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International Lessons on Financing Agricultural Modernization

Final Report

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1. Background of Research

1.1. Challenges facing China's agricultural finance

The following challenges are identified to be most significant for agricultural finance in China.

- 1) Inadequate supply of credit. One of the biggest limitations of financing agricultural modernization and development in China, is the inability of credit services to meet consumer demand. The loan products supplied by commercial financial institutions are usually characterized by high entrance standards, complex requirements, and complicated application procedures. Most loan products have very short terms, low credit lines, and inflexible payment schedules. These limitations make them unsuitable for agriculture, which is characterized by long earning cycles and large upfront costs. They could not meet the sector's demands of working capital.
- 2) Lack of collaterals. Farmers' biggest difficulty associated with getting loans is their lack of collaterals. Many barriers exist to banks acceptance of land management rights, machinery and equipment, and expected return of agricultural products as collaterals for loan approval. With regards to taking rural land management rights as collateral, the obstacles include: the property rights of farmers' homestead and contracting land are not recognized and lack legal validity; many limitations are imposed on the disposal and realization of these land assets; timely transfer of contracting and management rights by financial institutions is very difficult because of the absence of a unified, open-access market for land transfer, and this has made it very difficult for banks to recover losses from defaults. Meanwhile, the variety of agricultural insurance and compensation caps are very limited, and the risks of land management rights transfers are very hard to control; hence financial institutions face risks of large losses. In addition, the procedure for collateral registration is very complex, and guarantee fees and loan products are too expensive for farmers. Innovative mechanisms and supporting policies are urgently needed in order to fully utilize the financing function of land rights, which are farmers' most important assets.
- 3) Imperfect guarantee mechanism. In addition to the lack of collaterals, the imperfect design of guarantee mechanisms is another major problem for agricultural finance. Private guarantee institutions on the market usually are small in scale and have limited capacity. Some innovations have occurred in the public sector, but they are still at a preliminary stage.
- 4) Underdeveloped agricultural insurance. Since the Chinese government's call for the piloting and establishment of a policy-based agricultural insurance system in 2003, significant progress has been made. Yet there is still considerable potential for the further development of agricultural insurance in China. Major problems include: lack of legislation for agricultural insurance, imperfect operating system, inadequate risk diversification and management, deficient designs, lack of innovation of insurance products, etc. Furthermore, in addition to crop insurance, other types of agricultural insurance, including index insurance, price insurance, and income insurance, also need consistent promotion policies. Disaster insurance

has much potential for development as well.

- 5) Insufficient input for infrastructure. Construction of rural infrastructure not only consists of productive facilities such as irrigation and water conservation, farmland roads, and land consolidation, but also includes operational facilities such cold storages, warehouses, and wholesale markets. These public goods need extensive input support from the government.
- 6) Insufficient supply of financial resources and outflow of rural funds. Both commercial banks and policy banks have very limited supply of funds for agricultural finance. Rural credit cooperatives and Postal Savings Bank of China (PSBC) are the major financial institutions in rural areas. Most PSBC branches provide only basic services such as deposits, remittances, and settlements, and hardly any credit services that target farm households. Rural credit cooperatives are small in scale and have limited functions. Commercial banks in the rural market focus on collecting deposits rather than granting loans. Most financial resources are utilized for industrial and urban development. The allocation of funds is seriously unbalanced between rural and urban areas.
- 7) Limited functionality of rural credit cooperatives. In rural areas, except for some small guaranteed loans, most loan approval rights are concentrated in the township and city level branches. The loan amounts issued by local units continue to diminish. Although credit cooperatives achieve wide coverage in rural areas, their performance falls short of its potential. Many farmers complain about the complex procedure for loan applications, unfairness of credit rating, and high interest rates. Rural credit cooperatives are not adequately facilitating cooperation, effort concentration, and better resource allocation.
- 8) Value chain finance at a preliminary stage. There have been a number of successful experiments with agricultural value chain finance in some provinces and regions in China in recent years. But most have been relatively small in scale and fairly unsustainability. Value chain finance has great potential to promote the production of value-added agricultural products and increase farmers' access to credit. It deserves more participation and promotion.
- 9) Policy-based financial services are not effective. The Agricultural Development Bank of China (ADBC) is the only policy bank targeting agriculture in China. But its functions are limited to the management of funds for procuring grains, cotton, oilseeds, and for credit services used for circulating state-owned grains, cotton, and oil products. It has not assumed responsibility for undertaking preferential policy guidance for improving farmers' access to credits.

1.2. Financial Support for Modern Agriculture

Modern agriculture is characterized by intensive production, scaled operation, and concentration of capital investment. Due to its advanced forms of production, expansion of scale, and increased labor costs, modern agriculture demands large investments to support production. Meanwhile, new operation entities nurtured in the agricultural modernization process, including professional farmers' cooperatives, family farms, etc., call for innovative financial services and products that can meet the

needs of different production entities in various fields. With regards to the establishment and effectiveness of agricultural financial operation units, a sound institutional system and well-rounded operation monitoring mechanisms are urgently needed. Proactive guidance and strong policy support for certain regulatory issues, such as rural land transfer and rights validation, collaterals recognition and innovation, government and private institution guarantee mechanisms, etc., are also crucial for the development of agricultural modernization and finance. A unified design and planning process is also needed for the construction of the rural credit system. In summary, in order to support agricultural modernization through financial instruments, modern finance needs to be combined with modern agricultural operation; and special attention must be paid to this connection and the supporting measures for modern agriculture and finance.

1.3. Lessons from International Experience

There are a number of valuable lessons to learn from developed countries with regards to the above aspects of agricultural modernization and financial support. For example, many agencies under the U.S. Department of Agriculture offer financial guidance. Their first mission is to regulate the market and ensure orderly operations with a sound institutional system and comprehensive legislations. They try to fully motivate the private sector, provide reasonable incentives, and ensure sound monitoring. Their second mission is to cover areas that the private sector finds too costly to enter, including the provision of credit and guarantees for marginal farm households, investment in infrastructure, etc. The practice of setting up divisions specialized in agricultural finance is conducive to long-term and consistent policy and monetary incentives, and ensures the guidance of the agricultural finance market. Government support for agricultural finance and public-private partnership in Canada also offer helpful experience for China. In countries such as the Netherlands and Japan, the establishment of government guarantee funds, government investment for infrastructure, the development of unified agricultural value chains, the promotion of disaster insurance etc., also provide inspirations for China's agricultural finance development. We not only studied their current models, but also considered the historical dimension of the development of their modern agriculture. We investigated the difficulties these countries faced in the past and the various ways for overcoming them. We paid attention to the positive and negative impacts of these measures, especially with regards to China's realities on the ground. These could inform efforts at overcoming the challenges facing China today (DRC, 2012).

While identifying a number of good practices and lessons to learn from developed countries, we recognize that China has some unique conditions that complicate efforts at likening its experience with that of developed countries. The differences in natural endowments, stages of development, and institutional structures, limit the applicability of international experience to China. For example, the modern agriculture demonstration area, which is promoted through administrative institutions in China, is unique. The clustering of agricultural production in North America and technology demonstration farms in Japan are both different models. With regards to loan collaterals, the land registration process developed very early in developed countries and they have a long history of privatization making cases applicable to China relatively hard to find. Another example involves value chain development where developed countries and developing countries have different goals in

promoting value chain financing. In developed countries, value chain financing is aimed at deep processing and value addition for agricultural products; while in developing countries, it is designed to alleviate the lack of collateral and facilitate credit approval and loan monitoring.

Bearing these considerations in mind, and in order to target the current situation of agricultural development in China, we realize that it is useful to expand our horizon of learning and sharing international lessons. Cases from some developing countries are of great value for China as well. For this reason, we studied several topics in developing countries and incorporated valuable lessons from them as well as the innovative practices that are happening in these countries.

2. Agricultural Modernization

2.1. The process of agricultural modernization worldwide

2.1.1. Theories on agricultural modernization

Two major arguments exist concerning the theoretical foundation of agricultural modernization. John Miller (1966) divides the transformation process from traditional agriculture towards modernized agriculture into three stages: technology stagnation, low capital technology dynamics, and high capital technology dynamics. According to Miller, the agriculture in the technology stagnation stage is referred to as traditional agriculture, where the increase of agricultural productivity relied on the increase of supply of traditional agricultural inputs. Low capital technology dynamic agriculture is the transformation stage between traditional agriculture and modernized agriculture. At this stage, agriculture is still the dominant industry of the society. With social development, demand for agricultural products expands significantly, and capital becomes scarcer than labor supply. Agriculture at this stage focuses on improving land productivity. High capital technology dynamic agriculture is the stage of agricultural modernization, when the share of agriculture in the entire national economy decreases rapidly. Capital is abundant while labor is scarce, which makes the increase of labor productivity crucial.

Schultz (1964) starts from the theory of technological advances and points out that the core of agricultural modernization is to replace traditional inputs with modern inputs. Through better allocation of resources (management skills, production skills, etc.), technological efficiency is improved and agricultural productivity is promoted. He also argues that modern agricultural inputs require modernized institutional designs and modernized farmers; technological advancement would not happen otherwise. Schultz' theory not only pays attention to modernized agricultural input, but also stresses the importance of creating a technological and practical environment that is conducive to modern inputs and increased efficiency. He notes that the development of modern agriculture does not only depend on technological advancement, but also on finance, legislation, education, etc.

2.1.2. Major development stages

Based on the main component of agricultural modernization, this process worldwide can be divided roughly into two major stages. The first stage is from the Industrial

Revolution to the 1970s, when mechanization and biochemical technologies came to the fore. The second stage is from the 1980s until now, during which attention has been redirected to sustainability, modern management skills, and environmental conservation.

a) First stage

The first stage of agricultural modernization in various countries focused on increasing production. Different pathways were adopted because of differences in conditions, endowments, demographics, etc. The first pathway, as seen in the U.S. and Canada where populations are small and land resources abundant, undertook mechanization to boost labor productivity. Countries with dense populations and limited land, like Japan and the Netherlands, chose biotechnology as the major means of enhancing land productivity. Countries like Germany and France who have a moderate endowment of both resources adopted a combination of mechanization and biotechnology (Huffman, 1998).

Interestingly, those countries who initiated modern agriculture with mechanization and labor productivity gradually turned to biotechnology to improve yield; while those who started with biotechnology turned to mechanization to improve labor productivity due to the rising costs of labor. This phenomenon indicates that, although different countries pursued agricultural modernization through various paths, their main modalities are consistent in the long run and all converge towards a shared, comprehensive approach. Specifically, during the 1960s and 1970s, most agricultural modernization processes around the world featured capital- and technology-intensive development, with extensive use of machinery, electricity, high-yield varieties, and chemical products, which accelerated the improvement of agricultural productivity.

b) Second stage

Upon completing the first stage of agricultural modernization, an agricultural model based on petroleum resources and represented by intensive input and energy consumption, becomes widely adopted. Following the 1980s, global agricultural competition intensified and became a major objective for many countries around the world. Agricultural modernization then enters the phase of sustainable development, represented by ecological and precision farming. The focus of the second stage is the improvement of resource utilization efficiency, protection of the ecological environment, agri-food product safety, modern biotechnology, information technology, nurturing new farmers, integration of production, processing, distribution, and engagement in the international market.

During this process, developed countries gain advanced agricultural technology and strengthen management capacity. This is the period when they rapidly surpass developing countries in terms of energy consumption in agricultural production, utilization of natural resources, and information management. They also possess strong capacity in crop and animal breeding, as well as influencing international markets.

2.2. Evolution of agricultural modernization and policy in representative developed countries

2.2.1. The United States

Table 1 provides an overview of agricultural development in the U.S. Clear trends include: 1) steady decrease of the share of agricultural GDP as well as the share of population involved in agriculture; 2) rapid and continued growth in average income of farm households; 3) sharp increase in average farm size from 1950s to 1980s and a plateau phase afterwards, corresponding with the sharp decrease in the total number of farms; 4) continued increase in the output of rice and corn, while that of wheat remained stable after peaking during the 1980s to 1990s. These trends offer a general picture of the history of agricultural modernization in the U.S.

Table 1 Statistics of agricultural development in the U.S.

	GDP (billion 2005 USD)	Share of agri. GDP	Share of agri. population	Ave. farm household income (current USD)	Number of farms (thousands)	Ave. farm size (acres)	Output of major products		
							Wheat (million bu)	Rice (million cwt)	Corn (million bu)
1900			41%						2,662.0
1910							625.5		2,852.8
1920							843.3		2,695.1
1930		7.7%	21.5%				886.5		1,757.3
1940							814.6	24.495	2,206.9
1950		6.8%	16%		5,647.8	213	1019.0	38.813	2,764.1
1960	2,794.8			4,054	3,949.0	297	1354.7	54.6	3,907.0
1970	4,339.8	3.54%	4%	9,472	2,924.0	383	1351.6	83.805	4,152.2
1980	5,927.3	2.89%		18,504	2,428.0	429	2380.9	146.2	6,639.4
1990	8,228.9	2.06%		38,237	2,145.8	460	2729.8	156.088	7,934.0
2000	11,558.8	1.19%		62,223	2,166.8	436	2228.2	190.872	9,915.1
2010	13,595.6	1.19%		84,459	2,200.9	426	2206.9	243.104	12,446.9
2013	14,444.8				2,103.2	435	2129.7		13,925.1

(Sources: World Bank and USDA ERS)

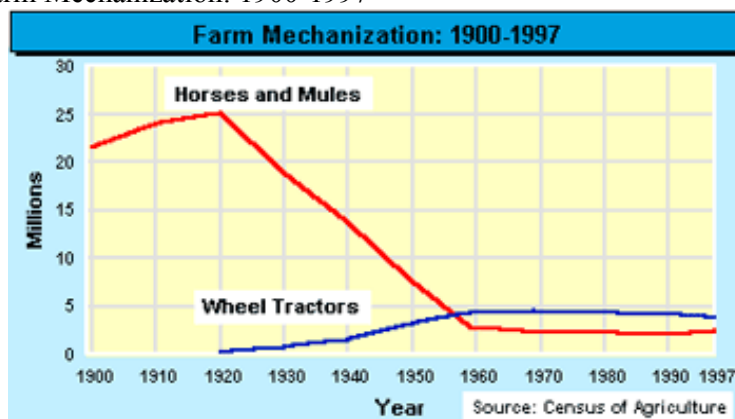
Agricultural modernization in the U.S. went through four stages: mechanization, biochemistry technology advancement, and management upgrading. The first stage, basic agricultural mechanization, took place between the 1900s and 1930s. With the popularization of internal combustion engines, the power of agricultural machinery was greatly enhanced. The number of tractors used increased from around 600 in 1907 to over 920,000 in 1930. Mechanization stimulated specialization and commoditization of agricultural products, resulting in the rapid growth of total agricultural output. However, agricultural policies in the U.S. remained focused on traditional approaches and favored enhancing agricultural productivity during this time.

The Great Depression in the 1930s had disastrous impacts on agriculture. Market demand dropped dramatically, production surplus piled up, and the prices of agricultural products decreased sharply. These circumstances lead to the transformation of U.S. agricultural policies, putting more emphasis on improving

farmers' income, providing price supports for agricultural products and restricting overproduction. This period began with President Roosevelt's New Deal and continued until the late 1960s. The new policies had two major aspects. First, restrictions were set on production and provided price supports for agricultural products. The government issued the first Farm Bill – the Agricultural Adjustment Act of 1933, authorizing the establishment of the Agricultural Adjustment Administration that subsidized farmers and processors' incomes directly, and the Commodity Credit Corporation, which provided non-recourse loans to stores and handles surplus agricultural products. The two agencies worked jointly to reduce agricultural production. The second aspect involved the promotion of agricultural free trade products and the expansion of exports. The Trade Agreement Act of 1934 contributed to the reduction of trade tariffs of agricultural products, increased agricultural export, and reduced overproduction of agricultural products.

Agricultural modernization in the U.S. evolved into the second stage after the 1940s. The outbreak of World War II created soaring demand for agricultural products. Agricultural production operated at full speed and became increasingly mechanized. As shown in Figure 1, the total number of tractors increased from less than 2 million in 1930 to 4.7 million in 1960 (Dimitri, Effland, & Conklin, 2005).

Figure 1 Farm Mechanization: 1900-1997

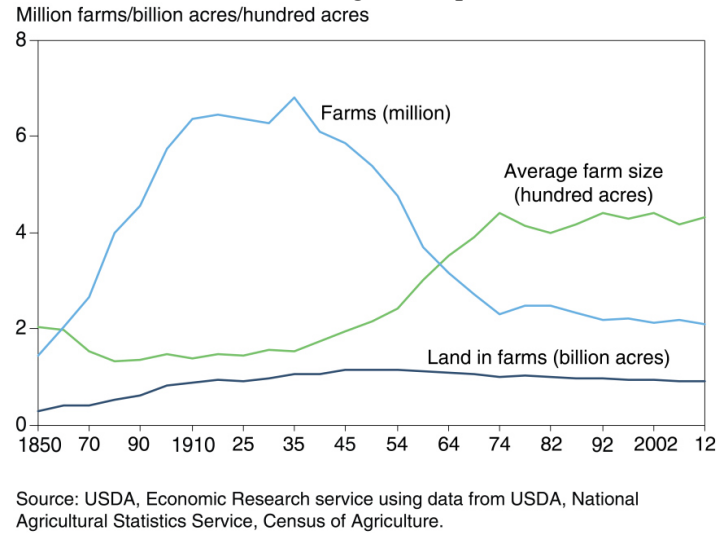


(Source: National Agricultural Statistics Service, USDA¹)

Industrialization and urbanization led to an increase in land prices. Increasing land use efficiency became a serious challenge for agricultural modernization. As the mechanization trend stabilized, the focus of modernization turned to the improvement of land use efficiency through the utilization of biotechnology and chemical technology. Meanwhile, there was an increasing trend of concentrated agricultural cultivation. The number of farms decreased sharply while the average acreage per farm expanded. Large-scale agricultural production gradually emerged. As shown in Figure 2, the total number of farms decreased from 6.8 million in 1935 to 2 million in the 1970s, while the types of crops cultivated per farm decreased from 5 in the early 20th century to 1 (Dimitri et al, 2005). In this period, the agricultural policies in the U.S. stimulated farmers' agricultural production and processing.

¹ http://nass.usda.gov/Publications/Trends_in_U.S._Agriculture/Mechanization/index.asp

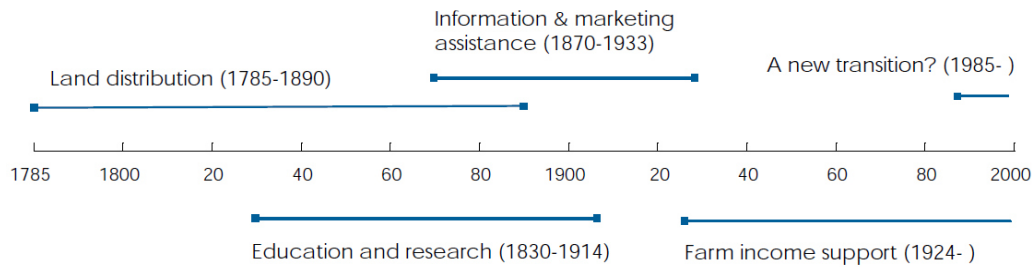
Figure 2 Farms, land in farms, and average acres per farm, 1850-2012



The third and current stage of agricultural modernization in the U.S. began in the 1970s, when advanced technologies were widely adopted in agricultural production. While the equipment and efficiency of agricultural techniques were generally improved, and the application of management techniques from the industrial sector to farm production greatly promoted scaled agricultural operation, improved agricultural infrastructure and facilities also helped to establish and develop a modernized agricultural service system. Every aspect of agricultural production became integrated, reflecting the industrialization of agriculture (Jiang and Xin, 2009).

