years (National Bureau of Statistics of China 2007b). Milk production, especially high-yielding production practices, also requires grains as inputs and therefore will continue to increase China's demand for grains.

Farmer Income

Average farmer income is an essential part of agricultural machinery demand. As farmers' incomes increase, their ability to purchase and invest in capital also increases. The average Chinese farmer's income has steadily increased over time and consists not only of on-farm income, but rural household businesses and off-farm remittances. Farmer's per capita income in China has doubled since 2000 to 4,761 yuan ($697) during 2008. This was the sixth consecutive year of an increase greater than 6% (*China Daily* 2009). This more than doubling of farmers' income nationwide makes the possibility of agricultural machinery purchases more feasible for many more Chinese farmers.

Availability of Credit

As credit opportunities are more readily available, capital investments tend to occur at an increased rate. Rural credit channels and availability have developed in many ways over the past

few decades and have just recently undergone major reform. Since the late 1970s, the majority of agricultural loans were obtained from the state-owned Agricultural Bank of China. In 2001, a political push to increase rural credit to small farmers caused the reform of China's Rural Credit Cooperatives. These institutions now provide more than 80% of China's official agricultural credit. Because of these recent reforms, along with changes in agricultural policy initiatives regarding rural credit, lending to farmers more than doubled between 2001 and 2005, (Gale and Collender 2006) see Figure 1.

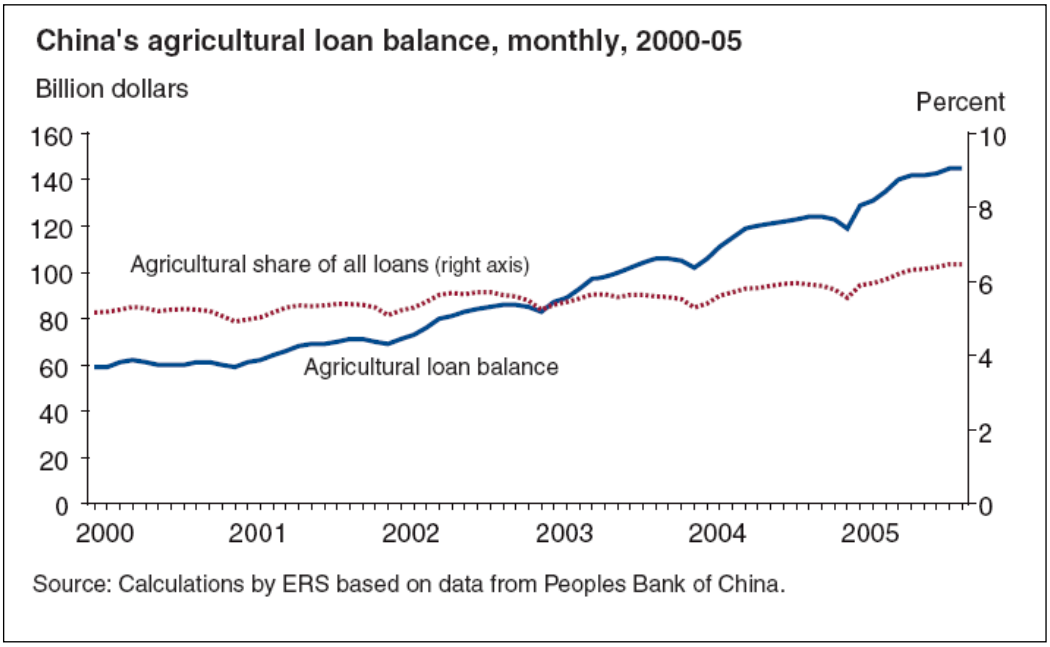

Figure 1. Changes in China's Agricultural Lending

Government Policies, including Taxes and Subsidies

China has deemed food security a priority. This is evidenced through their new agricultural policies where self sufficiency in essential crops is a goal they are moving toward. One food security goal is to ensure that adequate land is preserved for food production use. China has set an arable land minimum level of 120 million hectares (296.5 million acres). Its grain production output goals also help them accomplish their estimated food security needs. In 2006, China's grain production was 500 million tons. China wants to reach and maintain an annual grain output level of 551 million tons until 2010, then to reach 595 million tons by 2020 (*China Daily* 2008). As agricultural productivity becomes a priority, improving agricultural inputs and their availability to farmers becomes a main focus.

Other recent changes in China's agricultural policies include tax elimination and increased subsidies for grain production, high quality seed varieties, and agricultural machinery, as shown in Table 1. China has taxed agriculture for many generations because it has previously been the most wide-spread occupation and the largest tax-revenue generator. However, in 2004 for the first time China implemented agricultural subsidies because, in light of the increasingly industrialized economy, agriculture now contributes roughly only 15% of the nation's gross

domestic product (Gale, Lohmar, and Tuan 2005). Subsidies for agricultural machinery, made available to farmers in 16 provinces in beginning in 2004, make agricultural machinery available at a subsidized price (can compensate for up to 30% of the original price). Dealers collect subsidies from provincial governments (Gale, Lohmar, and Tuan 2005), providing additional assurance that farmers will receive the subsidized price of agricultural machinery and that subsidy investments are being used as intended. Investments have also increased for rural and agricultural infrastructure (i.e., roads, power plants, irrigation, research parks). These policy changes are aimed at increasing agricultural productivity and to encourage farmers to implement more efficient farm practices and agricultural inputs (Gale, Lohmar, and Tuan 2005). The trend toward increased subsidies suggests the Chinese government's increased desire to support and sustain agriculture, ensure food security, and encourage more productive farming methods.