From the 1970s to the late 20th century, biotechnology, chemical technology and modern management skills were widely embraced. Cultivated land area kept increasing, good harvests of grain continued, and the output of other agricultural products also increased dramatically. However, the financial burden of government-supported projects were heavy, and due to the improvement of farmers' income and expansion of operation scales, agricultural subsidy as a means of social wealth redistribution failed to deliver the desired results. The Farm Bill issued in 1973 introduced "target price," based on the cost of production and designed to balance the interests of farmers and consumers by protecting the consumers from overpriced products without reducing support for agriculture. Moreover, the government implemented a series of policies such as subsidy for disaster risks, national agricultural research and extension and education policy acts. After entering the 21st century, the goal of agricultural policy now aims to decouple subsidies and safety net structure, such as by establishing an income-based counter-cyclical payment program and supporting the development of small and medium farms.

Taking a historical perspective, the evolution of agricultural policies in the U.S. is shown in Figure 3.



Economic Research Service, USDA

Figure 3 Evolution of agricultural policies in the U.S.

Current agricultural policies in the U.S. mainly involve conservation policies for agricultural resources, price subsidies for agricultural products, agricultural credit policies, and risk guarantee policies. Among them, the commodity program that aims to upgrade products and support farmers' income has the longest history. The objective of these agricultural policies include: 1) Stabilize and protect agriculture through conservation reserve programs, grain reserve programs, government agricultural credit plans, and crop protection plans; 2) Promote agricultural development via boosting agricultural labor productivity, protect environmental and agricultural resources, and establishing agro-economic research institutes; 3) Maintain market order and ensure fair trade by establishing comprehensive legislation and authorities to protect farmers' legitimate interests and motivations. In order to protect farmers, ensure a reliable supply for consumers, and protect the national interest, the U.S. government indirectly intervenes in agriculture through various legislation, negotiations, and economic leverage, etc. (Bao, 2008).

For example, Congress is responsible for passing multi-year, omnibus farm bills that set agricultural and food policy, including farm commodity support, horticulture, livestock, conservation, nutrition assistance, trade and international food aid, agricultural research, farm credit, rural development, bioenergy, and forestry. The new 2014 farm bill, significantly alters the structure of farm commodity support, expands crop insurance coverage, consolidates conservation programs, reauthorizes and revises nutrition assistance, and extends authority to appropriate funds for many U.S. Department of Agriculture (USDA) programs through FY2018. In particular, the most recent farm bill affected crop support by eliminating direct payments,² the counter-cyclical price (CCP) program, and the Average Crop Revenue Election (ACRE) program. The current bill, however, does allow producers to choose between two programs linked to a decline in either price or revenue (price times crop yield) that are similar to the previous CCP and ACRE programs, the Price Loss Coverage or PLC and Agriculture Risk Coverage (ARC) (Chite 2014).

The Price Loss Coverage program serves as a counter-cyclical price program and pays farms when farm prices for covered crops fall beneath a "reference price", which has been increased above the parameters in the 2008 farm bill to better protect producers against market risks. The current program continues the historical policy of making payments on 85% of historical plantings (or "base acres") (which is designed to prevent the program from affecting planting decisions) (Chite 2014).

² Although direct payments had been made to producers and landowners based on historical production of corn, wheat, soybeans, cotton, rice, peanuts, and other "covered" crops since 1996, they had become increasingly politically unfeasible as recipients were able to receive payments without suffering a loss (Chite 2014).

The Agriculture Risk Coverage program is an alternative to PLC and is designed to cover some of farmers' out-of-pocket losses when crop revenues decline. Triggered when actual crop revenue declines below 86% of historical or "benchmark" revenue (such that the producer absorbs the first 14% of the shortfall), payments (as with the PLC), cover 85% of base acres. Farmers are also able to choose between coverage at either the county or individual farm level. While producers must cover the first 14% of losses (in order to account for more localized losses), the government pays for the next 10%, while remaining losses are covered by any crop insurance purchased by the producer (Chite 2014).

According to the 2014 farm bill, the marketing loan gains, and loan deficiency payments associated with PLC and ARC are capped at \$125,000 per person, while there is also a new adjusted gross income (AGI)-based eligibility requirement of \$900,000 (Chite 2014).

Moreover, a number of small and medium-sized producers established various agricultural cooperatives, setting up a comprehensive service system to combine family farms, agricultural resources, technologies and product marketing. These cooperatives are spontaneously organized and independent of the government. They actively take part in primary processing, storage, logistics, marketing etc. These cooperatives strengthen the resilience of agriculture by linking scattered households with markets.

Valuable lessons are offered by the development of U.S. agricultural modernization. Firstly, the government's role of guidance, regulation, and control is crucial. Sensible legislations and policies can guide and ensure the healthy and balanced development of agriculture, e.g., the price subsidy of agricultural products in the U.S. Secondly, the advanced purchase and marketing system of agricultural products, and the comprehensive agricultural social service system are both essential for agricultural modernization. Applying a model of decentralized operation and centralized distribution, agricultural cooperatives in the U.S. succeeded in establishing an integrated rural market, resolving many of the problems facing farm households, farmlands and markets, and reducing the operational risks of small producers.

2.2.2. Canada

Canada has one of the most advanced agricultural sectors of any developed country. The average land cultivated per household is nearly 300 hectares. While the agricultural population only accounts for 3% of the total population of over 3 million, the average amounts of grain and meat products per agricultural laborer is 2.5 million tons. GDP created per agricultural laborer is around 51,600 CAD, and the average income of farmers is 29,300 CAD, 1.4 times the urban resident average. The levels of organization and education of farmers are also very high. The agricultural economy and rural development in Canada are very advanced.

Agricultural modernization in Canada was initiated through land scale-up. This process facilitated the massive transfer of agricultural labor to non-agricultural sectors, which led to a concentration of land and improvement of production relations. The share of labor engaged in agriculture decreased from 50% in the earliest days of the

nation to 3% today, while those engaged in the service sector increased from 3% before World War II up to 74% today. The service industry absorbed large amounts of excess agricultural labor. Along with the labor transfer, the scattered agricultural lands were gradually consolidated and scaled up. With an average of 300 hectares per farm, one agricultural laborer averages 120 hectares of land.

One of the prerequisites of scaled agricultural production is increasing mechanization. In Canada, 98% of the land is operated by family farms that began developing mechanized production from the 1950s to 1960s and has now reached a very high level. Each laborer owns two tractors on average. Production relies heavily on high-power machinery and a lot of field work can be completed in one operation. Production efficiency is very high.

Production scale-up was also associated with specialization and agricultural division of labor. The wide utilization of large agricultural machinery reduced labor demand while promoting specialized production, making the production area of a single agricultural output very concentrated. For example, the wheat from Saskatchewan makes up 3/5 of the national total; barley from Alberta accounts for 1/2, corn from Ontario takes up 3/4 and most grapes come from the Niagara region.

Along with scaled-up production, agriculture is increasingly integrated with food processing and trade, thereby promoting industrialization of agriculture and modernization of logistics. In 2000, the cultivation industry produced 2.3% of total GDP and agricultural labor accounted for only 3% of total employment, while the food processing and trade sector directly related to agricultural cultivation generated 10% of GDP (over 60 billion CAD) and employed 15% of total labor (around 1.8 million). The total output and employment of food processing and agricultural trade is 5 times that of agriculture.

The integrated system of urban and rural societies also played an important role in the process of agricultural modernization. This integrated system focused on the development of metropolitan suburbs as well as of rural towns, aiming to integrate infrastructure, social benefits, social insurance, and other policies. Rural residents enjoy the same level of public goods (water, electricity, road, etc.) and social benefits such as health care, education, insurance, etc. as their urban counterparts. This laid a solid foundation for the development of agriculture.

Historically, various cooperative organizations were the main driver of agricultural modernization. Cooperatives in Canada were founded as early as the 1900s. They implemented various development practices, while the government only provided support on a programmatic basis and was not involved in implementation. The government also passed detailed legislations to regulate cooperatives and their general principle is to promote their balanced development according to their members' wills and without over-restriction. Cooperatives connect separate farm households to empower them in the context of the changing market. Five major categories of cooperatives exist in Canada: 1) agricultural production cooperatives, of which there were over 300 by the end of the last century, are some of the most successful cooperatives; 2) financial cooperatives, which have the largest scale in terms of membership and financial endowment, with over 16.7 billion CAD of assets; 3) marketing cooperatives, of which there are over 600 around the country, provide

wholesale and input retail services; and 4) service cooperatives that are mostly non-profit cooperatives engaged in housing, health care, etc. Most of these traditional cooperatives have undergone significant transformations in recent years. Referred to as “New Generation Cooperatives,” they focused on processing businesses and link them with farm households to promote value-added products. These new cooperatives also engage in a number of innovative practices, such as acquiring finance through the issuance of equity.

As for the most recent development strategy, Growing Forward 2 (GF2), administered by Agriculture and Agri-Food Canada, is the on-going five-year (2013-2018) policy framework for the agriculture sector in Canada. Being the foundation for government agricultural programs and services, \$3 billion dollars are jointly invested by federal, provincial and territorial governments. GF2 programs focus on innovation, competitiveness and market development. The investment under GF2 programs include \$2 billion in cost-shared programs, the cost of which are shared on a 60:40 basis between provinces and territories, so as to ensure programs are tailored to meet regional needs (Agr.gc.ca., 2014). Continuous efforts are being made to support agricultural modernization through policy instruments designed to boost production, promote risk management, etc.

2.2.3. The Netherlands

Agriculture in the Netherlands is characterized by intensive operation. As the major producer, family farms adopted advanced technologies and modernized management patterns, resulting in very high yield. The Netherlands is a global leader in various agriculture-related technologies, including those related to the environment, energy, information, biotechnology, materials, etc.

Modernization of agriculture in the Netherlands can be traced back to the late 19th century. At the time, excessive imports and internal conflicts between domestic producers caused an agricultural recession. The strategy employed by the government of the Netherlands was to boost the quality and efficient use of production factors, and to improve the supply of input and sales of outputs. After World War II, the Netherlands decided to dedicate its limited land resources to the development of high value-added industries such as livestock and horticulture, and to pursue structural optimization and the development of high-efficiency agriculture. They also emphasized science and technology in agricultural production, which further accelerated the development of agricultural productivity (Jiang & Xin, 2009).

In the Netherlands, R&D takes the lead in its agricultural service system, with the establishment of a well-rounded, national R&D network. The government has a long history of agricultural R&D investment. The first publicly funded agricultural experiment station was founded as early as 1877 in Wageningen, complete with comprehensive supporting facilities and various research, monitoring, and testing equipment. The period from the 1950s to 1970s witnessed a sharp increase in public R&D investment, reaching an average annual growth of 4% (Alston, Pardey, & Smith, 1997). The number of theoretical and applied researchers steadily increased afterwards and ensured up-to-date applicability for on-the-ground production.

Most research, extension, and education are carried out by specialized, government-

funded institutions. The government also recently established a brand-new National Agricultural Science and Education Center to coordinate and organize agriculture-related research and education. Its mission is to consolidate resources, integrate advantages, and expand innovative research and education in various topics such as nutrition and health, sustainable agriculture, environmental change, social transformation, etc. Efforts at technology extension have featured cooperation between the central government, local institutions, and farmers and collaboration among the national agricultural extension system, social extension system, and private consultation system. In the meantime, government-owned experiment stations and local agricultural research centers worked to cope with application challenges, demonstrate new technologies, and promote the integration of research outputs with field production (Evenson & Gollin, 2007).

On the whole, 60% of the funding for agriculture-related research and education extension in the Netherlands comes from the government. Strong support and adequate investment is an essential factor for agricultural development, especially in regards to modernized technologies, in the Netherlands.

2.2.4. Japan

World War II seriously impacted Japan's economy. Industries and urban centers suffered and large numbers of urban workers returned to rural areas. However, rapid development during the 1950s to 1960s propelled Japan to become the second largest economy in the world. The rapid advancement of industry drew agricultural labor from rural areas, creating a favorable environment for operation scale-up, mechanization, and advancement of agricultural technologies. These opportunities were not lost to the Japanese government (Zhang & Xie, 2012). The Japanese government impressively promoted agricultural modernization through the adjustment of agricultural policies, improvement of regulations, and reinforcement of various agricultural production supports.

The modernization of Japanese agriculture can be divided into the following stages:

Exploration. Agricultural modernization can be traced back to as early as the Meiji Era, when advanced machinery and equipment were popularized and breeding and cultivation technologies from European countries were introduced. From the end of World War II to the 1960s, the Japanese government adopted measures to promote agricultural development, aimed at "rural democracy" and "grain production stimulation". Several pieces of legislation were enacted to boost land productivity in order to increase yield and total output. These measures increased grain production and improved agricultural productivity.

Rapid development. Along with rapid economic development, particularly in the heavy industries, a large number of rural laborers flowed to urban areas and the population employed in agriculture sharply decreased. In order to facilitate mechanization and labor productivity improvement, the Japanese government made regular revisions and improvements of its old agricultural land and grain legislations during 1961-1999. Agricultural productivity and farmers' income were greatly improved with the adoption of production, price, and structural policies

Further improvement. From the late 20th century and onwards, industrial development caused increasing land abandonment, and food safety, environment, and energy issues received growing attention from the public. Food safety issues were especially prominent. Therefore, the focus of agricultural modernization was turned towards organic farming, eco-efficient agriculture, and green agriculture. The level of modernization has further improved (Zong et al., 2011).

A significant feature of Japanese agricultural modernization is the priority given to technological improvement, which aims to improve yield and land productivity via enhanced breeding, infrastructure construction, agriculture-related industry, and intensified application of fertilizers and pesticides. In the meantime, small-sized machinery and equipment were used to intensively farm the limited arable land. The cultivation conditions for agricultural products were thus effectively improved and yields increased accordingly. Agricultural R&D, education, and technology extension played vital roles for agricultural modernization in Japan.

2.3. The vital role of financial support in agricultural modernization

2.3.1. Theoretical foundation of agricultural finance

According to the definition of Barry and Robison (2001), agricultural finance focuses on the acquisition and use of financial capital by the agricultural sector. Financial capital includes debt, equity, and leased capital, although each of these sources may assume numerous forms. Agricultural finance includes the following elements: 1) Market, which concerns the organization and performance of institutions as financial intermediaries for the agriculture sector, the trading of financial instruments in the financial markets, rationing of credit etc. 2) Capital management, which includes investment analysis, capital structure, performance measurement, financial planning, risk and liquidity management, etc. of either individual firms or at the sector level. 3) Policy, which concerns the role of governments in filling the gaps and resolving imperfections in the agricultural finance markets, as well as providing targeted assistance to recipients consistent with social goals that are unmet by private financial capital.

Suppliers of capital and services of agricultural credit include commercial banks, specialized cooperative or shareholding credit institutions, government support programs, credit cooperatives, trade and processing companies of agricultural products, and financial intermediaries (such as institutions engaged in insurance, pension, guarantee, etc.). Though these suppliers have various characteristics in organizational structure, operational models, level of specialization, capital sources, importance, and relationship with the public sector, they all participate in the following services: 1) loan issuance; 2) loan capital injection; 3) assuming risks; 4) provisions of liquidity; and 5) risk monitoring, repayment collection, and other related services.

Extensive researches have been done domestically and internationally on agriculture, focusing on growth of earnings, investment analyses, financing structure, risk and liquidity management, performance measurement, and relationships between borrowers and lenders (Turvey, 2009; 2013).

2.3.2. Characteristics of agricultural finance

Agricultural production has unique features with respect to finance. For example, farm production is usually capital intensive, geographically separated, limited in production scale and coverage, has long production cycles, and is subject to large impacts from operational risks and from the overall economic environment. While some agricultural producers have large scale productions, complex organizational structures, and various financing sources, the majority of them are very small in scale, depend heavily on their own funding, and rarely use external shareholding investments (Barry & Robison, 2001).

2.3.3. Importance of agricultural finance

Extensive theoretical and practical researches have suggested that the economic growth of an economy is closely related to the sophistication of its financial system. Without the existence of financial markets, the high cost of information and transactions (including the costs of acquiring information, enforcing contracts, and trading commodities and obligations) usually “immobilize savings, stifle risk-taking, constrain investment decisions, hamper technological innovations, and dampen rates of economic growth” (Barry & Robison, 2001). High-return and technologically intensive projects generally require long-term investments of capital, but savers are reluctant to use their funds in risky investments where there is a lack of information. Therefore, financial markets enable the mobilization and transfer of these savings into high-return projects, with advantages in liquidity, diversity, and information-sharing.

Considering the characteristics of agricultural production – long earning cycle, high risk, vulnerability to natural conditions, low profitability, etc., there can be multiple reasons for market failure in this sector. Under perfectly competitive markets, commercial financial institutions find it extremely hard to earn adequate profits and therefore a deficit in market supply would occur. In addition, many researchers (Binswanger & Khandker, 1995; Meyer & Nagarajan, 2006; Zeller, 2006; Weber & Musshoff, 2013), through empirical research, found that the biggest challenge facing agricultural production is the mismatch between the design of loan products (including microcredits) and the demands of farmers. A number of specific challenges contributed to this gap between supply and demand, including:

- a) High transaction costs for both borrowers and lenders
- b) High potential risks faced by borrowers and lenders, because of income volatility
- c) Impacts from external economic conditions
- d) Limited instruments to cope with risks
- e) Insufficient information of borrowers
- f) Lack of qualified collaterals
- g) Unfavorable policies, legislations, and regulations towards agriculture

With these challenges, it is essential for the government to incentivize commercial financial institutions to provide the most-needed financial services, or adopt a more direct way of establishing policy-based financial institutions (Jaffee, Siegel, & Andrews, 2010).

Experiences from agricultural modernization in developed countries show that

although the structural design, operation model, and service products of financial systems for agriculture vary greatly, the agriculture sector generally receives the most direct credit from the government and enjoys strong support in the form of agricultural insurance policies and subsidies. This common practice aims at providing capital to agricultural producers with preferential prices and easy access to credit, as well as offering low-price insurance policies to compensate losses from natural disasters, market volatility, and other factors. Additionally, financial support is employed by various developed countries to boost R&D and the dissemination of inputs, in order to promote the scaled development of agriculture and motivate private sector investments. With the joint effort of the public and private sectors, advanced production and management technologies are rapidly developed and applied, promoting capital intensive modernization of agriculture(Zhao, 2010). More details on these approaches will be discussed in the following sections.

3. Evolution of Agricultural Finance System in Developed Countries

3.1. Evolution of agricultural finance system worldwide

During the first half of the 20th century, agricultural finance in most developed countries was independent from the commercial bank market, and consisted of financial institutions specifically designed for agriculture that were jointly established by the government and agricultural production organizations. Two major factors contributed to this phenomenon. The first was the mismatch of terms of funds being transacted. While the industrial sector favors long term bonds that are readily guaranteed by commercial banks, farmers need long term mortgage loans to fill the capital gap between purchasing and developing land, which cannot be fulfilled by long term bonds (Schickele, 1978). Secondly, farmers preferred intermediate loans with terms between 3-5 years in order to meet the demands of working capital for purchasing livestock, equipment, and facilities; but private commercial banks usually favor short-term credits of 60-90 days to industrial and trade companies in order to match their short-term liabilities (deposits), instead of providing intermediate credits. In the meantime, short-term operational credits that farmers might have needed usually carried much higher risks than did industrial. For these reasons, farmers were usually unable to access the services of commercial banks. Interest charged on the few agricultural credit products available were higher and payments terms, inflexible. The demands of agricultural production could not be met.

In response, a number of cooperative agricultural banks, either privately owned, government-guaranteed, or government-owned, were established thanks to the joint effort of farmers and the government. Many of these institutions were established before the 1940s and expanded afterwards with the active support from the government on the structure, recognition of the increase in credit demand, as well as the increased understanding of the importance of agricultural finance.

After World War II, major investments were directed toward the development of agricultural productivity in advanced countries, and especially for the protection and stabilization of agricultural production incomes through the establishment of market-related regulations and income support policies. Under such support frameworks, governments used financial means to encourage the structural advancement of farm

production, including the effective use of land, new machinery, fertilizer, pesticides, and state-of-the-art facilities. Many such policy interventions in the agricultural structure took advantage of the adjustment effect of finance (OECD, 1970; Green, 1987). Since the demand for agricultural credits increased rapidly during this period due to previous capital scarcity, and as related government departments monitoring the financial market had been established, these direct financial interventions were very effective.

Since the 1970s, a series of international and domestic changes imposed incredible pressure on the income protection measures for agriculture. Impacts from the agreement on the trade liberalization of agricultural products in the Uruguay Round of the WTO, domestic fiscal difficulties in different countries, among other reasons, reduced government interventions for agricultural structural adjustment. Protection and support policies for agricultural finance also gradually liberalized, ending the division of the agricultural credit market (Cerny, 1993; Coleman, 1996).

Below is a detailed description of the agricultural finance system in the targeted countries.

3.1.1. The United States

Although the agricultural sector takes up less than 1% of the total GDP in the U.S., the government has set up a robust system to provide strong support to agriculture and rural development. In response to the changing conditions of agricultural development, especially on the international arena, the U.S. congress introduces new Farm Bills regularly to provide adequate budget support and subsidies (USAID, 2005a).

In the U.S., the policy-based financial support to agricultural modernization is mainly composed of the federal government and related non-profit institutions. They provide funds for infrastructure in rural areas and loans for small farm households and enterprises that could not obtain loans from commercial banks. Services include direct agricultural loans, loan guarantees, price subsidy payments, infrastructure construction loans, etc. Commercial banks, on the other hand, provide loans to eligible farmers through their branches in rural areas. Public and private efforts complement each other to meet the demand of different entities in the process of agricultural modernization and support the development of agriculture and rural areas (Zhang, 2012).

3.1.1.1. Evolution of agricultural finance institutions

Policy financial institutions for agriculture were first established in the early 20th century in the U.S., represented by the Farm Credit System (FCS), which is a publicly funded, private cooperative-based credit system (Peoples et al., 1992). The system collects funds via selling government bonds and takes no deposits. It established four institutions – Federal Land Banks (FLB), Federal Intermediate Credit Banks (FICB), Cooperative Banks, and Production Credit Associations (PCA) – in 12 agricultural credit regions around the country (Dolan & Collender, 2011). FLB provides long term loans for farmers' purchase of land, machinery and equipment, and livestock; FICB issues intermediate and short term guarantee loans for purchase of non-fixed assets, and these loans reach farm households mainly through PCAs; and Cooperative Banks

offer loans and various consulting services for agricultural cooperatives, and these loans include short term and seasonal working capital loans, infrastructure construction loans, and export loans. These loans can also be distributed to member farmers by the cooperative (Zhang, 2009).

In 1933, the Farm Credit Administration (FCA) was established to take charge of the four organizations of FCS. It coordinated detailed credit support programs via the Farmer Home Administration (FHA) under the U.S. Department of Agriculture (USDA). FHA was established in 1946 and is a government funded, privately owned organization. It does not take deposits but uses the prepaid capital offered by the government. Its mandate is to provide credit support for agricultural production and rural development, help marginalized smallholders in some agricultural production communities, and undertake the responsibility of lender of last resort (US Department of Agriculture, 1985). Specific measures include direct or guaranteed loans for individuals, low-income families and the elderly in housing construction and renovation, improvement of farm environment and water resources, and emergency aid. The development of FHA loan programs represents a transformation of the mission of agricultural finance support in the U.S., from welfare orientation during the Great Depression towards strengthening the economic capability of farm households. Through operational and purchasing loans granted by FHA, these households gradually built up capacity and turned to commercial banks to meet credit needs (Barry, 1995).

Commodity Credit Corporation (CCC), a government-owned and operated entity established in 1933, was also a policy financial institution targeted at agricultural finance. Its mandate was to stabilize, support, and protect farm income and prices. CCC helps maintain balanced and adequate supplies of agricultural commodities and promote orderly distribution. Through loans, purchases, payments, and other operations, it facilitated the provision of materials and facilities required in the production and marketing of agricultural commodities. It was reincorporated as a Federal corporation within USDA in 1948.

During the 1970s, the coverage of FHA's programs expanded extensively, with a big increase in the number of borrower's eligibility examined, amount of total loans granted, and number of loans approved. Moreover, the Rural Development Act in 1972 authorized FHA to conduct guaranteed loans (Ahrendsen et al., 2005). In the Farm Bill published in 1978, an "economic emergency aid loan" program was announced to help those farm households facing decreasing commercial loans and the dual pressure of rising costs and declining prices (Dodson & Koenig, 1997).

In the mid-1980s, some public agricultural credit institutions were eliminated, and most loan products were transforming from direct loans to guaranteed loans. As assigned by the Farm Bill of 1985, FHA lowered the share of direct loans and substituted them with guaranteed loans. The Omnibus Budget Reconciliation Act of 1990 restated the need for this change (US General Accounting Office, 1992). The share of guaranteed loans rose from 35.9% in 1986 to 68% in 1993. This transformation indicates that the focus of FHA has turned from fulfilling the gaps of commercial credit services to providing guarantees for loans issued by commercial and FCS banks.

During the financial crisis of the 1980s, the Credit Promotion Program played a vital role (Stam et al., 1991). The sharp increase in commercial agricultural loan defaults drastically expanded bad debt and drew a lot of agricultural lending institutions out of the market. The Agricultural Credit Act enacted in 1987 announced that FCS will provide funding support to the agricultural finance market. This act also facilitated the establishment of Farmer Mac, a private organization that provides liquidity to the mortgage loan market of agricultural fixed assets (Ahrendsen et al., 2005). The financial crisis also stimulated more changes of FHA. It became more and more market-orientated, and strived to expand its services to cover the entire agriculture and food industry, as well as other aspects of the rural area. It was also put under strict monitoring like other financial institutions, unlike before, when the FCS was self-disciplined and FHA was supervised only by USDA and not the national banking regulatory organizations)

In 1994, the Farm Service Agency (FSA) was established under USDA. It incorporated a number of past agricultural credit support programs and took over the responsibilities of FHA and CCC. The mission remained the same – to provide farmers without credit access direct and guaranteed loans. Although the share of FSA's loans only takes up 3% of total loans and 4% of guarantees in the entire agricultural loan market, it played a vital role in certain regions and for certain borrowers (Ahrendsen et al., 2005).

Policy financial institutions in the U.S., guided by government policies, provide low-interest and long term loans for poor farmers, rural infrastructure, price support, and many other aspects that commercial financial institutions are unwilling or unable to offer. They fill the gap of government and commercial institutions' support for agricultural modernization, and effectively promoted the modernization of agriculture (Li, J.G., 2007).

Besides policy financial institutions, commercial banks are also a major provider of agricultural credit, taking up around 50% of loans in the agricultural sector.

3.1.1.2. Organization of the government agricultural system and related financial institutions

The current service system and relations between offices in USDA is shown in Figure 4 below::

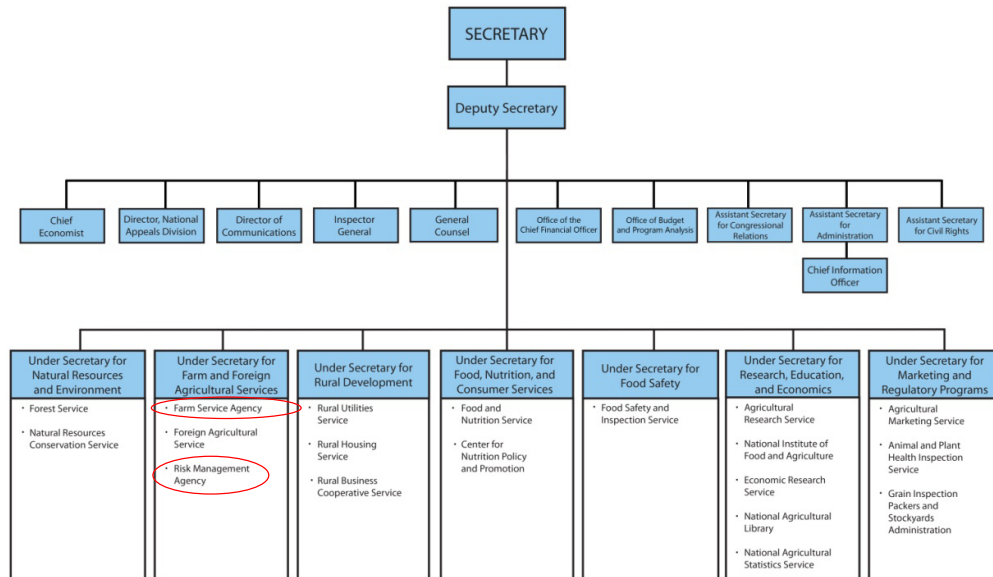
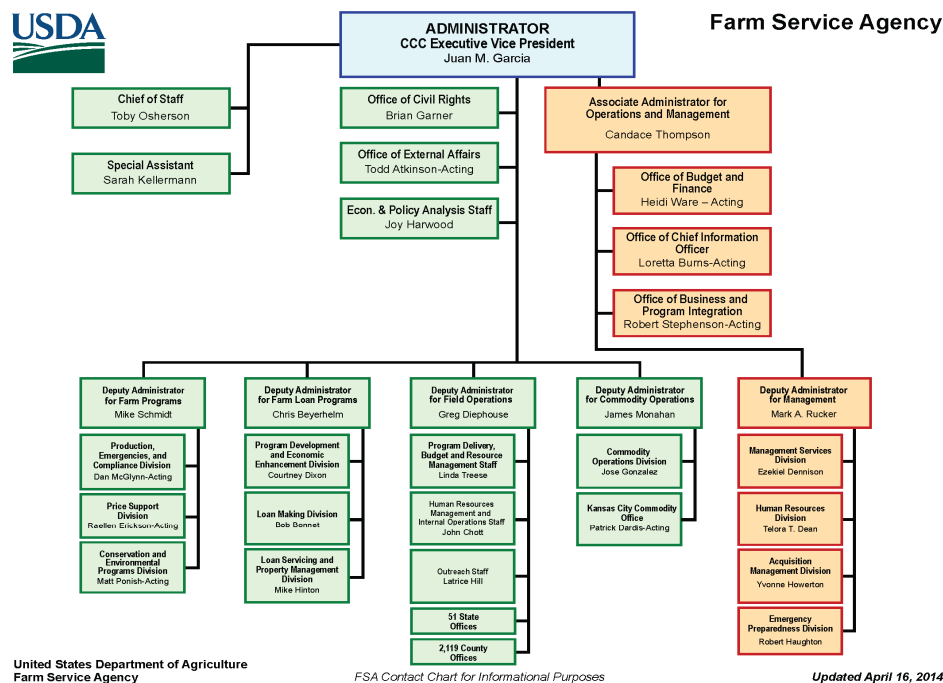


Figure 4 Organization chart of USDA

Among various agencies, the Farmer Service Agency (FSA) and the Risk Management Agency (RMA) assumed responsibility for the management of guidance for financial services for entities engaged in agricultural operation, focusing on agricultural loans and agricultural insurance, respectively. As shown in Figure 5 and 6, the two agencies have very distinct and specific responsibilities. They cover a wide range of services, including financial products, knowledge extension, regulatory support (e.g., affirmation and registration of assets), monitoring and assessment, etc.



United States Department of Agriculture
Farm Service Agency

FSA Contact Chart for Informational Purposes

Updated April 16, 2014

Figure 5 Organization chart of Farm Service Agency

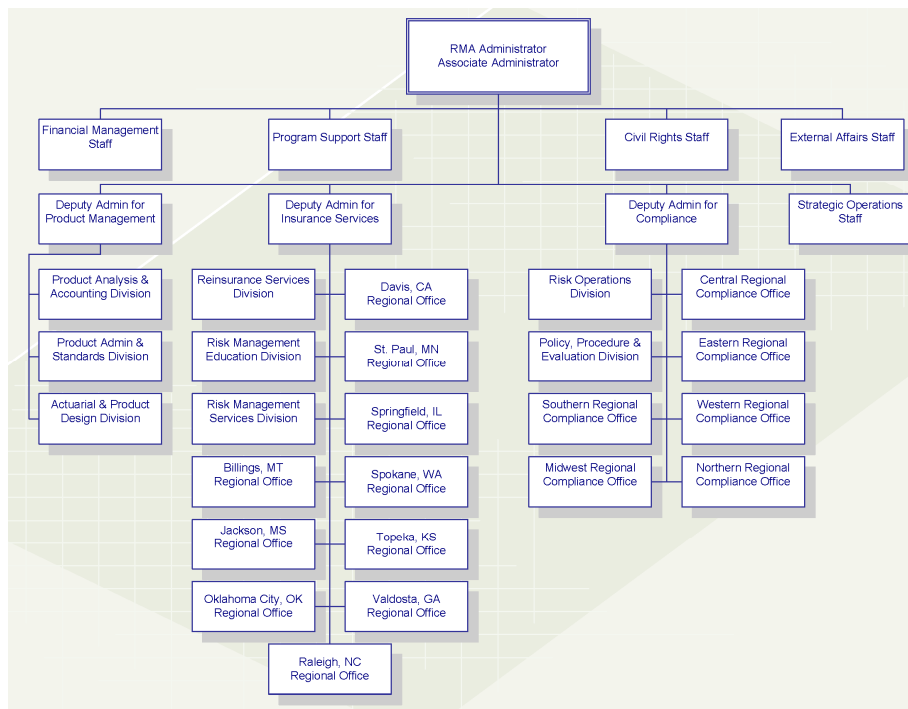


Figure 6 Organization chart of the Risk Management Agency

3.1.2. Canada

The agricultural finance system of Canada is mainly comprised of policy-oriented financial institutions that are dominated by the government and various commercial financial institutions, including banks, insurance companies, etc.

3.1.2.1. Historical evolution

Agricultural credit in Canada can be traced back to 1927, when the government established the Canadian Farm Loan Board (FLB) to provide long-term guaranteed loans. In 1944, with the policy of promoting modernized agricultural production, government guarantees was implemented and the Farm Improvement Loans Act was enacted in order to expand the credit support to agricultural producers and cooperatives with guarantees offered by the federal government. In 1980, the total amount of loans guaranteed by the government took up 12% of all mid-term loan balances. This act was expanded in 1988, forming the Farm Improvement and Marketing Cooperatives Loans Act (FIMCLA), and later revised and renamed as the Canadian Agricultural Loans Act (CALA) in 2009, which supported cooperatives and raised the limits on loans (Canada Co-operative Association, 2009).

The federal government increased its intervention in agricultural finance through the legislation of Farm Credit Act in 1959. Farm Credit Canada (FCC), a crown (state-owned) company and policy-oriented financial institution controlled by the government, was established as a result. FCC took advantage of the Consolidated Revenue Fund to provide long-term loans that the private sector was not willing to (Coleman, 1998). Being the largest long-term loan provider, FCC focused its service on agriculture-related businesses and covered a wide range of clients who worked on

family farms, agricultural enterprises, and many others engaged in agriculture. Compared with provincial and regional policy-oriented financial institutions, FCC plays a vital and guiding role in the operation of agricultural finance all over Canada. It is one of the most important institutions in agricultural finance in Canada and reports directly to the congress via the Department of Agriculture and Agri-Food (AAFC). It is also a major source of government funds devoted to national agricultural development.

FCC offers a wide variety of credit services for agricultural enterprises and farmers, including initial financing, cash flow optimization loans, fixed asset loans, and insurance policies such as for life and accident insurance, key producer insurance, and payment protection insurance, as well as venture capital investments. FCC also works with a number of regional financial institutions or federal government departments to jointly promote the development of certain goals. For example, FCC and the Bureau of Western Economic Diversification Canada initiated the “Financing plan for value-addition processing corporations in West Canada” project, which provides long-term debt capital for small and medium enterprises in the West, facilitates commercial R&D or market development programs, and promotes opportunities for value-addition processing companies in the agriculture and food sector to enter the global market and drive the prosperity of the rural economy in the area. The “National Bioethanol Project” is another example, receiving 140 million Canadian Dollars from the government with the intention of boosting farmer investment in the ethanol industry. The FCC, entrusted by AAFC, manages this fund (Bai, Xu, & Wang, 2006). Apart from institutions owned by the federal government, provincial-level institutions also offer interest subsidies as a way of supporting long-term agricultural loans. The “Office du Credit Agricole in Quebec” established in the 1930s does just that.

During the 1980s, the production of grain in the prairie provinces of Canada suffered greatly from drought. It led to the Special Farm Assistance Program undertaken by the FCC, which acted as the lender of last resort and strived to provide compensation for marginalized producers. This program cost the government 400 million CAD. The huge price tag compelled government policies to become more market-oriented. The federal government made the decision in 1988 that the FCC should withdraw its responsibility as the lender of last resort, but instead provide an appropriate amount of mortgage loans on the basis of breaking even. Thus the interest difference between the FCC and private credit institutions narrowed. The 1993 Agricultural Credit Act further expanded the service of the FCC to various segments of production, including diversified farm operation, high value-added agri-food production and processing, consultation and counseling for livestock purchases, agricultural planning and operation, etc. In the mid-1990s, after a series of transformations, the FCC gradually changed from a dominant institution into a corporation directly competing with the private sector.

3.1.2.2. Organization of the government agricultural system and related financial institutions

Agricultural-related government departments in Canada are mainly divided into two independent but cooperating systems – the federal and the provincial level. A practice worth noting is that, like the United States, there is also a division established specifically to manage agricultural finance under the department of agriculture. Below

is an organization chart of AAFC (Figure 7).