Table 1. Summary of Chinese Agricultural Policies

Policy Estimated Cost[1]	Description	Probable effects
Grain subsidies $1.4 billion	Direct payments of roughly $7.33 per acre planted in grain	Modest income gains for farmers. Effect on grain production is uncertain.
Agricultural tax reduction $5-7 billion	Elimination of agriculture tax within 5 years. Elimination of tax on specialty crops (except for tobacco).	May encourage planting of certain crop varieties
Seed subsidies	Subsidies for high-quality grain and soybean seeds of $7-10 per acre planted.	May encourage planting of certain crop varieties
Machinery subsidies $5 million	Subsidies for purchase of machinery in targeted areas	Increased mechanization but little effect on output. Frees labor for off-farm work.
Rural infrastructure spending $18 billion	Improvement of irrigation facilities, electricity generation, roads, testing, facilities, other rural infrastructure.	Improve productivity and marketing efficiency.

[1]*The Chinese currency is the renminbi(RMB)or yuan. Dollar values throughout this report are calculated using the official exchange rate, currently fixed at RMB 8.28 = US$1. See Shane and Gale for a discussion of Chinese exchange rates.*
Source: Gale, Lohmar, and Tuan 2005: 3.

The Communist Party of China continues to privatize more of its state-controlled industries to reap the benefits of a market economy for its people. It has given more control over key industries to the private business sector while maintaining a portion of the previous state-owned enterprises (SOE) (Shane and Gale 2004). This is seen in agricultural machinery, dairy, and other industries throughout China. Not only does this trend give rise to more efficient markets, it also allows for and encourages foreign direct investment in these industries.

Summary

Attempting to formally characterize the market for farm equipment in China is complicated by a lack of publicly available information that could be used in a model of supply and demand of farm equipment in China. This lack of data and the fact that China has only relatively recently liberalized its market atmosphere to allow outside investment and entrepreneurship in the agricultural and food sectors make it almost impossible to explain the factors affecting the demand for agricultural machinery in China through the use of econometric methods. Instead,

we offer a case study of an American machinery manufacturer to provide a detailed description of the opportunities and challenges related to selling agricultural machinery in China.

Procedures

We conducted a single exploratory case study of John Deere's operations in China (Yin, 1994). The main source of primary data came from interviews with employees of John Deere China Investment Co., Ltd. (JDCI), who has had a presence in China since 1976. A general set of questions was given to company officials, including questions about JDCI's history, background, and other matters eliciting information needed to help prepare for interviews. Responses to the initial set of questions raised additional questions, especially regarding specific details of the organizational workings in China. For example, one initial question was: "How have current Chinese agricultural policies affected John Deere tractors in China?" The response mentioned that farm machinery subsidy policy in China was a major consideration affecting relationships between JDCI and tractor and implement dealers in China. More specific questions about subsidy policies in China were then included in the interview questions. The 11 individuals interviewed at JDCI were those who play a key part in the company's decision and management process, including its president and the Directors of Sales and Customer Support (Marketing), Supply Management, and Manufacturing. Most of the persons interviewed were located at the Beijing corporate office, while others were located at the Tianjin Economic Development Area. The company also facilitated a meeting with one of its independent dealers located in northern Hebei, who asked four of its local farmer customers to participate in this study.

The interviews were held in October, 2008 and were done in person, lasted about one hour, and were conducted in English unless, due to language barriers, Chinese needed to be used. In these cases, the interviewer (first author) or other bilingual individuals helped translate. Interviews were voice-recorded and notes were taken during the interviews. None of the questions directly sought proprietary information.

Each interview was analyzed separately for its main points that focused on how JDCI has met the demand for agricultural machinery in China, how it perceives the market, and its experiences within this market. Slight differences and additions of information to these themes were noted and added to their description in the case study. Not every point of information within a theme was mentioned by multiple individuals. However, the main ideas within a theme usually had multiple individuals who validated them. When a main point was mentioned by only one individual, it was added only if it was believed to be an essential part of understanding the agricultural machinery market in China or of meeting that market's demands. When available and relevant, sources other than the visit to JDCI were also used to add validity to the themes identified. Through the use of multiple sources, data triangulation was achieved. These additional sources included published secondary data and information from national statistical databases, news articles, and organizational publications. Time series statistical data was analyzed for relevant trends that supported or contradicted findings from the JDCI visit. This contributed to a more complete and valid picture and description of these themes.
Some practices were standard throughout the company's world-wide operations, but particular attention was paid to points that were unique to the Chinese market. Once the main points of each interview were identified, multiple interviews were compared to identify common themes. Identifying common themes from multiple sources strengthens the validity of these themes. This

iterative process of comparison and contrast of data (Strauss and Corbin, 1998) allowed us to identify relevant themes and detect any inconsistencies between new intuitions and our data. The process continued with a combination of inductive and deductive analysis until no new relationships emerged.

John Deere in China

The first visit to China by John Deere executives occurred in 1976. This visit was made by former CEO William Hewitt, who headed the U.S.-China Business Council that was then visiting China. Two years later, John Deere was invited by Chinese officials to participate in "Friendship Farms" where John Deere provided some tractors and combines to China.

> In 1982, the Ministry of Agriculture [MOA] and the Ministry of Mining and Engineering Industries approached Deere to enter into five 'Tech Transfer' relationships with Jiamusi and Keifang (combines) plus Shenyang, Tianjin, and Changchun (tractors). Deere saw this as an opportunity to become further entrenched in the market with one or two generation older technology. After ten years (1991), these tech transfer relationships were suspended with only Shenyang and Jiamusi actually having succeeded in adopting more than just Deere cosmetics into their own Soviet rooted designs (JDP).[3]

The first joint venture for John Deere in China was set up in Jiamusi in 1997 which later became a wholly-owned foreign enterprise in 2004 under the name John Deere Jialian Harvester Co. Ltd. Another joint venture, John Deere Tiantuo Co. Ltd., was formed with Tianjin Tractor Manufacturing Co. Ltd. in 2000. This was done in part to increase market share in the smaller horsepower tractors and to gain greater access to the Chinese agricultural machinery market. In 2005, John Deere opened a new transmission factory in the Tianjin Economic Development area named John Deere Tianjin Co. Ltd. The most recent addition to JDCI is the acquisition of Ningbo Benye Tractor Co. Ltd. in August of 2007. Again, this joint venture gave greater capabilities to JDCI in producing low horsepower tractors and increasing market access.

This case study of JDCI focuses on how this U.S.-based company has met the growing demand for agricultural machinery in China. As the study progressed, certain overarching themes were identified which emanated from multiple interviews. Some of these themes were of a general nature, such as standardized practices throughout the global industry. Here, we focus on overarching themes specific to the Chinese market which we examine in detail:

- Intellectual Property Rights (IPR)
- Government Relations
- Legal Environment
- Supplier Relations
- Growth Market/ Market Dynamics

[3] President of John Deere's operations in China.

Intellectual Property Rights (IPR)

IPR issues and concerns in China relating to agricultural machinery have had a long-standing history. These issues relate to the enforcement (or lack of enforcement) of trademark, copyright, patents, and other IPR. JDCI's Legal Counsel told us:

> IPR enforcement [in China] is an issue, but great improvement has been made especially within the last five years. Larger cities such as Beijing, Shanghai, etc. … have better enforcement with judges who understand the new legislation and have some experience with it. Rural areas are a challenge and IPR legal action in these areas is sometimes not worth the cost of litigation (JDLC[4]).

Because of this, JDCI completes a cost-benefit analysis of pursuing litigation on certain IPR issues. Sometimes, if the potential future harm of an IPR violation is large if left unchecked, then even though the immediate financial benefit is low, JDCI will take action. The president of JDCI indicated that on average, about 80% of IPR cases put through litigation proceedings in China are found in favor of the plaintiff (the company holding the IPR). "If companies are willing to actively pursue [IPR], they will be rewarded" (JDP).

Another example of IPR issues was mentioned by the Director of JDCI engineering regarding spare parts and accessories. He stated,

> This is where protection of IPR is important in a place where [the Chinese] are masters of duplication. Service parts can be a big part of your business. Having the protection to avoid duplication of service parts is a challenge. If the part is relatively simple, it is easy for them to make it and sell it at half price (JDE[5]).

Thus, protecting IP before and after market is a priority for JDCI.

As IPR issues continue to be a factor in China, JDCI has taken steps to protect its investments. JDCI exercises caution in how Chinese operations use current John Deere IP. Adjustments to product development processes and procedures have been made to continue to successfully meet the demands of the Chinese agricultural machinery market while protecting the company's IP. "They haven't had to redesign systems but they have had to adopt a 'just what we need' policy: getting agreement on what they need to do their jobs and get access to that and nothing more. In other areas [of the world], if you have access to the system, you have access to everything" (JDE).

Government Relations

Government relations are crucial and must be an effective part of doing business in China. Because China has a centrally-controlled government, new legislation can have a very quick and powerful effect on any business. Local, provincial, and national government levels all have separate ways of affecting industry and business requirements and standards. As a company

[4] John Deere legal counselor in China.
[5] John Deere director of engineering in China.

becomes better at cooperating with these decision-making officials, both the government and business can benefit from more transparent and efficient operations. "The People's Republic of China has had policy changes in November 2007 and March 2008. Government policy changes frequently in China. Therefore, there is a larger 'policy risk' of doing business in China" (JDGRM[6]). A few of the current issues being considered by the Chinese government that JDCI believes are important to its business and the agricultural machinery industry include land reform and food security. One example of how the cultivation of government relations has been beneficial was shared by JDCI's president regarding its harvester factory.

> A harvester company that received John Deere technology in the 1970's friendship farms now has set up a factory right next to John Deere Harvester factory and produces yellow and green machinery called Jiangliao John Deere. They would also stop customers from picking up their John Deere orders or would redirect them to their own factory. Therefore, John Deere petitioned officials to stop the use of the John Deere name or John Deere (who are investing and are the province's largest employer of 1,600 employees at that location) will stop production in that city immediately. Officials complied. To solve the other problems, more government relations are being developed to hopefully have the factory moved to a location other than the John Deere site (JDP).

Because of good communication with government officials, a very important issue to JDCI's business was resolved. Further government relations will also play a key role in this and many other issues of JDCI doing business in China.

> Don't try and tell the Chinese government what to do, help them understand that you have some solutions to their problems. Show them how you can help the Chinese people and improve the current situation (i.e. setting up demonstration farms and showing solutions to the people and government and not just trying to collect the money or sell a product) (JDP).

Legal Environment

China has a centrally-planned economy with a legal environment much different from the United States. New and current legislation changes the way local or foreign-based corporations do business in China. The interpretation and implementation of legislation unique to China also affects what businesses must do to be legally compliant. We focus our discussion on two aspects of the current legal situation that are important to the agricultural machinery industry and JDCI: subsidies and mergers and acquisitions/joint ventures (M&A/JV).

A major legislative action passed in 2004 has changed how the agricultural machinery industry functions in China. This action provided for subsidies by provincial and national governments for farmers' purchase of agricultural machinery. "To sell machinery in China you need to be on the government subsidy list. Regulations are very strict and once applied for; it takes one year to get on the list" (JDP). Government subsidies currently compensate farmers for up to 30% of the purchase price of machinery and so most farmers will not purchase machinery that is not on the subsidy list. In fact, a JDCI dealer said that 98% of tractors sold are subsidized. He continued

[6] John Deere's director of government relations in China.

by saying that a farmer will only purchase a tractor without a subsidy if all of the year's subsidized tractors have already been sold and he does not want to wait a year to buy a subsidized one.