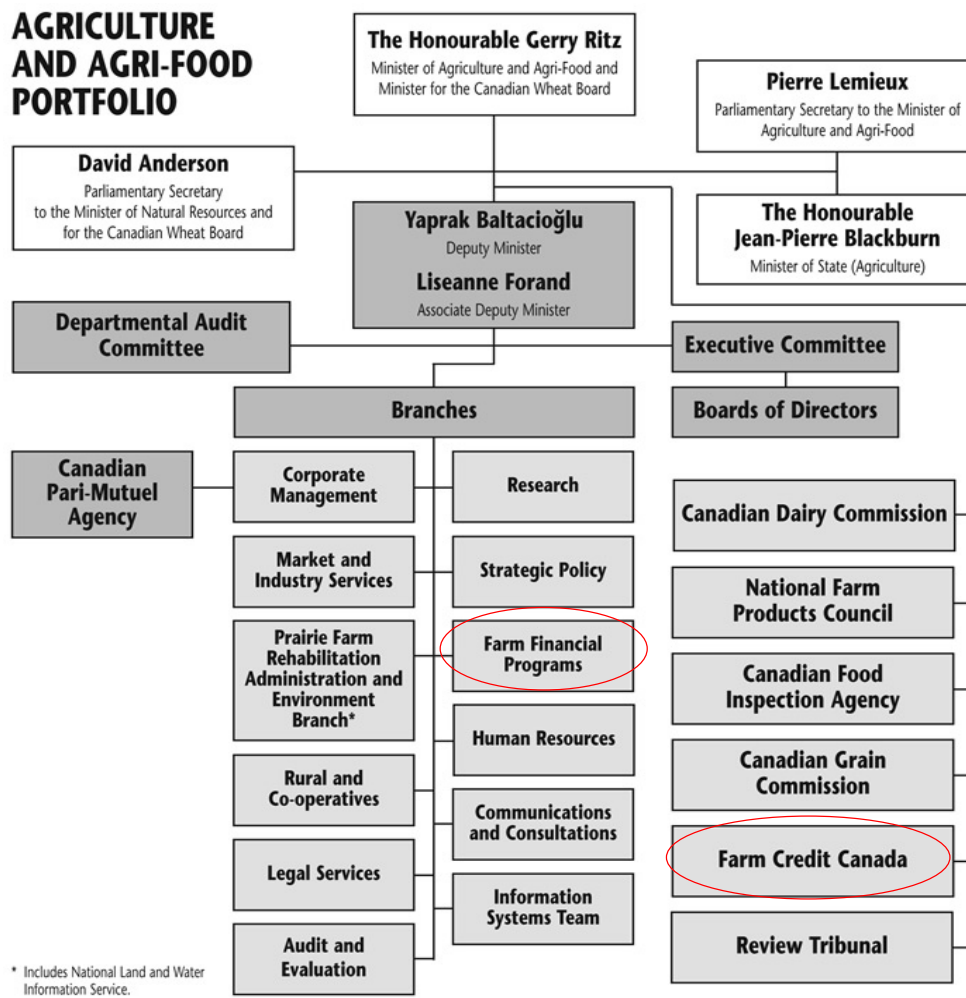
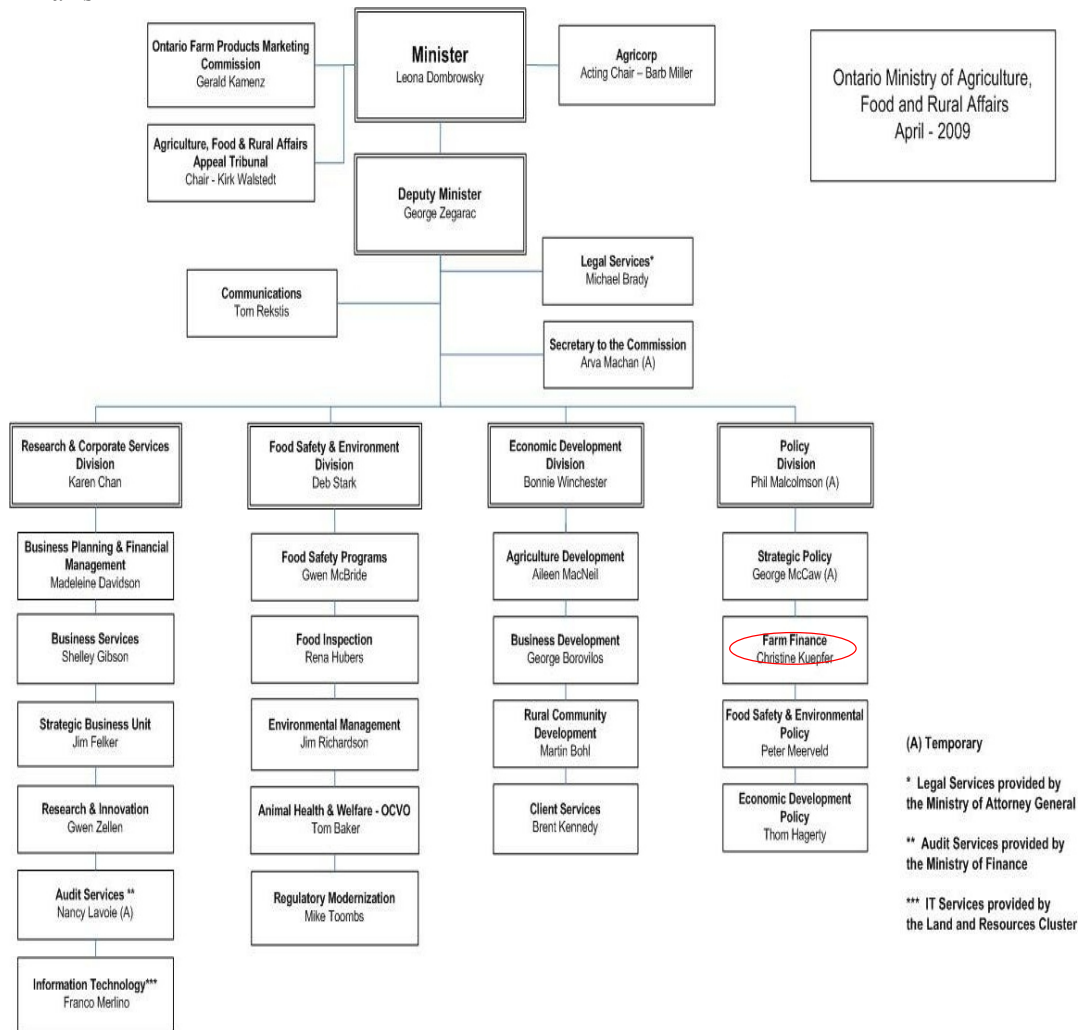


Figure 7 Organization chart of the Department of Agriculture and Agri-Food, Canada

Figure 8 Organization chart of the Ontario Ministry of Agriculture, Food and Rural Affairs



As shown in the graph above (Figure 8), provincial governments also have divisions dedicated to agricultural finance corresponding to those in the federal government office. The provincial and the federal government cooperate in many aspects regarding the effective cooperation of finance and agriculture. Together they fulfill their functions of guidance and supervision.

3.1.3. The Netherlands

The main farmer cooperative finance organization in the Netherlands is the Agricultural Cooperative Bank, which resembles a farmer finance cooperative or credit cooperative and its mandate is to provide credit support and other financial services to its members. A famous example would be Rabobank, which is a farmer cooperative bank that started as a farmer credit cooperative. Currently, 90% of the credit used by farmers in the Netherlands comes from farmer cooperative banks.

To facilitate farmers' financing, the Dutch government also established the Agricultural Guarantee Fund institutions after World War II in order to provide

guarantee service to farmers who borrow from the bank. An Agricultural Security Fund was also established by the government to help those hit by natural disasters (Fan, 2009).

3.1.4. Japan

3.1.4.1. Evolution of agricultural finance institutions

The Japanese Government's investment support for agricultural development is abundant, accounting for over 40% of the total investment in the national economy. The investment takes the form of subsidies and low-interest loans. Subsidies are managed by specialized institutions and target rural land infrastructure construction and machinery and equipment purchase. Long-term low-interest loans were provided by the government to support the structural reform of agriculture, while short-term loans for agri-food product distribution and low-interest loans for agricultural cooperatives to support modernization were also made available. Beyond these, the Japanese government also implemented price subsidy policies for agricultural products. Over 70% of agricultural products receive price support from the government.

Commercial finance is separated from policy-based finance in Japan, and this is true for agricultural finance too. The Agricultural, Forestry, and Fishery Finance Corporation (AFFFC) is a policy-oriented agricultural financial institution fully funded by the Japanese government. Founded in 1953, it provides production support to producers in the agriculture, forestry and fisheries sectors in the form of low-interest, long-term capital when they fail to receive adequate finance from the Central Cooperative Bank for Agriculture and Forestry (CCBAF) or other financial institutions. It was reorganized into the Japan Finance Corporation (JFC) and the Agricultural, Forestry, and Fishery (AFFF) Unit in October 2008. As a public corporation wholly owned by the government, JFC is a comprehensive government-affiliated financial institution. JFC meets the capital and service demands of farmers and agricultural corporations that are in the process of modernization, whose demands would otherwise go unmet by commercial financial institutions. Public finance provides full funding for its operation. It provides direct loan services and operates with entrusted institutions.

The Japanese Agricultural Cooperation (JA) is a type of farmers' cooperative for economic development and played an important historical role in Japan's agricultural development. It was established based on the Agricultural Cooperation Act of 1947. In less than 3 years, over 4,000 local JA's around the country were established and over 99% of farmers participated (Li et al, 2002).

In the 1950s, the focus of agricultural policies in Japan was to maintain the economic status of self-employed farmers, so JFC provided a "self-employed farmer protection" loan. After the 1960s, the focus of credit turned towards structural adjustment of agricultural production and support of processing and distribution of agricultural products. In the beginning of the 1990s, when the Japanese agricultural product market became more liberalized, JFC set up a "Specified Agricultural Products Processing Fund" to direct investment and strengthen the competitiveness of domestic agricultural products (Liu, 2013).

3.1.4.2. The system of agricultural finance

The current agricultural financial system in Japan is comprised of the policy-oriented system, JA system, and the private sector. JA, which is a corporation in nature, is the dominant player while governmental policy-oriented financial institutions act as important supplements.

Policy-oriented agricultural finance involves fiscal appropriation, credit, and other investments devoted to agriculture under the central and local government frameworks. They provide farmers with long-term, low-interest loans via directly-owned financial institutions, or subsidies and guarantees for this type of loans provided by other financial institutions. The financial services provided by the policy-oriented financial system include the following: 1) Financing via JFC. The JFC originally offered long-term, low-interest loans targeted at land improvement, afforestation, fishing port construction, and other infrastructure construction. Its coverage gradually expanded to include small and medium agricultural enterprises (SMAE) and comprehensive infrastructure development. 2) Interest subsidies provided by the central and local government public finance institutions to agricultural finance institutions and other institutions. It aims to meet the financial demand for agricultural modernization, especially for the construction of individual and public facilities and agricultural machinery and equipment. 3) Other fiscal subsidies, including aid for natural disasters, popularization of new technologies, etc.

JA organizations can be divided into two categories: general JA and specialized JA. While specialized JA features their expertise in particular industries, general JA engages in credit, buying and selling, mutual assistance, among other operations. The Joint Association of Agricultural Credit Cooperative (JAACC) is one of the general JA's responsible for agricultural finance. It utilizes the funding from deposits in the JA system and also the funding collected by the Joint Association of Mutual Assistance Cooperative (JAMAC) from insurance services to issue loans and provide credit guarantees to its members.

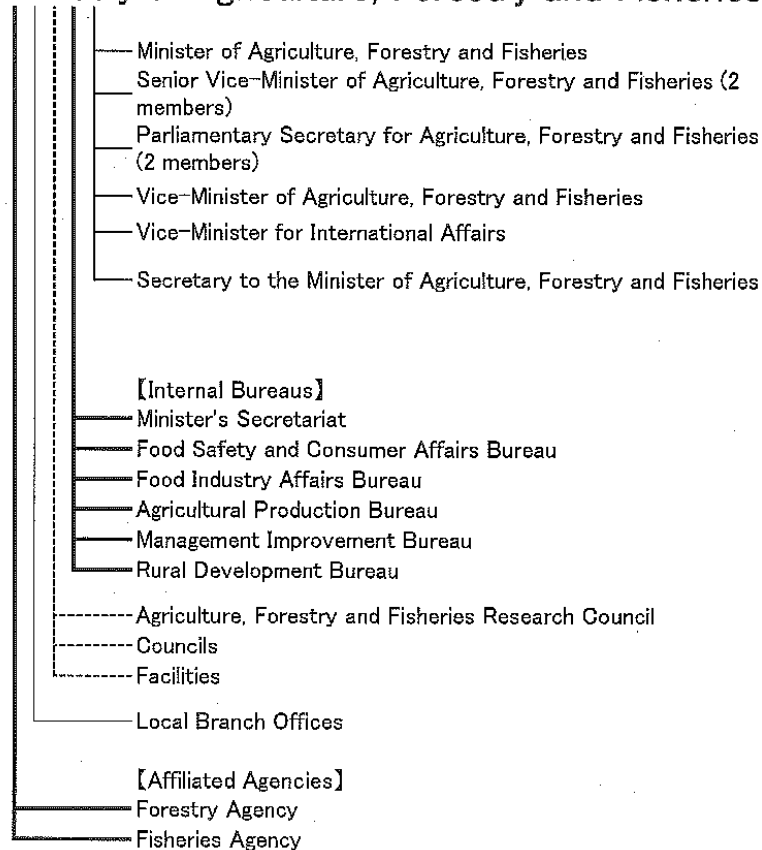
And the JA finance system consists of three levels – the ground level of local JA credit offices in cities, townships, and villages; the intermediate level of JAACC in prefectures; and the top level JFC. Under the coordination of JAACC, local JA credit offices collect deposits from farm households and issue loans. They are required to turn in their surplus funding to upper levels of JAACC in the form of deposits and cannot transfer them to institutions outside of the JA system. As the deposit interest in JA is usually higher than other banks, their service network has a wide coverage in rural areas, and the officers provide on-site services regularly, which attracts large amounts of farmer deposits – over 50% of all farmer deposits (Nie & Xu, 2008). JAACC therefore serves as a link – on one hand, it collects the surplus funds of some local JAs and provides loans to others who are short of funding; on the other hand, it turns its own fund surplus in to JFC and receives funding when there is insufficient funding. The JFC leads financial operations within the JA. It not only takes responsibility for internal fund distribution, but also engages in external financial operations with institutions outside the system – issuing agricultural and forestry bonds, conducting foreign exchange services, and connecting the JA financial system with national finance, commercial banks, and other financing institutions.

Private commercial institutions outside of the JA financial system assume a relatively small share in the modern agricultural finance system. The amount of loans issued by private institutions accounts for only 3% of all agricultural loans offered in the country. In 2008, financial institutions in the JA system issued 89% of all loans related to agriculture. Among them, 7% came from JFC.

The advantage of the agricultural finance system in Japan is the integration of cooperative financial institutions within national agricultural modernization development and policies. It has a relatively fixed service area, adequate information resources, and strong directional guidance. In addition, cooperatives in various levels have reasonable flexibility and autonomy of operation, which is also conducive to governmental support to basic industries. The disadvantage of this system is its limited service coverage, low profit margin, overdependence on favorable policies, and pressure on public finance.

Below (Figure 9) is an organization chart of the Japanese Ministry of Agriculture, Forestry, and Fisheries (MAFF). Issues related to agricultural cooperatives, finance, and insurance are supervised by the Management Improvement Bureau under MAFF.

Ministry of Agriculture, Forestry and Fisheries



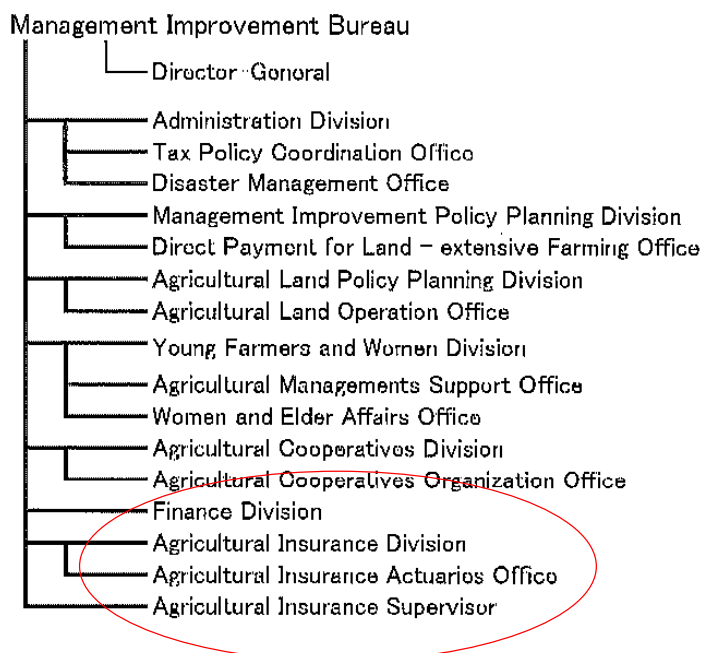


Figure 9 Organization chart of the Ministry of Agriculture, Forestry and Fisheries & the Management Improvement Bureau

(Source: Official website of Japanese MAFF, www.maff.go.jp/e/)

3.2. Major players and case studies

3.2.1. Banks

Expanding the service network coverage of banks is important for agricultural finance. In developed countries, most banks have established service branches in rural areas. Local credit officers have a better understanding of the situations and have long-term relationships with farm households. Deep and comprehensive knowledge of a farm's assets, credibility, and business operations significantly decreases the costs of financial services and loan monitoring, which is conducive to better and broader bank services provision in rural areas. As an example, out of over 8,000 banks in the U.S., more than 5,000 of them are community financial institutions serving the counties.

Case Study Rabobank, the Netherlands

Rabobank is a cooperative bank rooted in agriculture and originally consisted of several rural credit cooperatives. It was initiated as a bank “of farmers themselves” and now still occupies 85%~90% of the agricultural finance market and around 40% of SMAE services in the Netherlands. Benefiting from its solid experience with rural services and strong rural clients base, Rabobank offers relatively low loan rates to farm households.

Rabobank is divided into 14 specialized departments based on their functions, including property, insurance, capital management, etc. The design of financial products in Rabobank involves the careful consideration of the needs of various farm households and takes a balanced approach to farmers within the whole value chain, so as to bridge capital and services among farmers, cooperatives, processors, and

retailers. The capital loans and production funds thus diversify risks and increase liquidity along the chain. Moreover, Rabobank receives strong support from the Dutch government, including tax deductions, approval for conducting mixed operation, and the right to issue bond financing, which are essential to its success (Wang & Song, 2008).

3.2.2. Cooperative financial institutions

Helmberger and Hoos (1962) first developed the mathematical model for agricultural cooperatives, regarded as a milestone for theoretical research on cooperative economics (Sexton, 1995). The establishment of the first cooperative financial institution can be traced back to 1864 when Raiffeisen founded the Raiffeisen Bank, a saving and lending cooperative in Germany. He was the first to introduce the concept of “self-assistance” for the development of saving and lending services in urban and rural areas. He also set up some operation regulations that are still applied today (Ingalsbe & Groves, 1989).

Since 1988, traditional cooperatives in the U.S. were reorganized into “new generation cooperatives” (NGCs). They kept most of their traditional characteristics, but gave more emphasis to value-adding production. Members of NGCs enjoy the rights of product marketing in proportion to their share of investment and these rights can be transferred among fellow members. Additionally, the membership is closed to outsiders. This operational strategy makes the coherence of NGCs very high and their market competitiveness very strong (Cook, 1995). This transformation can also be seen in other developed countries such as Canada.

Case Study *The agricultural cooperative system in the U.S.*

A special management system different from that of commercial banks was established for agricultural credit cooperatives in the U.S., including an independent monitoring institution (Bureau of Credit Cooperative Administration), industry self-disciplinary association, capital liquidation center, and mutual-assistance insurance institutions. These institutions provide strong support for the operation, information enhancement, capital management, and risk diversification of credit cooperatives.

Besides, the success of agricultural credit cooperatives in the U.S. has several characteristics: 1) Initiated by the government and operated by the private sector. U.S. Credit cooperatives were mostly founded by the government and enjoyed favorable policies to ensure their healthy development. After they became strong enough to support themselves, the government sold the shareholdings gradually to cooperatives and farmers and helped them to become real farmer group-run cooperatives. 2) Developed independently and enjoy favorable policies. The government does not intervene in the operation and management of cooperatives, and allows them to form joint cooperatives voluntarily. Favorable policies include tax exemptions, requirement-free deposit reserves, and federal bond purchase approval (Cheng, 2005).

3.2.3. Private companies

Case Study *ADM Company in the U.S.*

The Archer Daniels Midland (ADM) Company is a large-scale agricultural production corporation. Its net sales in 2010 reached 62 billion USD and net profit, 1.9 billion. It is one of the world's largest companies processing oil seeds, corn, and wheat. And its businesses have expanded to achieve very wide coverage in recent years, including expansion into the nutrition industry, grain storage, transportation and logistics, etc. It has over 270 manufacturing factories scattered in more than 60 countries around the world. ADM sticks firm to the "whole value chain" strategy, which centers around food and closely connects all links from farm gate to the table. It has established a compressive value chain of "production-transportation-processing-transformation-delivery-marketing and sales" after over 100 years of development. As a result, the scale of ADM's production has greatly expanded and a wide coverage of geological locations is now reached. Their market share and product variety are also drastically improved.

ADM has 4 subsidiary companies who engage extensively in finance and are devoted to the provision of such services as agricultural production management, trade of futures, risk management, and investment consulting. The comprehensive financial system serving its value chain not only extends the scope of products and services, at the same time, it provides strong support to information and capital to various links within its business line (Li, J.M., 2007).

3.3. Lessons for China

1) Establish comprehensive legislation and regulation for agricultural finance to ensure the effective use of policy-based funding. The U.S. is a good example for developing comprehensive legislations for agricultural finance. For example, the 1916 Federal Farm Credit Act established the foundation of policy-based finance for agriculture. A series of amendments and new regulations were issued afterwards and strengthened the relevant institutional design. After the New Deal in 1933, over 40 agricultural legislations were enacted to ensure its orderly, independent development and avoid diversions caused by administrative interventions and administrative transitions. In the twelve agricultural credit regions, policy-based financial institutions operate independently with supervision under the farm credit management bureau.

2) Clear and detailed division of labor inside the financial system. For example, although the policy-based financial system in the U.S. is both large and complex with various institutions, these have distinct service targets and are therefore relatively efficient. For instance, the machinery and equipment loans provided by cooperative banks played a vital role in basic agricultural mechanization in the 1940s to 1950s, and greatly boosted agricultural labor productivity; while the Commodity Credit Corporation focused on the distribution of agricultural products and adjustment of prices through finance instruments and therefore the amount of outputs. It helped to manage the widening gap between increasing productivity and the shrinking consumer market after World War II as well as the shock of price declines on small and medium farm households that resulted from the widened price disparity between industrial and agricultural goods. This clear division of responsibilities promotes efficiency gains through targeted services, and by preventing credit cost redundancy and responsibility negligence.

3) Efficient and flexible administration. Flexible administration based on local

conditions is very favorable for the effective use of agricultural credit capital. For example, a regional farm credit commission is established in each of the 12 farm credit regions, under the supervision of the federal credit commission. These regional institutions follow the general principles set by the federal commission and design their own policy details based on specific local conditions. They also supervise the implementation of various policy-based financial institutions. This is an effective and timely way which gets around the difficulties caused by variety in regional situations, seasonality, and other factors.

4. Mechanism of Agricultural Finance Support in Developed and Developing Countries

4.1. Public finance expenditures in agricultural finance

Public finance investment is the most important agricultural financial support mechanism available to developed countries and involves government provision of full or a major share of funding for national policy-oriented financial institutions targeted at agriculture. For example, in the U.S., the Federal Land Bank and Cooperative Banks were both initially fully funded by the government; operational funding of the Commodity Credit Corporation was also offered by the national treasury. JFC in Japan is also financed by the government's fiscal investment and loans project. The coverage of credit support, interest discounts, and other features of these institutions are closely connected with government policies. Their mandate is not profit maximization; instead, they adjust their service targets and objectives according to the changing situation of domestic agricultural development and of the external environment.

Public investment of the U.S. government focuses on long-term, large-scale programs, policy-based subsidies, and large agricultural infrastructure, having very strong policy orientations and wide coverage. Examples include food and nutrition programs, insurance and subsidy, environmental protection, and rural infrastructure construction. Major policies of the U.S. government: 1) monitor and supervise agricultural production through the establishment of specialized service and management institutions, to ensure fair prices for producers and consumers and stabilize the market environment. Many offices under USDA offer market information in a timely and effective manner, and provide necessary agricultural standard guidance as well, promoting the production and export of domestic agricultural outputs. 2) offer a number of favorable incentives in finance and tax benefits for farmers, especially preferential policies for agricultural credits.

Large amounts of subsidies are granted to agriculture in the U.S. These subsidies come along with specific programs that are stipulated in the Farm Bill. Current agricultural subsidies are imbedded in price-income support programs, aiming at helping the farmers to cope with market price risks and income risks.

Another focus of public investment is the support of research and development of core technologies, including agricultural biochemical products, breeding, machinery, value chain development, etc. Governments of developed countries usually carry out targeted, specialized development programs to promote technology R&D in research

institutions, universities, and the private sector. Comprehensive coverage with detailed programs help to ensure the effective allocation of funds, and often times the governments offer initial funding for commercialization of research outputs.

Also, although the provision of public goods through public investment enables the profitability of private investment, a crowding-out effect on private investment can also result from public investment via macroeconomic effects, for example. As a result, the net effect of public investment on private investment is not always positive. Additional research is needed to both better determine the nature of this effect, and expand the evidence base to a wider variety of settings (Mogues et al. 2011).

4.2. Agricultural loans

In agriculture, the presence of risk in loan transactions is one of the most important factors affecting supply and demand and it is revealed in the influence of borrower collateral status on the outreach of financial services. Farmer borrowers' lack of access to eligible collaterals impedes the entry and deepening of formal credit services in the rural environment and limits the development of agricultural finance (FAO, 1996).

Difficulties in meeting banks' collateral requirement can arise for two reasons, either they do not have any asset to offer as collateral or their assets are not acceptable to the bank. In both cases, banks have tended to reject loan applications. Approaches to alleviating this issue fall into two categories: "no-collateral" strategies and "with-collateral" strategies (Hishamunda & Manning, 2002).

4.2.1. "No-collateral" strategy

A major no-collateral strategy involves group lending, which has achieved great success worldwide, e.g. the programs carried out by the Grameen Bank in Asia and similar initiatives by the Green Bank working in Sub-Saharan Africa. Village banks and solidarity groups are the two other popular modes used to tackle the problem of collateral. In the village banking approach, an institution goes into a village and organizes a group of members which then functions as a bank. Group members select a management committee, which is trained to run the bank. In effect all members of the group are fully accountable for the loan.

Another source of agricultural credit without collateral is the government lending institution. An example would be the FSA in the U.S. FSA retains responsibility of government loans targeted at agriculture. It provides credit resources for marginal farmers who are unable to get loans from private commercial banks and helps them with operational credit needs, such as purchasing livestock, feed, machinery and equipment, etc.

4.2.2. "With-collateral" strategy

Now we present an overview of alternative collateral options that are commonly used, based on a synthesis publicized by FAO (FAO, 1996).

4.2.2.1. Conventional Collateral

- Endorsement

Endorsement means the signing of documents in which the borrower or a third party places on record the security of the loan. This entails low transaction costs for the borrower but introduces additional costs for the lender if the endorser has no proper credit record or proven creditworthiness.

- **Mortgage of land**

Land owners in the most developed countries have clearly recognized boundaries of their assets and are entitled with revenue distribution and disposal rights. Thus they enjoy full rights of land transfer, leasing, guarantee, inheritance, etc. For example in the U.S., the Federal Farm Loan Act and Farm Credit Act have set detailed regulations for farmland loans and guarantee procedures, setting specific rules for the eligibility of borrowers and usage of loans (farmland, agricultural production equipment, input, livestock, etc), as well as the limit, term, and interest rate of loans (Zhang, 2007).

Meanwhile in many developing countries around the world, land titles are not clear. If the land is government owned or common land, to which no individual or group of individuals holds title, then, although the land has a value, it cannot be used as collateral for raising a loan (Hishamunda & Manning, 2002). Meanwhile, the option of titling the land can be politically and socially sensitive as the change is likely to involve conflicts of interest, transaction costs and friction (Platteau, 1992).

- **Pledging of Agricultural Assets**

The main advantage of the use of pledging movable assets is that almost all rural producers own some asset or crop that they can offer as security. Moreover, almost all assets that can be pledged are salable.

- **Guarantee Funds**

Guarantee funds constituted by borrowers or third parties (government, NGOs, etc.) intended to reduce the lenders' loan portfolio risks and replace or supplement other collateral. It has the advantage of being appropriable and access to liquidity funds from which the lenders can cover the risks of the loan transactions.

- **Agricultural Insurance**

Agricultural insurance does not constitute a collateral in itself, however development banks are using insurance against various types of weather catastrophes as a prerequisite for the provision of farm loans. This type of mechanism, as in the previous case, seeks to supplement or replace the demand for real collateral from rural producers.

4.2.2.2. Non-Conventional Collateral

- **Non-Conventional Pledges**

Non-conventional pledges refer to the pledging of livestock or smaller animals and household electrical appliances that are normally not accepted as pledges by commercial banks or development finance institutions. Non-conventional pledges have the advantage that most rural producers possess goods that can be used to constitute this kind of collateral at no great transaction costs to the borrower.

- **Common Group Funds**

Group funds combine the mechanism of solidarity groups with that of guarantee funds. Each one of the members of a solidarity group contributes money (or sometimes other

assets) to a common fund that serves as collateral for loans to all group members. This fund is deposited into an account that is blocked by the lender, so long as the loan contracts are in force and may be used only to recover unpaid loans.

- **Blocked Savings**

Blocked savings are savings that the borrower gradually and continuously deposits into an account, until a certain amount has been accumulated that will serve as collateral for a loan. Once the loan is made, similarly as in the case of the group funds, the savings will remain blocked or frozen, while earning interest until the loan has been fully repaid.

- **Solidarity Groups**

Solidarity groups are constituted by persons who have access to loans and often also training services. The members of the group collectively secure the debt service, and the access to subsequent loans depends upon the prompt repayment of the previous loans by all group members. The loans can be granted to the group as a whole or to each member individually and the repayment obligation can be assigned to the individual members or to the entire group.

- **Expected Revenues**

In some developed countries, expected revenues is emerging as a new option of collateral for applying for loans. For example, the U.S. Farm Bill validates the eligibility of agricultural products as guarantee for agricultural loans, based on protective purchasing prices.

- **Warehouse Receipts**

Warehouse receipt finance is a proven instrument for actors in the agriculture sector to obtain finance that is secured by goods deposited in a warehouse, and based on a receipt for the stored goods issued by the warehouse operator. It is especially interesting for rural small and medium enterprises (Höllinger, Rutten, & Kiriakov, 2009).

- **Endorsement by Grassroots Organizations**

In this case, the financial institutions request the endorsement of the organization to which the borrower belongs, as a means of replacing the required information about the borrower's credibility and his willingness to repay. It operates well for the selection of borrowers and loan collection, but not for the monitoring of loans when there are a large number of members in the organization.

- **Interlinked or Trade Related Credit**

This modality is used by traders. A loan is granted, tied to another trade related transaction between the lender and the borrower; the terms of both transactions are generally set at the same time. Faced with a failure in the main trade transaction, the lender can normally only take action with regard to future loans and trade related transactions. This is similar to the mechanism of value chain finance, which will be discussed in detail later (Hishamunda & Manning, 2002).

- **Government loan guarantees**

Government loan guarantees are used to encourage the establishment of commercial aquaculture in several OECD countries (Ridler and Hishamunda, 2001). They work as

a substitute for collateral, as the risk of the borrower defaulting is shifted to the government and, thus, to the taxpayer. However, if a government is to be able to sustain such guarantees, then it must minimize the extent to which it is asked to honor its guarantees. This means that the government would face the same trouble ensuring that loans are repaid as the banks would have collecting them. If it does not do so, the payments of guarantees to the banks become a drain on the public purse and subject to possible political attack. The existence of loan guarantees can undermine the determination of the borrower to repay the loan (Fleisig, 1995).

Case Study *Bulgaria Experience with Collaterals of Agricultural Loans*

In Bulgaria, the biggest constraint for agricultural lending is absence of suitable collateral. Many rural assets have a low collateral value and are difficult to monitor, foreclose and liquidate. In addition, banking legislation encourages banks in their conservative attitude towards collateral (FAO, 2005).

The government then introduced a number of legal and institutional reforms aiming at enhancing the use of rural assets as collateral and streamlining the processing and foreclosure of claims. After hard efforts, the land restitution process is completed and most agricultural land is privately owned,³ although the problem of scattered ownership among numerous heirs resulting in fragmentation of land remains. In spite of these improvements, agricultural land is normally not accepted as collateral, mainly because of the low levels of sales transactions on rural land markets and low prices for agricultural land. In the face of these difficulties, the government tried to stimulate land markets by establishing a market information system (FAO, 2005).

Meanwhile, moveable assets are accepted by some financial institutions as collateral, but are valued at very low prices. The large number of cows and other animals on small and medium sized farms suggest that many farmers might be in a position to offer these as loan collateral (FAO, 2005).

The system of warehouse receipts, pursuant to the Grain Storage and Trade Act, provides an alternative in short-term lending to grain producers, traders and processors by using stored grain as collateral. The warehouse receipts, issued by private licensed warehouses, constitute an effective mechanism for stored grain to be used as collateral for short-term loans. By using their grain as collateral, grain producers and processors thus enjoy greater flexibility in choosing the best time of sale. Financial institutions accepting warehouse receipts as collateral have the advantage of the high security ensured by the professional management of the licensed warehouse and the continuous control by the supervising agency.

4.3. Agricultural insurance and reinsurance

4.3.1. The global picture

Total annual agricultural insurance premiums worldwide amounted to approximately US\$20 billion in 2007. More than half of all countries—104 countries—offered some form of agricultural insurance in 2008 (Mahul & Stutley, 2010). Geographically these

³ In 2000, 98% of the land has been returned to its legal owners who have received legal documents of ownership

insurance premiums are concentrated in developed regions, i.e. in North America (55 percent), Western Europe (29 percent), Australia and New Zealand (3 percent), while Latin America and Asia account for 4 percent each (Roberts, 2005).

In 2008 the World Bank conducted a survey on agricultural insurance programs in 65 countries, covering more than half of the countries, at all stages of development, that are known to offer agricultural insurance. Results from the survey indicate that premium subsidies are the most common form of public intervention in agricultural insurance. Almost two-thirds of the surveyed countries provide premium subsidies, which usually cover around 50 percent of the original gross premium. Governments also provide public reinsurance, subsidies on administrative and operational expenses, and loss adjustment subsidies.

Agricultural insurance takes a long time to develop and its development increases with a country's general economic development. The United States and many European countries have had agricultural insurance for more than a century and have developed mature markets with high penetration rates. In developing countries, agricultural insurance started with multiple peril crop insurance programs (MPCI) provided by the public sector, which underwent major growth during the period of 1950–90, particularly in Latin America and in Asia. However these programs did not perform well. Since the 1990s, most developing countries witnessed a shift from public to market-based agricultural insurance, which was promoted by governments through the commercial insurance sector, often under public-private partnerships (PPPs) (Mahul & Stutley, 2010).

As of 2008, private insurance providers operated in 54% of the surveyed countries, of which PPPs were implemented in 37%. Coinsurance pools, usually relying on PPPs, have been established, mainly in middle-income countries, as a way to strengthen the supply of agricultural insurance. PPPs in agricultural insurance tend to improve the financial performance of government-sponsored agricultural insurance programs. Reasons include better implementation of insurance principles, such as sound underwriting procedures and better pricing of risk; lower administrative costs; and greater financial discipline of private insurers (Mahul & Stutley, 2010).

In two-thirds of the surveyed countries, the provision of agricultural reinsurance is by private reinsurers. In another 22 percent, agricultural reinsurance is provided by both public and private entities. Some countries, such as Japan, rely only on public reinsurance. Public sector support to reinsurance is higher in high-income than middle-income countries. Forms of support range from national reinsurance companies to agreements under which governments act as excess-of-loss reinsurers. Governments can also provide support with legislation and research, development, and training (Mahul & Stutley, 2010).

Agricultural insurance includes the following major categories: 1) single-risk insurance, covering against one risk, e.g., hail, earthquake, etc.; 2) combined insurance, combining and covering several risks; 3) yield insurance, providing guarantee based on regional average yield or on individual historic yield; 4) income insurance, taking consideration of yield, price, and also costs in the whole-farm income; 5) revenue insurance, combining yield and price risks coverage and can be product-specific or whole-farm. Other categories also include whole-farm insurance,

index insurance schemes, etc. (OECD, 2008).

While income and revenue insurance schemes are most popular in the U.S., a wide range of agricultural insurance schemes based on different approaches exist around the world.

4.3.2. Rationale

The agriculture sector is very vulnerable when exposed to adverse natural events, such as droughts or floods, as well as market risks, such as seasonality and volatility. A number of risk management strategies and financial tools have been developed to cope with these adverse events, among which agricultural insurance plays a major role. It is an important tool for boosting rural economic development and the modernization of the agricultural sector, because it helps transfer excessive agricultural risks to a third party and increase access to credit and the adoption of high-yielding activities (Mahul & Stutley, 2010).

Increasing Access to Credit

Access to credit is severely restricted for many farmers, due to a variety of constraints including high transaction costs, high probability of default risk and covariant risks, lack of collaterals, big volatility of production and price, etc. The challenge of limited access to credit aggravates the vulnerability of farmer households in the face of unexpected income shocks.

Agricultural insurance offers techniques for identifying, assessing, and reducing risks, and could provide an incentive for commercial banks to meet the growing demand for agricultural credit. It also increases the creditworthiness of farmers and other actors along the value chain in the agricultural sector. It eases the financial instability at the farm level that arises from yield or price shocks and that thus leads to higher stability on subsequent segments including processing and marketing.

Linking insurance to loans in the agricultural sector is a common practice in many countries. Specifically, government-sponsored agricultural programs in developing countries are usually linked to credit, such as in India.

Facilitating the Adoption of Higher-Yielding Activities

To reduce the high risk of income loss, farmer households commonly diversify and adopt low-risk activities or technology, which usually have low average returns. However, agricultural insurance can help farmers invest in more profitable activities, which may also be riskier, because insurance facilitates the transfer of excess risk to a third party. The promotion of agricultural insurance as an instrument for risk transfer is favored by many governments attempting to modernize their agriculture.

In the context of climate change, insurance can also facilitate the adoption of adaptation activities. In India, for example, farmers in Andhra Pradesh were encouraged to shift from rain-fed crops to livestock as a way to better mitigate the impact of recurrent droughts on their livelihood, and a livestock insurance policy was especially designed for those farmers (World Bank, 2006).

4.3.3. Insurance in developed countries

4.3.3.1. U.S.

The U.S. agricultural insurance policies are delineated by the insurance acts. The 1994 Insurance Act strongly promoted and popularized agricultural insurance products for revenue and income. After the 1996 Farm Bill, even more emphasis was given to agricultural insurance. Additionally, the implementation of countercyclical payments from the 2002 Farm Bill became an important public tool for market risk management.

Agricultural insurance plays a vital role in risk diversification, loss compensation, productivity improvement, and income support. It is crucial to the development of agriculture in the U.S. (Liu, 2004). The system is controlled, managed, and subsidized by the government, and operated by private insurance companies. It is jointly-operated by the government and the market, which encourages flexible models, varied products, and initiative from farmers and commercial insurance companies. Statistics from 2012 show that nearly 300 million hectares are insured and the amount of total premiums is over ten billion U.S. dollars. The total value of crops insured exceeds 100 billion dollars (USDA, 2013).