Each province has its own variation on subsidy implementation, which means JDCI must deal with each province's implementation measures. An overview of the current agricultural machinery subsidy process and implementation was provided by JDCI together with additional information from the Organisation for Economic Cooperation and Development (OECD).

> Since 2004, the government has provided a subsidy for the purchase of agricultural machinery … The programme is implemented at the provincial level and it is up to local governments to decide on the machinery and models eligible for the subsidy. The subsidy has been used to target the mechanisation of wheat harvesting and rice planting, but in 2007 trials started to include support for mechanisation of corn harvesting (OECD 2008).

To qualify for the subsidy list, some preliminary evaluations must take place. The list is updated once a year, and if the deadline is missed, there is a one-year delay before the product is placed on the subsidy list. This does not preclude a company from putting machinery on the market, but the machinery will most likely not sell well because the government subsidy is not available. Part of qualifying for the subsidy list is to have each tractor model comply with safety and performance testing such as horsepower, drawbar power, fuel economy, and noise.

> You have to sell 30 tractors before May-June timeframe and then give five tractors to the government to be tested and be evaluated. These 30 tractors are sold at a lower price and then followed and documented to help in the evaluation. By the end of the year, the MOA makes their decision on additions to the subsidy list. They will allow John Deere and others to make minor changes after the approval (JDAPM[7]).

The level of subsidy provided to farmers has been increasing every year since subsidies were implemented (Figure 2). This trend indicates that increasing investment in agricultural machinery is a high priority for the Chinese government, and further changes in subsidy legislation and implementation will continue to greatly affect the agricultural machinery industry.[8]

Additional evidence that government subsidies are changing the Chinese farmer's purchasing decisions and increasing the demand for agricultural machinery in China is obtained from interviews with the farmers.

> CF1[9] Farms 300 mu. which is rented, owns 30 mu., and does service contracting on 600-700 mu. This is his 2nd year of farming with his current tractor which is an 80 hp John Deere tractor bought in Oct, 2007. He previously has owned a 10 hp tractor purchased in 1988.

[7] John Deere's Apollo tractor program manager.
[8] This also supports the projections of Mehta and Gross (2007). That is, increased subsidies would be expected to lead to increased growth rates in the demand for agricultural machinery.
[9] CF1 – CF4 indicates separate interviews with four separate farmers. Descriptions of farm and farmer's use of tractors are summaries of information provided by the individual farmers themselves but are not direct quotes.

CF2 Contracts 400 mu and owns 200 mu. This is his 1st year farming (2008) with his two new 82 hp John Deere tractors. He previously purchased in 1990 a small 15hp tractor.

CF3 Contracts 300 mu and owns 10 mu. 2008 is his first year farming with his new 82 hp John Deere tractor. He previously purchased in 1987 a 55 hp Tiantuo tractor and a small 12 hp tractor.

CF4 Contracts 400 mu and does not farm any of his own. This is his first year farming with his new 82 hp John Deere tractor. He previously purchased in the 1980's, two small 12 hp tractors.

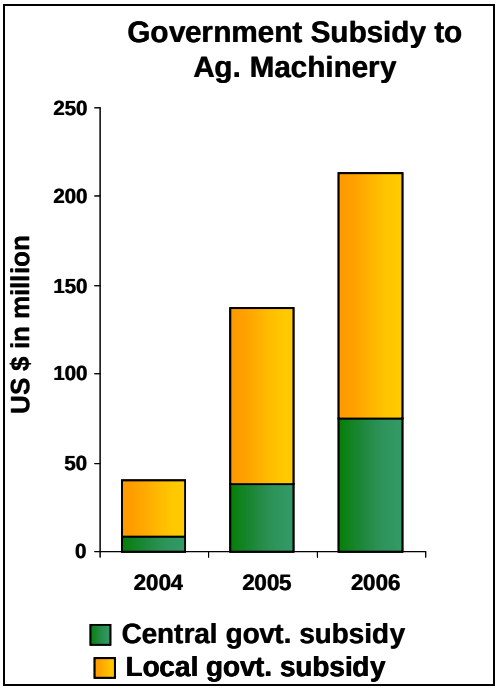

Figure 2. Chinese Government Subsidy Levels
Source: JDCI

All of these farmers purchased their first tractors in the 1980s and only recently decided to purchase larger and newer equipment because of the subsidies. Increasing farmer income is also a factor, but these farmers indicated that government subsidies sped up their decision to buy farm equipment.

Setting up new businesses and the location of businesses are also regulated to a degree by the Chinese government. When companies wish to grow through M&A, the Chinese government must first approve the action. This also occurs in the United States under certain circumstances when very large companies are involved in an M&A action, especially when anti-trust issues or national security issues are involved. But in China, government approval is always a factor, especially when a large number of competitors are state-owned enterprises (SOEs).

Recently, JDCI acquired a privately owned Chinese competitor, Ningbo Benye. This was done to increase market share and to enhance low-hp tractor production. Government response to this acquisition was positive.

> The Government was very supportive of John Deere. John Deere has history with the Chinese government through technology transfers and friendship farms. Within the 30 years of the Chinese opening [of John Deere], many companies have come and gone, but John Deere has stuck with it. The government has been very supportive of John Deere because they know they are trying to help the Chinese farmers and the Chinese people (JDP).

However, not every joint-venture or acquisition is always approved nor is this always a smooth process through the Chinese government. JDCI shared their insight as to the reasons why some companies have been more successful than others in penetrating the market and growing their operations in China through M&A and JVs.