The first insurance regulations came with the 1938 Agri-product Insurance Act and the establishment of the Federal Crop Insurance Corporation (FCIC), a government-owned corporation established under USDA to implement the insurance programs. The insurance only covered a single product (wheat) at the time and the maximum limit was 50% ~ 70% of average output. It covered losses from drought, flood, hail, storm, and other adverse weather conditions in the form of wheat product or cash. Agricultural insurance products in the U.S. developed slowly during this era because of the low participation rate associated with the limited coverage and high premiums prevalent at the time (Liu, 2004). The enactment of the Federal Crop Insurance Reform Act of 1994 dramatically restructured the crop insurance system, expanded the scope of the crop insurance program by authorizing a new catastrophic (CAT) coverage level offered to farmers, and implemented a series of benefit programs, including a mutual assistance and reserve program, a price support, production adjustment program, etc. In 2000, the Agricultural Risk Protection Act further increased the share of subsidy to crop insurance premiums and the average subsidy rose to 53%. Over 100 types of crops were eligible for insurance and more than 800 thousand hectares were insured, taking up 76% of insurable land. Around 65% participated in the insurance program at the time (Zhou, 2010).

Management system and major players

Agricultural insurance companies in the U.S. are privately owned but are subsidized by and benefit from public reinsurance schemes. Private companies who wish to perform agricultural insurance services need to apply and undergo strict screening before they are authorized to provide services. There are 17 companies currently authorized by USDA in insurance businesses (Ace Property & Casualty Ins. Co.; Hartford Fire Ins. Co.; Rural Community Ins. etc.). They cooperate with the Risk Management Agency (RMA) under USDA. RMA regulates the premium rate and calculation formula of indemnities, manages the subsidy for operation and administrative fees, approves every insurance product, and provides reinsurance to

private insurance companies. These functions are performed through FCIC under RMA (USDA, 2013).

Thus, the operation of U.S. federal crop insurance is conducted in three hierarchical tiers: the first tier being the FCIC, the second tier being the authorized private insurance companies, and the third tier being insurance agents and loss inspectors. FCIC does not involve itself in the direct operation of crop insurance businesses, but instead defines rules, enforces auditing and monitoring, and invests in reinsurance schemes. FCIC's mission is to expand coverage and meet farmers' needs to the maximum extent possible. Products are sold by licensed private insurance companies, who are incentivized to provide crop insurance services because they can receive premium and operation subsidies as well as other support from the government. This way, the government transformed its role from that of direct involvement to complementary support. At the same time, in order to raise the participation rate, the government has allowed insurance policies to feature a combination of voluntary compulsory insurance. Taking advantage of these measures, agricultural insurance in the U.S. now enjoys wide coverage and a large total premium. In Crop Year 2012, the total premium amounted to \$11.1 billion, total crop value insured was \$117 billion, and total acres insured reached 282 million⁴.

Government subsidies are the primary modality for promoting agricultural insurance, and include 1) full subsidy for the catastrophe insurance schemes: 40% for the production of high-risk crop and income insurance; varied percentage of support to other types of insurance schemes; 2) 20% to 25% subsidy for the operation costs of private insurance companies; and 3) subsidy for extension and education costs of insurance companies to promote insurance participation (Zhang, 2012). Such subsidy not only ensure the profitability of private insurance companies when operations are successful and total indemnity is low, but also prevents these companies from having to face unbearable losses when circumstances are unfavorable. Meanwhile, the government provides reinsurance for the insurance schemes sold by private insurance companies, offering them a good basis to reasonably predict possible losses and thus increase their willingness to enter the market. A diagram describing this relationship is shown as below:

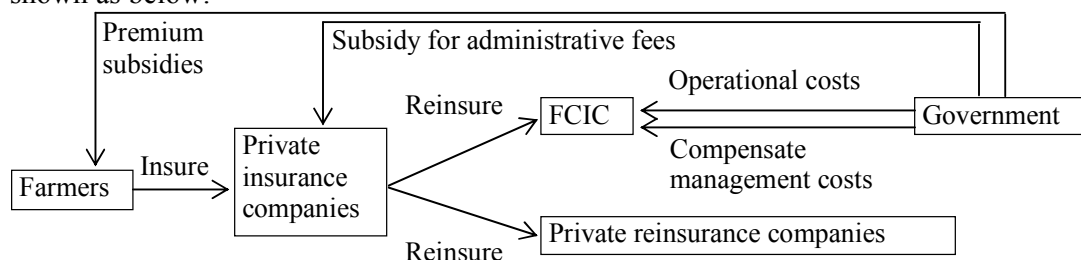


Figure 10 The operation of the U.S. agricultural insurance system

Insurance products in the U.S.

Four major categories of agricultural insurance can be found in the U.S.: yield, revenue, regional, and special crop insurance schemes. Each type of insurance has a corresponding premium subsidy rate that ranges from 55% to 85%. Yield insurance

⁴ RMA statistics, <http://www.rma.usda.gov/pubs/rme/aboutrma.pdf>

used to be the most popular type. The coverage of yield insurance has a wide variety of protection levels and thus different premium rates. This type of insurance cannot compensate for price volatility risks, so in recent years more farmers have turned to revenue insurance.

Revenue insurance is very important in the U.S., with 73% of the all premiums collected coming from this type of insurance. There are a variety of revenue insurance schemes, though the three standard ones are Crop Revenue Coverage (CRC), Revenue Assurance (RA) and Income Protection (IP). There are set formulas to calculate indemnities based on Adjusted Gross Revenue (AGR), which uses grower's historic tax information as a basis to calculate the level of guaranteed revenue. All these revenue insurance schemes cover main field crops such as corn, soybeans, wheat, rice and cotton. And there are specialized livestock insurance schemes with similar natures as well. One main characteristic of the U.S. insurance products that offer price risk protection is the use of the futures market price as a reference price. They therefore provide coverage against intra-annual price fluctuation (OECD, 2008).

a) Catastrophe insurance

Catastrophe insurance, although introduced as early as 1938, did not gain popularity for a long time. This was mainly due to the negative impact of a "special aid program" also designed for assistance to catastrophe-stricken farmers. The Federal Crop Insurance Reform Act of 1994 called off this program and set out formal, specific regulations for catastrophe insurance. Its principles are wide coverage, low protection, and low premiums. It only provides 50% protection based on the 4-year average output and compensates based on 55% to 60% of market price. And the premium is as low as 600 dollars per year. In addition to this basic choice, a more protective but more expensive choice is also offered, which provides 65% to 75% protection on output and 100% on pre-decided price. The premiums for this type of insurance differ depending on risk evaluations, which are based on the type of crop, regional differences, etc. The U.S. government provides full subsidy to catastrophe insurance schemes, which means that the losses of farmers are fully covered by the government (Zhou, 2010).

b) Index insurance

Index insurance schemes are unique because the indemnities are not calculated from the loss of an individual farm, but from an index that is external to the farm. They are divided into two categories: area-index insurance (based directly on an area's average yield or income) and indirect-index insurance (other kind of indices, such as the temperature and precipitation indices).

The area-index insurance is usually based on the yields of a homogeneous area. If the area yield decreases below a given value, all the insured farmers in this area get an indemnity, regardless of whether they experience loss or not. An example of this is the Group Risk Plan (GRP). And another area-index insurance scheme is the Group Risk Income Protection (GRIP), which uses revenue as a reference instead of yield. In 2004, area yield and area revenue index insurance schemes accounted for 7.4 % of total acreage insured but less than 3 % of total premiums (OECD, 2008).

The most widely used type of indirect-index insurance is weather-index insurance. It was first developed in the U.S. in 1997 and became popular in Canada, where precipitations, humidity, temperature, among many other weather indices, are signed to be the basis of index insurance schemes (Zhang & Pan, 2010). This will be discussed in the following section.

4.3.3.2. Canada

In July 1959, the federal government passed the Crop Insurance Act to assist provinces in making affordable crop insurance available to producers. Under this legislation, the federal government entered into agreement with provinces on crop insurance programs. Later on the federal level, the program evolved into the Production Insurance Program, now known as AgriInsurance.

Unlike the government supported and private company operated organization in the U.S., the agricultural insurance in Canada is operated directly by the public sector, and specifically by non-profit organizations that are federal and provincial government entities. Based on the Crop Insurance Act of 1959, the federal and provincial governments jointly support agricultural insurance through the establishment of federal and provincial level institutions to conduct insurance services. Provincial non-profit organizations from the public sector directly undertake insurance operations (marketing, delivery, and services) and the operation costs are shared by the federal and provincial governments. Each province currently has either a Crown Corporation or a branch of the provincial agriculture department responsible for administering the AgriInsurance program (Agr.gc.ca., 2014). The federal government's role is to provide program oversight and to ensure adherence to various regulations.

As stated in the ongoing five-year plan (Growing Forward 2), agricultural insurance is a most important part of the policy framework on the agri-food sector. AgriInsurance is a federal-provincial-producer cost-shared program that stabilizes a producer's income by minimizing the economic effects of production losses caused by natural hazards. AgriInsurance is a provincially delivered program to which the federal government contributes a portion of total premiums and administrative costs. The federal government also provides a reinsurance arrangement (deficit financing) to provinces. Currently, five provinces (Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia) participate in the reinsurance arrangement.

AgriInsurance schemes are developed and delivered by each province in order to better accommodate the needs of the producers in that province. Production losses as well as loss of product quality and both yield and non-yield based plans are offered. The provinces have the incentives to improve their programs to meet changing industry requirements, while the directives from the federal government are provided in Growing Forward 2. In addition, these insurance plans are developed and delivered in accordance with the Farm Income Protection Act and the Canada Production Insurance Regulations and Multilateral Framework Agreements. AgriInsurance plans are offered for over 100 types of crops and cover livestock losses as well. They are available based on either individual yields or area-based yields. They are tax-free and reinsured by the government, and the subsidy for the premium is around 50%. There

are both voluntary and compulsory insurance schemes.

Strong support from the government is crucial to the success of agricultural insurance schemes in Canada. First, the Federal Crop Insurance Act of 1959 and Crop Insurance Regulations of 1991 ensured order in operations, reasonable division of labor among different actors, and popularized insurance schemes across the country. Second, the federal government established the Insurance Bureau of Canada (IBC) under AAFC in 1964. It collects data from different regions and conducts statistical analyses via in-depth investigation of agricultural production to serve as the reference for deciding the amount, terms, and conditions of the subsidy to local governments. The price setting of premiums is also based on big-data models to ensure fairness. In the meantime, IBC provides strong support to the development of provincial insurance agencies, revises insurance schemes, and supervises improvements around the country. It also reviews new products designed by insurance companies and popularizes agricultural insurance schemes.

Moreover, the federal government provides reinsurance services for those non-profit organizations engaged in agricultural insurance schemes in order to mitigate risks. It also provides subsidies for partial coverage of premiums to assist farmers and for auditing expenses to support operating organizations of insurance schemes. Federal and Provincial governments support the AgriInsurance programs by paying all administrative expenses and sharing premium costs with clients. The companies delivering the insurance products have to be supervised by the provincial government and sign agreements with the federal government (Zhang, 2012).

Index insurance in Canada

As mentioned in the previous section, weather index insurance is quite popular in Canada. In Alberta, one of the major agricultural production provinces, an insurance program called “Lack of Moisture Option” was introduced. It is an area-based Silage Greenfeed Insurance Program⁵ that compensates clients when accumulated moisture at a selected weather station falls below 80% of the historical moisture at that weather station. Several weather station sources are used to gather precipitation data and the rainfall for the current year is compared to historical rainfall (normal) patterns for the same growing period at the weather station selected to determine a claim. Coverage is available for dryland crops in all 22 crop risk areas in the province.

Similar insurance programs are also popular in other provinces such as Manitoba and Saskatchewan⁶. Another example of weather index insurance is the Corn Heat Unit (CHU) Insurance. It is an area-based program which provides protection against a lack of heat for irrigated corn, and specifically covers any lack of heat during the growing season plus a provision for late spring frost. Actual production of corn on the farm does not affect a claim payment. CHUs are calculated from temperature measured at several weather stations adjacent to the production area on a daily basis beginning on May 15. CHUs for the growing season are the sum of the daily calculations, which is based on a set of complex formulas. Premium rates are based upon historical corn heat unit data.

⁵ Website of AFSC. www.afsc.ca/doc.aspx?id=7393 and www.afsc.ca/doc.aspx?id=7395

⁶ www.masc.mb.ca/masc.nsf/insurance.html and www.saskcropinsurance.com/cropinsurance/weatherderivative

Apart from weather index insurance schemes, price index insurance for livestock loss protection is also popular in Canada. For instance, the Western Livestock Price Insurance Program (WLPIP) provides producers with a range of coverage options to help manage price risks by providing an insurable 'floor' price on cattle and hogs. It was first developed as a producer-driven initiative under the guidance of Alberta Beef Producers, but has expanded to all of Western Canada. The program is market-driven and takes into account price risk, currency risk and basis risk. An insured price is selected upfront as a 'floor' price, which acts as a protection against the market being lower than the insured price when the policy expires. If the market goes above the insured price, producers can still take advantage of the upside and sell livestock for that higher price. In either case, there is no obligation to sell livestock when the policy expires. The settlement of insurance is based directly on Western Canadian cattle/hog markets. Settlement indices are calculated weekly for each cattle program and monthly for the hog program, and are designed to reflect current Western Canadian prices, which ensure the program is responding to market conditions that producers are actually facing in their home market.

4.3.3.3. Japan

The current agricultural insurance system in Japan began with the Agricultural Disaster Compensation Act of 1947. It takes the form of a three-level mutual assistance scheme. Local organizations based in the city, township, and village level Mutual Assistance Cooperatives (MAC) are responsible for the direct provision of agricultural insurance, while the prefecture level Joint MACs provides reinsurance schemes. The government provides reinsurance for the Joint MACs and also a certain portion of premium subsidies. Thus a combined, top-down approach towards agricultural insurance supported by the government and the MAC is established. One characteristic of agricultural insurance in Japan is the combination of compulsory and voluntary programs. Producers of major crops and livestock, and those whose output exceeds a certain amount, are required to participate in the compulsory insurance programs (Lv et al., 2011). Since the share of farm households in premium payment is very small, the bulk is subsidized by the government, and there is a preexisting reinsurance scheme, most farmers and local organizations have strong incentives to participate in the insurance programs.

Strict regulations are set for the use of premiums collected in order to ensure stability and sustainability of the funds. Premiums can only be used as investments and the value added can only be used as a risk management fund and to provide some emergency compensations to the members. Premiums cannot be used to cover operational costs. They are instead covered by government subsidies and profits made from commercial insurance programs. The reasonable and controlled allocation of funds is essential for the development of agricultural insurance in Japan, and ensuring adequate funding for emergencies and preventing corruption, both of which are important incentives for agricultural producers (Liu, 2008).

4.3.4. Insurance in developing countries

4.3.4.1. India

India has over 120 million farmers. Its agriculture sector accounts for 20 percent of

GDP and is dominated by small farms, with an average farm size of 1.5 hectares. In 2005, 18 million Indian farmers were insured under the National Agricultural Insurance Scheme (NAIS).

For a country with millions of smallholder farmers, the challenge for agricultural insurance in India is to provide risk-management solutions while maintaining a sustainable system. In 1979, an area-based approach was introduced under the Pilot Crop Insurance Scheme. It paid indemnities for yield shortfalls based on the average area yield as measured by crop-cutting samples. The insurance was available on a voluntary basis to farmers who obtain agricultural loans. The practice of linking insurance to credit became a feature used consistently in subsequent schemes.

In 1985, the area-index yield-shortfall program was expanded into 16 states and 2 unions, implemented by the General Insurance Corporation of India. The program pays indemnity on the basis of a formula that integrates threshold yield⁷ and actual yield.

Although area yield index insurance is well suited for India's context, it has several shortcomings. Firstly, the area of the insurance unit is large and rarely homogenous; efforts need to be made to reduce the size of the area. Secondly, as the index is based on yield, pre-sowing and post-harvest losses are not reflected in the yield index. Thirdly, it is challenging to provide adequate infrastructure and the human resources required to conduct over a million crop cutting experiments across the country to estimate the yields of each specific crop in an area, which usually delays the payments. Moreover, yield index based insurance can only be designed for crops for which there exist at least 10 years' of historical data at the insurance unit level, thus the potential for expansion is limited. Despite these shortcomings, the area yield index is still considered a very important insurance program for India and the government is set to introduce amendments to the program to overcome some the challenges mentioned above (Rao, 2010).

Forms of government support

To better promote agricultural insurance, the Agricultural Insurance Company of India (AIC) was created in 2002 by government decree to improve the performance of the NAIS, which has been in place since 1999. The program has expanded to nearly every state and territory in India in recent years. The government's crop insurance is compulsory for borrowers of crop credit and voluntary for non-borrowers. Only about 20 percent of the farmers who purchased crop insurance are non-borrowers.

Government support to agricultural insurance in India includes the following:

- Insurance legislation
- Insurance schemes
- Support for the establishment of Agriculture Insurance Company of India
- Subsidy

Throughout its history, the agricultural insurance program in India has been heavily subsidized by both the central government and the state governments, who share the costs equally. These subsidies pass through various channels, including:

⁷ Threshold yield or trigger yield is a moving average yield of the past five years, multiplied by the coverage level, which ranges from 60 to 90 percent depending on the riskiness of the crop in a given area.

- Maintaining low average premium rates (well below actuarial rates), so as to make the insurance program widely affordable to farmers;
- Premium subsidies provided to small and marginal farmers with less than 2 hectares;
- Excess of loss reinsurance for claims with high loss ratios;
- Subsidies on the administrative and operating expenses of AIC, the national insurer.

India's crop insurance programs have undergone many changes in an effort to develop programs that serve the needs of farmers and are financially sustainable over the long run. The AIC is working to expand its market and to move toward an actuarial rating system. It is also working to address many of the shortcomings of the government program. One significant shortcoming has been the timeliness of payments. Given that it can take from six months to more than one year to estimate area yields with crop-cutting data, there are times when farmers do not receive payment before they must plant another crop. The government is moving toward blended products to address this problem. In this case, the blended product involves a more timely payment that can be made using a rainfall-index insurance and a second payment using the area-yield estimates.

A recent development is that private sector banking/insurance interests, with some advisory assistance from the World Bank, now offer other types of index insurance, e.g., weather-based index insurance, which cover non-irrigated farmers against the risk of insufficient rainfall during key parts of the cropping season. This will be discussed in a following section.

4.3.4.2. Brazil

The rural insurance system in Brazil has experienced a number of serious problems that have affected its development. One example is the gap between the value of claims filed and total premiums paid. Between 1995 and 2005, the premiums collected totaled R\$277 million and claims R\$500 million, leaving the system with a deficit of R\$223 million. The worst period was between 2003 and 2004, when floods and droughts in the south led to claims totaling R\$106 million vs. premium payments of only R\$40 million, leaving the system almost broke (Guanziroli & Americo, 2008).

One of the problems is that the system has tried to insure farmers against all types of risk in a country as large as Brazil, where the climate varies greatly from region to region. And there are also structural factors in Brazilian agriculture that increase risk, such as the limited transportation infrastructure, and the inadequate financial management practices of the farmers, due to a lack proper technical assistance.

The main obstacle to the implementation of a rural insurance system in Brazil is the lack of an efficient database that can be used to calculate productivity indexes for both family and commercial agriculture. When the data for these two categories are mixed together, lower average yields are obtained. If such figures are used as a reference for insurance purposes, the more mechanized farmers are not eligible for coverage. In Mato Grosso, for example, insurance covers only those who produce fewer than 60kg of soybeans per hectare. This leaves mechanized farmers, who produce an average of 65 sacks per hectare, uninsured. Insurance that works this way is not attractive to medium- or large-scale farmers.