> The government's viewpoint of FDI [foreign direct investment] has changed over time. When John Deere has created JVs, other FDIs 10 years ago, China really needed FDI. Today they are becoming more of an equal across the globe and they have tightened the clamps on who they will allow to invest in China. The U.S. does the same thing when FDI occurs in industries they believe are critical to national securities. When China's CNOOC (China National Offshore Oil Company) wanted to [purchase Unocal], the U.S. believed it was not in the interest of national security. China's construction industry is very protected and nothing higher than a 50/50 JV will currently be allowed to occur (JDP).

As China continues to address its many legal issues and to pass legislation in accomplishing government goals, businesses need to understand how China's dynamic legal system will affect their operations and the market in which they work. In the agricultural machinery market, government subsidies are a driving factor. Regulation of how a foreign company can grow is also very important to consider in successfully meeting demand for agricultural machinery in China. Establishment of a new factory or facility is also regulated to an extent. These issues of the Chinese legal environment are not all that exist in the agricultural machinery industry but they are some of the main legal challenges and differences of doing business in China that JDCI has dealt with and learned from.

Supplier Relations

One of China's competitive advantages is labor-intensive goods because the cost of labor is low compared to developed countries. This is a primary reason why JDCI has about 90% of its suppliers from China. One feature of the supplier market is that competition is fierce because more than one industry competes for the same suppliers. "In China, the view regarding suppliers is that they pick you, not that you pick them" (JDSCM[10]). JDCI's volume of business with suppliers is low compared to other customers such as those in the automotive industry so they must "rely on their core values, respect for the supplier, and their reputation, and longevity as a

[10] John Deere's director of supply management, strategic sourcing, and supplier development in China.

company. They also want to nurture and develop their suppliers and the relationships with them" (JDSCM).

JDCI wants to help develop their suppliers to facilitate and protect JDCI quality while saving both JDCI and the supplier time and money. They have instituted a Standardized Work and Pre-production Approval Process (PPAP) to help suppliers with their production processes. JDCI also uses incentive programs to develop their Chinese suppliers.

> Incentive programs are used but they are not monetary incentives. John Deere will offer training, management tools, assessments, recommendations, and other supplier development methods (lean training, technical professionals, etc…) as an incentive to suppliers to become better and more efficient. This usually turns out to be a win-win situation as suppliers save costs, increase efficiency, consistency, quality, etc. … and John Deere benefits from a more standardized product or process and less problem solving efforts are needed (JDSCM).

SOEs are a major factor in the Chinese supplier base. Since they are government-policy driven and do not have to make a profit, additional challenges occur with these types of suppliers.

> SOE's have a very underdeveloped management system so when you do business with those kinds of companies, you have to follow every problem from start to finish. Sometimes they give you a low price to get your business. Afterwards, when production starts, they will ask for a price increase and you may not have as much flexibility in dealing with the situation … If using an SOE for a very critical part of a product, you need to have a backup supplier planned in advance in case things go wrong, to insure your product can still be produced on time. Sometimes if an SOE has problems, John Deere's alternative suppliers are not interested because of the volume John Deere uses (JDTPM[11]).

Chinese suppliers are not as developed as JDCI's suppliers in traditional markets and as a result, need additional and more frequent attention. Language, business culture, and many other factors unique to China are important in Chinese supplier relationships. SOE suppliers can bring additional challenges in dealing with supplier problems, pricing, timing, and other issues that are important to being successful in doing business in China. Selecting and working with reliable suppliers and facilitating their development have assisted JDCI to meet cost, quality, and timing goals in bringing to market agricultural machinery.

Growth Market

Because many companies are racing to capture a part of the emerging Chinese market, it has created a very fast-paced business environment. The annual GDP growth rate in the United States only takes about three months to be achieved in China (Green 2007). Tractors and other forms of agricultural machinery are relatively new to the Chinese farmer, but the market is also growing rapidly and the number of firms selling tractors in China is increasing. JDCI's business strategy in China has adapted to the fast-growing agricultural machinery market.

[11] John Deere's GT5 transmission program manager in China.

> Because John Deere usually takes four to five years to develop a new product and have it ready for the market, they have decided to use other entry strategies, such as acquiring Benye, to enter the small tractor market quickly and in only one year. If they cannot keep up with the speed of their competitors introducing new product into the market, they will lose out on market share (JDBPD[12]).

Part of responding to this growing market is to develop products unique to China's agricultural processes. "Seeders, tillage equipment, roto-tillers, rice transplanters and others are being developed especially to help develop product lines to allow more exclusive dealer arrangements" (JDP).

Quantifying this growth is challenging due to limited public data and the speed of change occurring in China. But there are a few studies suggesting that China is a rapidly growing market for agricultural machinery and that most major agricultural equipment manufacturers are operating in China. For example, a market study completed by the Freedonia Group in 2006 projects rapid growth of the Chinese agricultural machinery market until 2010 (Table 2).[13]

Table 2. China Agricultural Equipment and Supply, 2000-2010 (Million Dollars)

				% Annual Growth	
Item	**2000**	**2005**	**2010**	**05/00**	**10/05**
Pop. (millions)	1,269	1,311	1,351	0.7	0.6
$GDP/Capita	4,260	6,450	9,250	-	-
Gross Domestic Product (bil $2000)	5,403	8,450	12,500	9.6	8.1
% agriculture	14.8	11.2	8.5	-	-
Agricultural Output (bil $2000)	801.0	949.0	1,063.0	3.5	2.3
$ equipment/$000 ag output	7.1	12.1	18.2	-	-
Agricultural Equipment Demand	5,650	11,510	19,390	15.3	11.0
Farm Tractors	1,585	3,250	5,470	15.1	11.0
Harvesting Machinery	930	2,060	3,470	17.2	11.0
Planting & Fertilizing Machinery	485	970	1,630	14.9	10.9
Haying Machinery	240	570	970	18.9	11.2
Plowing & Cultivating Machinery	485	1,000	1,690	15.6	11.1
Other Agricultural Equipment	1,210	2,085	3,510	11.5	11.0
Parts & Attachments	715	1,575	2,650	17.1	11.0
Net Exports	-650	-700	-790	-	-
Agricultural Equipment Shipments	5,000	10,810	18,600	16.7	11.5

Source: Taken from Mehta and Gross (2007)

The Freedonia study also mentions that China is now the second largest agricultural machinery producer (Mehta and Gross 2007). China's rapidly growing demand for agricultural equipment can be considered a unique case for a developing country because the developing world is typically where obtaining investment for agricultural machinery is the most difficult. Addressing

[12] John Deere's manager for business planning and development in China.