Scholars and practitioners have raised proposals for the further development of agricultural insurance in Brazil. One of them proposes to work with rural insurance rather than agricultural insurance alone. To do this, an income insurance system would be developed to include and protect farmers against variations in agricultural prices, as well as climatic risks. As a counterpart, the farmers would insure all his/her income. In other words, the farmer, and not only the crops, would be insured. Should a farmer lose money on one crop and earn money on another, his total income will not have varied and the insurance, therefore, would not be used. There are, however, difficult technical-political problems that must be solved in order to adopt a system of this type. In the United States, such insurance exists, but risk is calculated based on the average earnings of the last five tax returns. In Brazil, most properties belong to physical persons, and their tax returns are neither reliable nor public.

Another solution proposed to the government was to increase the subsidy on premiums. The subsidy currently varies between 40% and 60% of the premium, with an upper limit of R\$32,000 per subsidy. This helps small- and medium-scale, but not large-scale farmers. Inasmuch as currently there are no state supported funds to protect farmers in the case of a catastrophic event, several arguments were put forth that call for the creation of a Catastrophe Fund (Guanziroli & Americo, 2008).

4.3.4.3. Vietnam

Vietnam has a long coastline and locates in the tropical monsoon region of South East Asia. Harsh weather events such as drought, flooding, typhoons and cold temperatures put smallholder farmers at risk of crop loss, which can be detrimental to their livelihoods. Promoted by MIA (The Micro Insurance Academy⁸) and under local administration, one insurance pilot scheme adopted a community-based model. The pilot is a key component of a wider program to promote innovative financing to build community resilience to climate change in coastal Vietnam.

MIA provided a comprehensive training program to Vietnamese colleagues and local government officials to administer and manage the Agricultural Community-Based Insurance Pilot, or “Agri CBI Pilot”. It was implemented in 81 villages in Nghi Loc district of Nghe An province. The target area is home to 9,500 households, and approximately 80% of these households are involved in rice farming. The Agri CBI Pilot tested the provision of rice insurance through an area yield product. It triggers a payment when the actual rice yield is less than 90% of the average yield for the last three crop seasons. In addition, farmers receive compensation if rice crops are damaged during the sowing period.

The Agri CBI Pilot is an encouraging innovation in agriculture insurance for developing countries. Several lessons can be drawn from the MIA’s experience with pilot, which include:

1. A common premium rate for all farmers has advantages in demonstrating a uniform price for risk transfer and builds equity in the program.
2. Reinsurance can provide additional protection to the community-based scheme. To reduce the possible effect on market distortion and moral hazard, subsidies for the reinsurance premium, instead of on the premium payable by farmers, might be a more

⁸ <http://www.microinsuranceacademy.org/project/nghe-an-vietnam/>

- favorable option. It ensures that equal risk exposure commands an equal premium.
3. Development of local operational and management capacity of the insurance scheme is important. It facilitates the efficient delivery of the insurance product and promotes trust among community members, which help achieve higher affiliation rates.
 4. Farmers need the insurance products that reflect their actual risk and capture micro fluctuations. Thus yield measurements should be as localized as possible.

4.3.4.4. Mexico

Crop insurance in Mexico dates back to 1926. Many of the early schemes were primary, where agricultural cooperatives often constituted special funds to cover income shortfalls caused by natural disasters. However these small-scaled funds did not work well when faced with frequent shocks. In 1961, the Aseguradora Nacional Agrícola y Ganadera S.A. (ANAGSA), a government-owned institution, started to directly retail an all risk crop insurance product with a 45-61% subsidy in the premium.

The most important feature of the ANAGSA program was linking insurance to credit on the bank level. Crop insurance was a prerequisite for getting approval for loans from the state owned agricultural development bank. Also, indemnity payments were made through the bank so that the bank could cancel outstanding debts before paying the farmer for losses. This setting made agricultural production expand into marginal, high risk areas and the loss ratios exceed 100%. The company experienced repeated heavy losses and eventually closed in 1990. Afterwards, AGROASEMEX replaced ANAGSA as the state crop insurance company. Unlike its predecessor, it operated in a liberalized market. It competed against five private companies under the same set of rules and regulations and all premium subsidies went directly to producers.

With the technical support of AGROASEMEX some 200 mutual insurance funds benefiting groups of farmers. During the decade, AGROASEMEX, offered multiple risk products for both crops and livestock. It used a premium subsidy of 30%, and diminished moral hazard problems by insuring 70-90% of total value as opposed to 100% value, as was the case with ANAGSA. As a result of the better use of modern underwriting techniques, such as deductibles to combat moral hazard, the company posted loss ratios of 78.6% for livestock and 64.6% for crops in 1999. In 2000, AGROASEMEX transformed into a second tier institution primarily providing reinsurance and secondarily working to promote and develop the industry by providing technical assistance to the mutual funds, and developing innovative instruments (parametric and catastrophic bond products). Since 2000, AGROASEMEX has been profitable (Wenner, 2005).

4.3.4.5. Innovation in agricultural insurance: Index-based insurance

In the past 15 years, financial and technological innovations have made insurance more affordable. Recent technological advances in remote sensing and automated weather measurement open the door to innovative index insurance contracts that can transfer the correlated or covariant risk out of small farm economic systems. However, realizing the risk transfer potential of these advances and that of older ideas like area yield insurance is subject to both demand- and supply-side constraints. A number of

recent projects have shown that the supply-side challenges can be overcome. Index contracts based on area yields, weather and remotely sensed vegetative growth data have all been designed and approved by regulatory bodies, offered for sale by commercial providers and reinsured by international reinsurance companies. One innovation is index-based insurance, which allows individual farmers to protect themselves against agricultural production risk by paying out when an independently observable trigger (such as the level of rainfall at a local weather station or data on output in a given area) shows that an insurable event has occurred. This approach reduces the cost of providing insurance against a number of agricultural risks and thereby allows insurance companies to reach poor households.

Because index insurance is based on an independent trigger that cannot be influenced by the actions of the farmer, it reduces moral hazard and adverse selection, but because it is based on an independent trigger, it may involve substantial basis risk (that is, the risk that payouts may not always exactly match the losses a farmer experiences), which can be difficult for farmers to understand. Recent experiences with index insurance indicate: (1) insurance often needs to also improve access to credit or technology adoption so that it clearly raises expected incomes; (2) much more needs to be done to reduce basis risk in these contracts, a task that may require substantial investments in weather-station infrastructure and data collection; (3) improving people's understanding and trust of insurance is key to increasing demand; and (4) scaling up insurance schemes in smaller and less advanced countries will require investing in public goods, such as weather data infrastructure, and piloting and testing new products (Hill, 2009).

Indeed, Hazell et al. (2010) find that many pilot projects have suffered from weak demand, while the ability of index contracts to help small farmers to better manage risk, and in turn improve their incomes and their children's human development prospects has yet to be substantiated by evidence (Carter 2012). In an effort to overcome the poor reception for novel index contracts (due to farmer inability to understand and lack of confidence in the contract, self-insurance, basis risk and loadings), Hazell et al. (2010) promotes a "value-added proposition" whereby index insurance is combined with other agricultural services.

The ultimate goal of small farm agricultural insurance is to obviate the economically costly self-insurance and coping strategies that contribute to smallholder poverty and which are a fundamental problem of their economic development. In order to adopt insurance policy from a development perspective, contract design should be pursued via a demand-centric approach that makes use of data on small farm households, their production technologies, and their constraints and which enables the evaluation of alternative insurance indices (e.g. area yield, satellite-based, weather-based and hybrid combinations) and the identification of a contract design that is statistically optimal and thereby cost-effectively reduces uninsured basis risk (Carter 2012).

An Example: weather-index agricultural insurance

Weather index based insurance caught the imagination of policy makers at the beginning of the 21st century, while international financial institutions, like the World Bank, encourage the pilots in low income countries where crop insurance cannot take off for various regions, including lack of historical yield or loss data. The basic

purpose of ‘weather index’ insurance is to estimate the percentage deviation in crop output due to adverse deviations in weather conditions. There are crop modeling and statistical techniques to precisely work out the relationships between crop output and weather parameters. This provides the linkage between the financial losses suffered by farmers and weather variations and also estimates the payouts that will be payable to them.

One key advantage of the weather index based crop insurance is that the payouts can be made faster, in addition to the fact that the insurance contract is more transparent and the transaction costs are lower. Because index insurance uses objective, publicly available data, it’s less susceptible to moral hazard (Hellmuth et al, 2009). Most importantly, there are many low income countries where no historical data whatsoever is available, except weather data, affording an opportunity to try out some sort of index insurance. A large amount of literature is now available on weather index insurance and many countries are piloting the weather index based insurance.

While having many advantages and offering great potential for farmers to manage production risk, weather index based insurance faces several challenges. These include non-availability of reliable and quality weather data, basis risk, complex index contract design, etc. The challenges mainly arise because of lack of good density of weather stations and poor index design, which may result in failure to capture the yield loss. Adequate infrastructure and correct design of the weather index are vital to the success of weather index based crop insurance, which ensures its great potential in assisting the mitigation of climate change impact on agriculture as well as in promoting more stable income for farmers.

Indian experience of weather-index insurance

India is among the first developing countries to pilot weather-index insurance. Benefiting from the availability of historical weather data for a large number of locations, dependence of agriculture on rains, and huge pools of scientific resources, India is advantaged in piloting different models of weather index insurance. The government realized the need for encouraging the pilot and has supported the program since 2007 by providing financial support in terms of subsidies for premiums. Consequently private sector insurers besides AIC have been running pilots in various parts of the country. The weather parameters so far indexed include rainfall (deficit, excess, dry-spell, wet-spell), temperature (minimum, maximum, mean), humidity, wind speed etc. During 2009-2010, AIC piloted weather index based crop insurance for over 35 different crops, insuring 1.98 million farmers covering more than 2.68 million hectares of cropped area for an insured sum of approximately 870 million US dollars for a premium income of 80 million dollars (Rao, 2010).

4.3.5. Government’s role

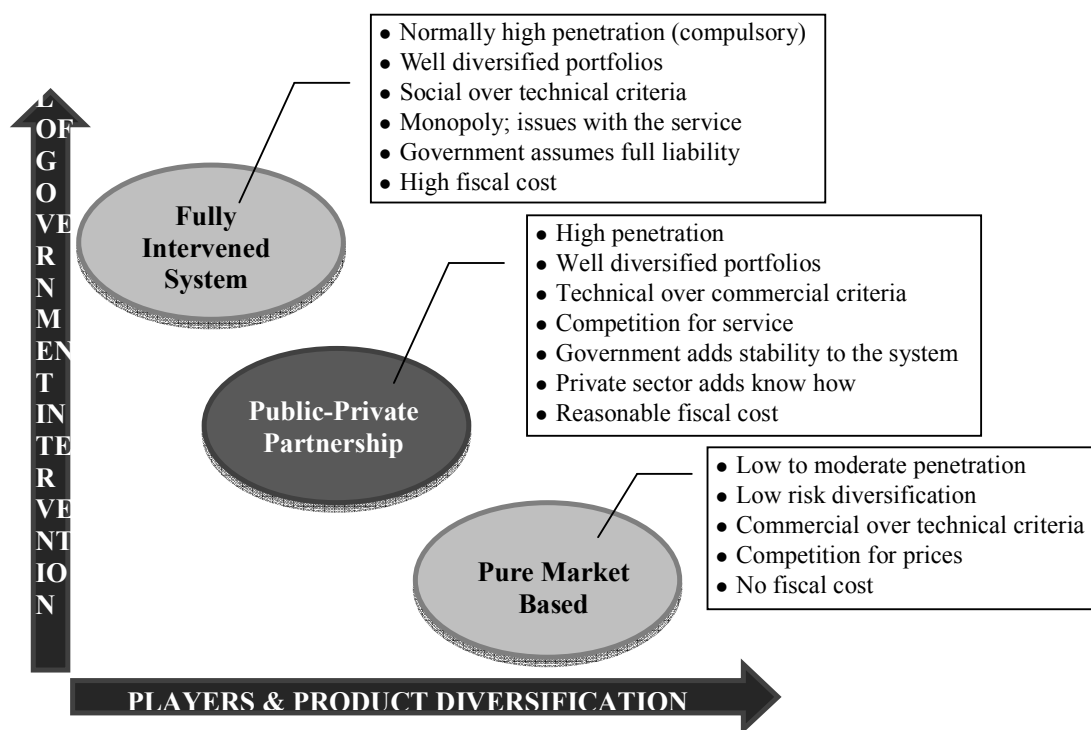
4.3.5.1. Overview of the role of the public sector in agricultural insurance

While agricultural insurance is a commercial business, it is very common for governments worldwide to play a role in it. It is in the interest of governments to promote agricultural insurance to maintain agricultural productivity and secure the welfare of rural communities. Government intervention in the market is appropriate because the private sector is sometimes reluctant to participate due to high upfront

costs, high distribution and administrative costs and capacity constraints related to the inaccessibility of reinsurance (Iturrioz, 2009). Public intervention in reinsurance can be justified in two ways. First, it's hard to place catastrophic risks in the private reinsurance market. Government intervention would complement the private reinsurance capacity. Second, in some countries, such as Mongolia, agricultural insurance is not mature enough to attract international private reinsurance. In such cases, the government can act as the sole reinsurer (Mahul & Stutley, 2010).

Governments pursue various modalities when intervening in agricultural insurance markets, including 1) premium subsidies; 2) investment in product R&D, training and information gathering; 3) agricultural insurance legislation; 4) public sector reinsurance; and 5) administration cost subsidies. And the World Bank states that a correlation can be found between the level of public sector support and the spread of agricultural insurance.

The delivery of agricultural insurance can be categorized into three models: fully intervened systems (also referred to as state controlled systems), public-private partnerships and pure market systems. The main features, as well as the advantages and disadvantages of each of these agricultural insurance delivery models, are summarized in the figure below.



Source: Agricultural insurance (Iturrioz, 2009)

Among the three models, public-private partnership systems are the most balanced, both in terms of government support and product availability. It is the preferred model for a successful agricultural insurance market. The support from the public sector enables the development and scaling-up of agricultural insurance programs, while the participation of the private sector brings skills, expertise, and innovation into the market.

Another important form of government intervention in agricultural insurance is the provision of catastrophe reinsurance protection. For example, South Korea has private international stop-loss reinsurance treaties for losses above a 110 percent loss ratio and up to a 170 percent loss ratio. The government provided unlimited stop-loss reinsurance for losses in excess of the 170 percent loss ratio on a base premium of \$50 million in 2005 (World Bank, 2007).

4.3.5.2. Examples of Government Support to Agricultural Insurance

Comparisons of crop insurance are helpful in understanding the various ways governments support agricultural insurance around the world. Table 2 provides a cross-national comparison of government support to crop insurance for selected countries.

Table 2 Types of Government Support to Crop Insurance, Selected Countries

Country	Forms of Government Financial Support						
	Year Public-Private Program Incepted	Agricultural Insurance Pool (Coinsurers)	Public-sector Multiple-Peril Crop Insurer	Premium Subsidies	Subsidies on Administrative Costs of Crop Insurance	Financial Support to R&D and Training	Public Sector Crop Reinsurance
United States	1930s	NO	NO	√	√	√	√
Canada	1970s	NO	√	√	√	√	√
Spain	1980	√	NO	√	NO	NO	√
Portugal	1979	NO	NO	√	NO	NO	√
Italy	1970s	NO	NO	√	NO	NO	NO
Mexico	1990	NO	NO	√	NO	√	√
Chile	2000	√	NO	√	NO	√	NO
India	1985	NO	√	√	√	NO	√
South Korea	2001	√	NO	√	√	NO	√
France	2005	NO	NO	√	NO	NO	NO

Source: World Bank, 2007

The table above shows that the most common form of state support in these selected countries is subsidies on premiums paid by growers. These subsidy levels vary from about 30 percent in Mexico to as high as 85 percent in Portugal, for some groups of farmers. In addition, the United States provides the catastrophe (CAT) program (50 percent insured yield coverage) essentially free of charge to farmers.

The complexity of the form and level of premium subsidies for agricultural insurance varies from country to country. Several countries have opted for a single flat-rate premium subsidy that applies to all crop and livestock programs and to all farmers, of either large or small holdings, in favored or in marginal areas. Other countries, including Spain and Portugal, have opted for differential-premium subsidies in favor of certain products, e.g., susceptible crops, favored regions, young farmers, multiyear contracts, etc.

4.3.6. Policy recommendations

A comprehensive agricultural risk management approach, including physical risk mitigation and financial risk management, can contribute to agricultural modernization. Access to financial services—including agricultural insurance and other risk financing instruments—can help farmers engage in more productive farming practices and ensure that they can start a new production cycle after a natural disaster.

Agriculture insurance can contribute to the modernization of agriculture. However, it cannot operate in isolation. It should be promoted only when basic agricultural services—extension services, the timely availability of inputs, and efficient marketing channels for agricultural outputs—are in place.

Key policy recommendations can be derived from the review of agricultural insurance programs. These recommendations provide decision makers with some basic principles to consider in four areas: customization of agricultural programs, enhancement of agricultural insurance market through public-private partnerships, risk-based pricing, and targeted premium subsidies.

Customizing Agricultural Insurance Programs

Agricultural insurance programs should be based on an appropriate market segment to address the specific needs of commercial, emerging commercial, and traditional (subsistence) farmers. To modernize production systems, agricultural insurance can facilitate access to credit. Appropriate agricultural risk management measures, such as secure access to inputs and risk mitigation activities, must first be implemented before commercial insurance can become viable.

Enhancing Market-Based Agricultural Insurance through Public-Private Partnerships

The primary role of the government should be to address market and regulatory imperfections in order to encourage participation by the private insurance sector. Governments should focus mainly on developing risk market infrastructure, such as a strong and enabling regulatory framework, public awareness campaigns, data collection and management, and capacity building. Some countries have developed a regulatory framework for agricultural insurance, usually under their non-life insurance regulation.

Using Risk-Based Price Signals to Encourage Sound Financial Planning and Risk Mitigation

In competitive markets, insurance premiums should be risk based and differentiated, reflecting the underlying risk exposure. It allows individuals, firms, and governments to evaluate the benefits of agricultural risk management programs by comparing the cost of risk reduction investments with the resulting reduction in potential losses. Risk-based premiums can also assist governments in budgeting for agricultural losses by helping them assess their contingent liability. By understanding their exposure, governments can better assess their liabilities in the event of natural calamities and

devise appropriate financial strategies.

Targeting Subsidies for Public Agricultural Insurance

Governments should carefully analyze the fiscal implications of government-sponsored agricultural insurance programs. Including administrative and operating and claim subsidies, the total cost to the government of providing agricultural insurance may be as high as 68 percent of original gross premiums. Such expensive public subsidy programs can place a major financial burden on governments, particularly in low- and middle-income countries. Moreover, the provision of subsidies can distort price signals and inappropriately incentivize farmers and herders to invest in unprofitable or excessively risky farming activities.

Subsidizing insurance premiums can help to correct and promote competitive private agricultural insurance markets, usually in the form of public goods that enhance the risk market infrastructure (for example, data collection and management, research and development, and legal and regulatory framework). Subsidies on social insurance premiums act as a wealth-transfer mechanism. They form a component of social safety net programs to ensure minimum incomes to farmers involved in unviable farming activities (Mahul & Stutley, 2010).