[13] The Freedonia Group study projected that agricultural equipment demand in China would grow by 11% per year between 2005 and 2010.

the market for agricultural machinery in China is critical for agricultural machinery manufacturers wishing to grow their sales because markets in most other parts of the developing world are growing at a much slower rate than China (Mehta and Gross 2007). The strategies John Deere has pursued in China are potentially helpful in understanding the conditions and procedures that might help overcome some of the problems associated with lack of capital on the part of farmers in the developing world who want to invest in farm machinery.

Another characteristic of China's economy is the relatively small level of investment needed to enter the Chinese market. The agricultural machinery market in China is composed of MNCs and many local companies, including privately owned corporations and government SOEs. Figure 3 shows the market share for the main competitors in the Chinese market. Because JDCI acquired Ningbo Benye in August 2007, they are transitioning the Benye brand to the John Deere brand. This increased their market share dramatically. When combining JDCI's and Benye's tractor market percentages, JDCI's total market share is 19%, or the #3 Chinese tractor market leader.

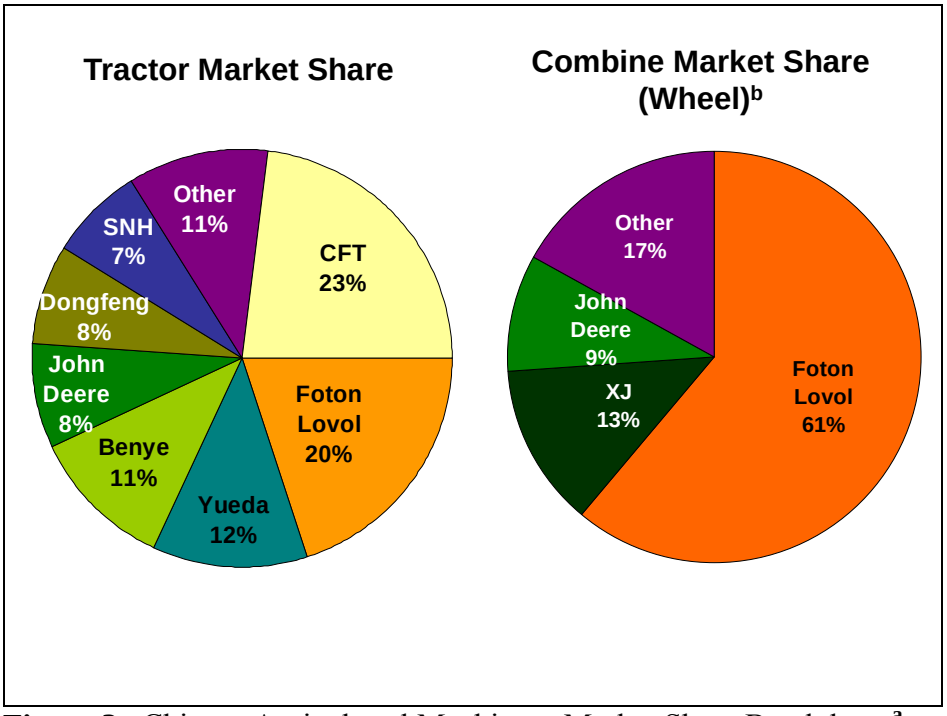

Figure 3. Chinese Agricultural Machinery Market Share Breakdown[a]

[a] See Table 3 for definition of acronyms.

[b] "Wheel" refers to combines with tires as opposed to combines with tracks which are used in wet conditions.

Source: JDCI 2008

Comparing the characteristics of the leading market competitors seen in Figure 3 provides some insight into the major companies in the Chinese agricultural machinery market. Each company has unique qualities which allow different business strategies to be implemented. A summary of these competitor characteristics is illustrated in Table 3.

One main difference among the companies is whether they are privately- or publicly- owned. SOEs have capital readily accessible to grow and manage business operations and, at least in the short-run, may not be required to make a profit. This gives SOEs at least a short-run competitive advantage over private enterprises. However, foreign partners entering the Chinese machinery market with advanced technology have the advantage of competing with superior products compared to SOEs. But, the foreign companies lack distribution systems in China.

Table 3. Comparison of Major Chinese Agricultural Machinery Competitors

Chinese Competitors[a]	Year Est.	Horsepower	Ownership Type	Parent Companies
China First Tractor (CFT)	1955	17-188	SOE[b]	
Foton Lovol	1998	20-265	SOE/some private	Beiqi Foton Motor Co.
Mahindra/Yueda[c]	2009	16-125	JV Mahindra 51% SOE 49%	
Dongfeng	1952	6-90	Formerly SOE, now private	
Shanghai New Holland (SNH)[c]	2001	<100	JV CNH 60% SOE 40%	Fiat/HASCO
Zhongshou (XJ)	1997	55-160	SOE	SINOMACH
John Deere/Benye[c]	2007	20-50[d]	Acquisition of a private company	Deere & Co.

[a] Acronyms provided for selected company names to match information in Table 3 to information in Figure 3.
[b] SOE = state-owned enterprise; JV = joint venture; CNH = Case New Holland (official name of the company is CNH though).
[c] Indicates at least partial foreign ownership.
[d] Only 20-50 horsepower tractors are manufactured at the John Deere/Benye facility. John Deere manufactures 80 horsepower tractors in other facilities in China besides John Deere/Benye and imports tractors that are over 80 hp.

One main difference among the companies is whether they are privately- or publicly- owned. SOEs have capital readily accessible to grow and manage business operations and, at least in the short-run, may not be required to make a profit. This gives SOEs at least a short-run competitive advantage over private enterprises. However, foreign partners entering the Chinese machinery market with advanced technology have the advantage of competing with superior products compared to SOEs. But, the foreign companies lack distribution systems in China.

Consequently, all major foreign companies have partnered with local Chinese companies to gain access to market distribution. Part of this market access is tied to the horsepower range of products. This affects partnership choices because horsepower determines the market segment (large state farms compared to smaller individually-operated farms). For example, Shanghai New Holland has completed two JVs in China, one with a smaller horsepower SOE and the other with a larger (>100hp) horsepower producer, specifically to gain distribution to both large and small producer market segments. John Deere has done the same (a JV and an acquisition) and Mahindra (one JV with Yueda which has access to both market segments).

China First Tractor is a SOE that has been in the market since the mid 1950s with a high level of engineering capability and is the largest agricultural machinery-producing SOE in China. This allows large capital access for operation and improvement of production capabilities.

Dongfeng produces smaller horsepower tractors and has a smaller operation compared to other producers in China. Being established as a SOE, they have reaped the benefits of the distribution network the Chinese government had allocated. They now are privately owned and operated by local investors.

Foton Lovol is a recent addition to the market even though their parent company is a SOE that has been in operation for over 50 years. A unique point of this competitor is the private/SOE mix that places increased autonomy and, consequently, added market agility to its operation. They have quickly grown to be the second largest producer of tractors and the largest producer of combines in China.

To compete against other companies, JDCI has continued to offer higher quality products and to build its reputation in China with the long-term market in mind. John Deere's first-mover strategy in China has given it long-term experience and time to develop the necessary infrastructure and marketing networks to do business successfully. More recent MNC additions to the Chinese market are in the process of developing these business components. "Having a presence in China is an advantage and the competition is just getting here. Therefore, they need to establish everything that John Deere is already using such as a dealer network" (JDP).

Market Dynamics

Common market segments for agricultural machinery in China are comprised of state farms, large land contractors, and private service contractors. The large majority of JDCI's current customers are in the service contractor segment. This makes sense due to the number of service contractors in China. Most Chinese farmers do not have large farms and there are a limited number of state farms, compared with the number of private Chinese farms. Even though there are many farmers without agricultural machinery, they are willing to pay a small fee to service contractors to plow, plant, till, and harvest their small farming acres. These service contractors are investment payback driven and are very price sensitive. "Customers are not very loyal. For a tractor, they will change brands for only 100 RMB [Chinese Yuan]" (JDM[14]).

To effectively meet Chinese demand for agricultural machinery, JDCI has made some adjustments to its marketing processes. For example, when setting prices, it has learned that dealers sometimes offer customers a price that discounts the entire margin. The company must tell dealers that the retail price is the minimum price for a product. Market forecasting in China is difficult because of frequent changes in government policies.

> In general, the government efforts and investment in boosting grain production and building a harmonious society keep the demand for agricultural machinery high; driving demand towards larger hp tractors but it destroys the normal market rhythm and normal seasonality of sales, making forecast almost impossible (JDP).

Advertising has also been adapted for local conditions. Some of John Deere's standard publications have been tailored for China. One of the company's magazines is targeted toward dealers and government officials while another is targeted to generate new customers. The most

[14] John Deere's director of sales and customer support in China.

effective forms of advertising include demonstrations and county fairs where Chinese farmers can see how agricultural machinery works. As many have never owned machinery, hands-on demonstrations explain better than words the benefits to the farmers. Another reason for advertising through demonstrations is, regardless of literacy challenges, the farmers will still understand what JDCI's products are. One literacy challenge is recognition of the John Deere logo. "It has the words 'John Deere' under the leaping deer, which customers cannot read. JDCI has looked into creating a logo with Chinese characters instead of the company's English name" (JDM). However, most of JDCI's target market has adequate literacy rates. "Most of the rural residents who are illiterate would not be able to afford a John Deere tractor in the first place. Most of their target market has at least a high school education" (JDM).

Limitations, Implications, and Conclusions

The demand for agricultural machinery in China continues to increase. It is a rapidly changing and dynamic environment that has been greatly affected by China's centrally controlled government. Through the case study of JDCI, we identify specific issues that multinational companies should consider if they want to become successful players in the Chinese agricultural machinery market. Government policies and practices surrounding IPR, government relations, the legal environment, supplier relations, and managing a growth market in a developing nation are key components of the unique aspects of conducting business in China. The experience of JDCI provides guidance to other organizations that want to better understand how the agricultural machinery market operates in China.

Limitations

Because of the time and resource limitations to this research, only one MNC was studied. A multiple-case study of several MNCs in the Chinese agricultural machinery industry would bring additional insight into how businesses have successfully met Chinese agricultural machinery demand. If multiple MNCs have dealt with the same challenges in the Chinese market that this research has identified, then increased validity and generalizability would result. Gathering large amounts of primary data by surveying Chinese farmers and their reasons for purchasing agricultural machinery and their general situation in the agricultural industry would have been helpful in studying this topic. These data could have been analyzed to discover the weight of each factor in the average Chinese farmer's decision to purchase agricultural machinery. Since climate, policies, and the agricultural industry vary by location, these surveys could be done in multiple provinces to obtain an even more accurate observation of the Chinese agricultural machinery market.

A challenge to this study is the method that JDCI uses in measuring success in the Chinese market. Most companies measure their sales and return on investment; JDCI does the same. However, when asked regarding this information, JDCI chose not to make this available. However, a proxy measure of success might be given by the longevity of John Deere's operations in China. JDCI is also expanding through construction and acquisition of new local competitors. This would not be occurring unless profits and sales are increasing. This is supported by John Deere's 2007, 2008, and 2009 Annual reports which indicate that sales are

growing much more rapidly outside of the U. S. and Canada than inside the U. S. and Canada. The 2007 report states that sales in emerging markets, including China, nearly doubled.[15]

Implications

The themes emerging from the study of John Deere in China give some insights into this agricultural machinery market in China. One must ask: What can other companies learn and apply from the John Deere experience? Even though John Deere is only one example of how a company has successfully competed in China's market, the lessons of John Deere are relevant for any company wanting to compete in this market. Above all, JDCI has had a long-term view of the potential of the Chinese agricultural equipment market. They have exhibited patience, perseverance, and a willingness to learn how to operate in this market, not only based on their own perceptions, but also using the experience of their Chinese partners. Without question, this long-term strategy requires substantial up-front investments that may not be possible for all companies. It also demonstrates buy-in by investors and management from the very beginning of the decision to invest in China.

JDCI can be seen as paving the way for other foreign MNCs to enter China. This can be seen in comparing the similar strategies to JDCI that other competitors such as Mahindra and CNH have used in JVs with local Chinese competitors. JDCI has provided a service to later-entering firms in the focus it has placed on encouraging favorable legislation which allow the agricultural machinery market to grow and Chinese agriculture to become more efficient. As JDCI has invested in these efforts, the entire market has benefited, especially foreign MNCs.

Significant policy and legal issues remain though, and if the Chinese government will address these issues, especially related to IPR, the entire market would benefit. Today's farm equipment relies on sophisticated computer systems that provide increased functionality and improve performance (Mehta and Gross 2007). Because JDCI sells a tangible good, the product can be reverse-engineered once introduced to the market. This prevents the latest and best technology from coming directly into the Chinese market. Concerns relating to IPR also make it necessary for JDCI to develop key control points where the release of technology, even internally, is controlled. Better enforcement of IPR would help eliminate these inefficiencies.

Our data point to the critical importance of managing supplier relations and the supply chain, which supports the findings of other researchers (Mehta and Gross 2007). More specifically, however, we describe how MNCs must integrate supply chain management practices with constraints imposed by government policies. Concurrently, companies must try to amend those policies that are detrimental to efficient operations. JDCI has implemented something similar to a U. S. lobbying model in China. JDCI's lobbying effort focus not just on farm equipment issues, but agricultural policy more broadly. For example, government subsidies for tractor purchases have been a critical element of equipment manufacturer success in China. Future

[15] While this does not directly measure profitability, accelerating sales imply profitability especially when investments by John Deere continue to expand in China. See http://www.deere.com/en_US/ir/media/pdf/financialdata/reports/2010/2009annualreport.pdf, http://www.deere.com/en_US/ir/media/pdf/financialdata/reports/2009/2008annualreport.pdf, and http://www.deere.com/en_US/ir/media/pdf/financialdata/reports/2008/2007annualreport.pdf

strategies must consider how profitability can be maintained without subsidies. Providing financing to customers is one way (Mehta and Gross 2007). Relaxing land tenure regulations that support increases in the block–size of land that one farmer or a group of associated farmers can farm is another. This also supports the notion that MNCs must be involved in trying to influence Chinese land policy.

To compete in a dynamic and quickly growing Chinese market, access to the market is a key component of being successful. Building from scratch is difficult in a country that is learning how to utilize markets, and growth can be greatly accelerated with a locally established network. This suggests that M&A/JV with a company having a dealership network is essential. CNH stated when completing their Shanghai New Holland JV: "Shanghai New Holland will have the benefit of the New Holland brand's depth of technology and broad distribution as well as Shanghai Tractor's distribution channels and excellent reputation" (Walsh 2001). This statement exemplifies the principle of foreign partners bringing technology to China as local companies open their market access to these MNCs. This is very essential in the Chinese agricultural machinery market.

One would usually consider that functioning in a command economy would suggest that risks are high and that a company would be forced to focus on short-term high profits to compensate for the level of risk. JDCI believes that the potential payoffs in China justify long-term investments. The company believes it can deliver a long-term relationship in China because of the technology and management it brings to the table. However, they have needed to closely manage both of these resources in China especially because of IPR issues.

Conclusion

The demand for agricultural machinery in China is growing. Much of this growth is driven by the Chinese government and its desire to increase rural incomes and agricultural efficiency. The Chinese government also pursues these objectives as a way to increase political stability and national food security. There are many peripheral issues about the agricultural machinery market in China such as IPR, legal environment, and supplier relations that will continue to evolve. The findings of this research demonstrate the rapid change occurring in each of these areas as well as the features unique to the Chinese market. Any business that wants to expand into the Chinese agricultural machinery market must carefully consider the dynamics of these issues. Companies can also learn how to better adapt to these issues in China by understanding how JDCI has dealt with them. For example, as companies become actively involved in shaping government understanding of an industry, the results can be very beneficial to doing business in China and to the Chinese people. The composition of the Chinese agricultural machinery market is changing as companies grow through JVs and M&A. This can be seen in JDCI and other MNC's business expansion in China. Market players are racing to meet the demands of the Chinese farmers as the market continues to expand. However, if government priorities change, this market could quickly decelerate.

This research also has implications for Chinese agricultural machinery dealers because it provides them with a broader picture of what is occurring throughout China. Even though this research focuses on the Chinese agricultural machinery market, many of the challenges of

meeting market demands that have been identified will be similar to those found in other centrally controlled countries. However, future research must be done in these economies to determine the relevance of these findings to agricultural machinery markets in other nations.

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