4.4. Agricultural value chain finance

4.4.1. Risks in agricultural value chains and the advantages of value chain finance

Risk and uncertainty are ubiquitous and varied within agricultural value chains. These result from a range of factors including:

- Unpredictable nature of weather;
- Unpredictable nature of biological processes;
- Distinct seasonality of production and market cycles;
- Geographical separation of production and consumption;
- Unique and uncertain political economy, both domestic and international, of food and agriculture (USAID, 2005b).

In agriculture, various actors on the value chain have very strong inter-dependence and all of them face multi-faceted, simultaneous risks, including weather, price, logistics, infrastructure, hygiene, environment, labor, and policies. These broad structural, demographic, and institutional changes, some associated with globalization and the uptake of new technologies will continue to alter the risk landscape, risk management practices, and their efficacy for different agri-food value chains (Jaffee, Siegel, & Andrews, 2010).

An integrated approach towards value chain development is essential, focusing on the inter-links of technologically independent segments as well as the internal workflow management within them (King & Venturini, 2005). Value chains concern a series of segments that jointly bring food from farm gate to the table, including input supply, production, post-harvest handling, storage, processing, sale and distribution, food services, and consumption. These segments are usually intertwined with value chains in other industries, extend to broader geographical regions and policy ranges, and involve even more public and private organizations (Ma, Zhang, & She, 2011).

Agricultural value chains integrate various links including input supply, production, processing, transportation, and marketing into a whole. And value chain finance provides reliable capital support and financial services to the industrialized operation of agriculture (Song et al, 2012). It first appeared in the 1950s in the U.S. and enjoyed mass development around the world, playing a vital role in the process of industrialization and marketization of agricultural products. In developed countries such as the U.S. and the Netherlands, value chain financing has reached a high level of development (Bai, 2011).

4.4.2. Mechanism of value chain finance

4.4.2.1. Operational models of value chain finance

Typical organizational models of value chain finance include: 1) Producer-driven. For example, small-scale producers, especially when formed into groups such as associations or cooperatives, constitute the core of a value chain, and help smallholder producers access new markets, obtain higher market prices, and stabilize and secure their market position. 2) Buyer-driven. The processors, exporters, retailers, traders and wholesalers and other market actors sign contracts with producers to form a value chain. This form of contract farming is a very common value chain model. It helps to assure supply, increase volumes, and supply more discerning customers by meeting market niches and interests. 3) Facilitator-driven. These are the value chains initiated by NGOs and other support agencies, as well as national and local government. They either target specific impoverished farmers or the general regional and local development. 4) Integrated. This type of value chain is usually led by large firms, supermarkets, and multi-national companies. It is the earliest form of internal vertical integration (Miller & Jones, 2010). During China's experience with agricultural modernization, various value chain development innovations have also been undertaken according to different driving forces in specific locations. They are categorized into dragonhead enterprise-led, farmer-company-led, government-led, regional-led, etc. (Cui & Jiang, 2010).

4.4.2.2. Categories of the sources of value chain finance

According to Quiró (2011), value chain finance can be categorized into the following types based on the sources of funding:

a) Direct value chain finance. It includes the financing among actors, e.g., loans provided by retailers to suppliers, advances from suppliers to farmers, etc.; and also the financing inside the segment, e.g., credits supplied and provided among farmers, financing provided by cooperatives to their members, by agricultural mutual fund organizations, etc.

b) Indirect value chain finance. It takes advantage of the relationships among actors in the chain in order to attract external capital to flow into the value chain. For example, banks could provide loans to farmers and processors, recognizing the processing contract or other commodities as collateral.

4.4.2.3. Classification of value chain finance products

According to a systematical classification conducted by Miller (2012), value chain finance products can be categorized into the following five categories: 1) Product financing, e.g., trader credit, input supplier credit, processing firm credit, lead firm financing, farmer cooperative credit; 2) Receivables financing, e.g., trade receivables finance, factoring, forfaiting; 3) Collateralization, e.g., warehouse receipts, repurchase agreements, finance lease; 4) Risk mitigation, e.g., insurance, forward contracts, futures; and 5) Financial enhancements, e.g., securitization, guarantees, joint ventures (Miller & Jones, 2010). In the practices of business operations, value chain finance products usually combine several types mentioned above into a package, in order to maximize the conformation with clients' demands. Some case studies as examples will be presented in the following section.

4.4.3. Agricultural value chain finance in developing countries

4.4.3.1. Increased interest in and risks associated with agricultural value chain finance in developing countries

Due to the 2008 food crisis and commodity shortage, public sector interest in agricultural financing has enjoyed a renaissance after many years of declining investment, while private sector interest has also been stimulated by the attendant profit opportunities (Miller and Jones 2010). Meanwhile, development agencies have also been drawn to the VCF approach to promote and develop value chains (Miller 2012). VCF, specifically describes “the use of a value chain and the way in which it supports participants by tailoring services and products to one or more points in a value chain in order to reduce the risk and cost of financing, and increase the efficiency of the value chain as a whole”. In particular, VCF helps to expand the financing opportunities for agriculture, improve efficiency and repayments in financing, and consolidate value chain linkages among participants in the chain. Motivations to pursue VCF differ between contexts, business models, and participant roles. Campion (2006) suggests that the nature and motives of finance provided within the chain differs from that provided by a financial institution. Nyoro (2007) elaborates, describing how in Africa “value chain actors are driven more by desire to expand markets than by the profitability of the finance”, with traders drawn to its function as a procurement facility, input suppliers to it as a sales incentive strategy, while financial institutions are allured by the ability to lower the risk and cost associated with providing financial services. Meanwhile, VCF recipients, such as smallholders or their customers, may be able to overcome disadvantages such as their lack of collateral or transaction costs of securing a loan, which often hinder access to financing (Miller 2012).

Additional drivers of the VCF trend include; a global, liberalized and fragmented marketplace with little seasonality and high product diversity; food safety and traceability requirements; and higher quality standards in conjunction with the enforcement of basic environmental regulations (Miller 2012). Meanwhile, remaining obstacles are presented by the following: deficient and un-innovative provision of financial products and services for agricultural and rural production; shallow reach of rural financial intermediaries, and underservicing of producers, especially smallholders. Despite the prevailing assumption that the agricultural sector is too costly and risky for lending (see Table 3), major banks including Rabobank and

Banorte, maintain that agricultural credit is profitable in situations of effective producer integration into viable chains (Shwedel, 2007; Martínez, 2006).

Table 3 Risks to financial service providers

Type of Risk	Risk mitigation measures
Production risks: These arise from a variety of factors (input supplies, lacking or late credit, low quality standards, improper storage and packing, weather risks, diseases, etc.).	By employing a comprehensive chain approach that looks beyond the borrower to the health of the chain, the financing institution is better informed about the capacity of the chain partners and linkages, including producers' capacity to ensure adequate supply in terms of quantity and quality. The financing agency can also finance and manage financial transactions for various actors in the chain (e.g. input suppliers, storage facilities, trade) and appropriate insurance.
Supply risks: This refers to situations where producers (farmers) may not honour their contractual supply obligations. A commonly observed problem in contract farming is "side-selling," which derails the built-in repayment mechanisms for farm credits.	Strong producer organizations (farmers' cooperatives) and/or group solidarity systems (mutual guarantees based upon savings) provide some assurance that contracts will be honoured and the risks of "side-selling" minimized. Reliable supply allows for collateralization through warehouse receipts in which the FSP becomes a party.
Finance risks: These relate to the non-repayment of credit provided to farmers, other producers or other value chain actors. This risk is borne by the FSP or the chain agent acting as retail-finance provider for farmers/other actors or by both.	Non-repayment of credit to chain actors can be greatly reduced by incorporating a lead actor considered trustworthy. Such actors help instil and ensure accountability. Arrangements of this type are strengthened when a lead actor (co-signatory) is able to absorb risks (e.g. through its equity capital or member savings) and when contingency arrangements are in place to deal with unavoidable risks (such as crop failure). Providing financing through a tripartite arrangement not only improves the efficiency of credit delivery, but minimizes the risk of non-performing loans.
Marketing risks: These relate to the inability to sell on time, in the right quantities and/or at an acceptable quality standard. This includes the short- and long-term market situation and the use or absence of marketing contracts.	Fixed contracts throughout the chain help stabilize turnover, especially when dependence on one market can be avoided. Sales or export agreements are a strong asset in negotiations with financiers, especially when they are also financing other agribusinesses within the value chain. In niche markets, such as fair-trade channels, the buyer relationship can significantly reduce marketing risks, even for small-producer groups. Product standards and certification can also reduce risks.

Price risks: These arise from fluctuations in market prices in the period between, for example, the time a farm contract is signed and the delivery date. These risks are borne by producers/farmers or the buying chain actor, depending on the type of contract.	Direct linkages to the end-consumer markets can promote fair and relatively stable prices. Information technology can be used to minimize price risks. Contractual arrangements should be transparent to help the FSP assess risks. Forward contracting and futures are examples of more advanced price-stabilization mechanisms in VCF.
Climate risks: These relate to shocks produced by weather, such as droughts or floods. Weather shocks can trap farmers and households in poverty, but the risk of shocks also limits farmers' willingness to invest in measures that might boost their productivity and improve their economic situation.	Agricultural insurance, including weather index insurance, has shown potential to help smallholders, FSPs and input suppliers manage low- to medium-frequency covariate risks such as drought or excess rainfall. Farmers can buy insurance as part of a package (e.g. credit and other financial services, technology, agricultural information) or, occasionally, as a stand-alone product.

Source: Reproduced from Miller (2012)

Given the widely recognized importance of supplying additional finance and investment throughout the food chain, financial institutions and policymakers can play an important role in developing new products and accessing new markets by engaging more with value chain actors (Miller and Jones 2010). As enhancing smallholders' productivity, competitiveness and their participation in increasingly global value chains are prioritized elements of the agriculture-for-development agenda (World Bank, 2008), increased efforts behind AVCF will have major impacts for most food insecure and impoverished agricultural households and communities.

4.4.3.2. Development considerations of strengthening different business models

The strategy for developing or strengthening value chains depends on the business model (discussed in section 4.4.2.1) involved and must be framed by an understanding of the chain as a single structure (Miller 2012). And one major development consideration is that smallholders serve as an important target group for development institutions, as they constitute a large share of rural poor and also play a major food production role, in improving the socio-economic situation of a large number of people, improving food security and promoting economic development. Indeed, models that feature the incorporation of smallholders in value chains should be emphasized. For example, as the costs of organizing and training small producers can be prohibitive for commercial companies, intermediation by development organizations, such as non-governmental organizations (NGOs) and government agencies, in facilitator-driven models (as described in section 4.4.2.1) promotes smallholder producers integration into commercial value chains. Furthermore, facilitation also appeals to development agencies interest in long-term sustainability due to its time-bound nature and inclusion of a clear exit strategy, and indeed it has served as a highly effective approach.

4.4.3.3. Sources of AVCF

As described in section 4.4.2.2, there are two primary forms of AVCF, internal and

external. An example of the former is the input supplier credit in Myanmar whereby smallholder farmers are offered deferred payment sales by agro-input retailers (Myint, 2007). Kenya, however, offers a typical example of the latter, where exporters pay farmers via the bank, which then releases the payment, minus the scheduled loan payments, to the farmer group (Marangu, 2007).

However, it is important to note that as an ‘approach’, AVCF facilitates the sharing of risks among various actors and the appropriate transference of defined risks to parties most able to manage them, while the actual financing can be either direct, indirect or ‘cascading’, whereby financing flows into the chain at multiple levels and according to the activities in the chain (Miller and Jones 2010).

4.4.3.4. Developing country and donor AVCF strategies and considerations and case studies

Governments and donor agencies do not need to be fully versed in value chain finance instruments (as described in section 4.4.2.3). However, it is important that they (a) understand the benefits and risks of the different financial instruments to the various participants within the value chain and (b) ensure that adequate mechanisms are in place to permit and govern their application (Miller 2012).

Table 4 Summary analysis of agricultural value chain finance instruments

Instrument	Benefits	Limitations	Application potential
Product financing			
Trader credit	<ul style="list-style-type: none"> •Farm-gate finance with ease of transaction •Culturally accepted and well-known at all levels •Secures sale/purchase and price of seller and buyer 	<ul style="list-style-type: none"> •Non-transparency of true market value •Often informal, with potential for side-selling •Quality and quantity uncertain when granted pre-harvest 	<ul style="list-style-type: none"> •Middleman traders will remain important but as chains integrate will lessen in importance •Traders’ tendency to act as wholesalers’ agents
Input-supplier credit	<ul style="list-style-type: none"> •Buyers obtain needed inputs •Suppliers secure sales 	<ul style="list-style-type: none"> •Input costs may be excessive •Lack of security in repayment •Lack of competitive suppliers in many regions •Smallholders’ use and application of inputs are often poor 	<ul style="list-style-type: none"> •The focus on reducing administration costs and risk associated with multiparty links to banks and produce buyers is promising for direct payments from sale •Food quality and safety are growing concerns
Marketing company credit	<ul style="list-style-type: none"> •Secures product quantity and price •Funds advanced as 	<ul style="list-style-type: none"> •May not be directly accessible to small-scale 	<ul style="list-style-type: none"> •Value chain control through contract farming is

	needed; payments often discounted directly •Uses contracts to set finance, price and product specifications	farmers •Credit advances increase financial outlay and administration •Contracts often not respected	growing in importance •Value chain approaches reduce transaction costs and risks
Lead-firm financing	•Secures market and price •Offers technical guidance for higher yields and quality •Less side-selling options due to closer monitoring •Enforceable contracts with less side-selling due to closer monitoring •Lead firm can often hedge price risk	•Less accessible to smallholder farmers •Producers with fixed contracts do not benefit from rises in price •Cost of management and contract enforcement	•Growing use and high potential to provide access to markets, technical assistance and credit
Receivables financing			
Trade-receivables finance	•Reduces financing constraints for exporters and eases repayment urgency for importers •Can be cheaper than bank-loan alternatives	•Requires a proven track record •Is not suitable for perishable goods •Is most suitable for large transactions	•Used for import-export transactions for durable commodities •Increasingly used by input suppliers, equipment dealers and major commodity traders
Factoring	• Provides a source of working capital •Facilitates business and finance by passing collection risk to a third party (factor)	•Complex and requires a factoring agency •Not yet allowed in some countries •Lack of knowledge and interest on the part of financial markets	•Its use in agriculture is uncommon but growing •Best used for processors and input suppliers where product flows and accounts are stable
Forfaiting	•Makes capital available •Takes care of collection risks and cost •Can be selectively used for specific project funding or	•Requires selling accounts at a discount •Complex and requires the presence of specialized forfaiting or	•Less common than factoring but similar in principle •Invoice instruments are negotiable but complex, limiting their application

	accounts	factoring agencies	potential
Physical-asset collateralization			
Warehouse receipts	<ul style="list-style-type: none"> • Use inventory as collateral to increase access to financing • Where organization and trust are built, can also work on a less formal basis without the official warehouse-receipt legislation in place 	<ul style="list-style-type: none"> • Commodity traded must be well standardized by type, grade and quality • Increase costs • Often require special legislation 	<ul style="list-style-type: none"> • Relatively well known, and interest in wider use • Can be used at various value chain levels and possess growth potential • Currently used for durable commodities but with increased processing and improved storage, the range of their use can expand
Repurchase agreements (repos)	<ul style="list-style-type: none"> • Can reduce financial costs and have proved successful for selected commodities with well-functioning commodity exchanges 	<ul style="list-style-type: none"> • Complex; require commodities to be stored with accredited collateral managers and require commodity exchanges 	<ul style="list-style-type: none"> • Limited potential in near future • Used infrequently by exporters for some commodities
Financial leasing (lease-purchase)	<ul style="list-style-type: none"> • Provides loan security and ease of asset repossession in case of default • Especially good where legal system for loan collection is weak • Often has tax benefits 	<ul style="list-style-type: none"> • Requires coordination of seller, buyer and financier • Only feasible for medium- to long term purchases of non-perishable goods • Often requires insurance 	<ul style="list-style-type: none"> • High potential use for equipment purchase if legislation allows
Risk mitigation products			
Insurance	<ul style="list-style-type: none"> • Reduces risk for all parties in value chain • Commonly used and easily applied to fire, vehicle, health and life insurance • Crop and livestock insurance 	<ul style="list-style-type: none"> • Costly, requires subsidy when applied to agricultural production • Insufficient data limit weather indexing use in insurance 	<ul style="list-style-type: none"> • High interest among many donors and governments is increasing its use • Without subsidies, growth for production insurance will be modest until

	is increasing		sufficient data are available
Forward contracts	<ul style="list-style-type: none"> • Companies can hedge price risk, thus lowering financial risk and cost • Can be used as collateral for borrowing • Not dependent on commodity exchanges • Benefits can flow through chain when one party forward-contracts and can offer forward or fixed prices to others 	<ul style="list-style-type: none"> • Require reliable market information • Commodity traded must be well-standardized by type, grade and quality 	<ul style="list-style-type: none"> • Frequently used by larger companies and for major commodities • Have the potential to increase significantly wherever reliable market information is available
Futures	<ul style="list-style-type: none"> •Used globally in agricultural commodities to hedge risk •Futures serve as price benchmarks for reference trade •Reduces risk for all parties in value chain •Commonly used and easily applied to fire, vehicle, health and life insurance •Crop and livestock insurance is increasing 	<ul style="list-style-type: none"> •Commodities are traded in standard units requiring that they must be well standardized by quantity, type, grade and quality •Requires a well-organized futures market 	<ul style="list-style-type: none"> •Have growing use and potential when commodity exchanges work •Use is limited to larger producers, processors and marketing companies •High interest among many donors and governments is increasing its use •Without subsidies, growth for production insurance will be modest until sufficient data are available •Frequently used by larger companies and for major commodities •Have the potential to increase significantly wherever reliable market information

			is available
Financial enhancement			
Securitization instruments	<ul style="list-style-type: none"> •Have the potential to reach lower-cost capital market funding where homogenous pooling is possible •Have been used successfully in microfinance 	<ul style="list-style-type: none"> •Costly and complex to set up •Are adversely affected by securitization problems from the subprime financial crisis 	<ul style="list-style-type: none"> •Have limited potential for agricultural value chain investment tenor and cash flow
Loan guarantees	<ul style="list-style-type: none"> •Reduce risk to parties providing finance and/or the business venture, increasing access to funding •Can facilitate needed investment in a value chain 	<ul style="list-style-type: none"> •Costly and often subsidized in agriculture •Can reduce lender responsibility and accountability 	<ul style="list-style-type: none"> •Occasionally used as incentives for stimulating capital flows to infrastructure, new markets and exports, and, occasionally, production
Joint-venture finance	<ul style="list-style-type: none"> •Provides equity capital and borrowing capacity •Reduces financial leverage risk to investors •Often brings expertise and/ or markets 	<ul style="list-style-type: none"> •Hard to attract suitable investors with a common vision •Dilutes investor returns •Hard for small producers to participate in 	<ul style="list-style-type: none"> •Has growing potential in a globalizing world •Strategic partnerships, including public and private sector, are increasingly important in value chains

Reproduced from Miller (2012)

In addition to assessing the advantages of specific interventions, a number of programmatic considerations must be addressed, such as considering non-financial alternatives before considering financial interventions and avoiding crowding out the private sector and other ongoing initiatives with grants (Miller 2012). In addition, it is important to bear in mind that although the AVCF approach can be a valuable tool for development agencies, it is merely the means to a larger end. In other words, the AVCF approach should be deployed to demonstrate and promote the use of VCF and/or to expand financial access. Furthermore, the direct lending or investment in a value chain is often inadvisable for donors or development agencies, which should instead use their funding to, in turn, help attract local or, if needed, international funding and investment. With these principles in mind, we next consider several case studies of AVCF featuring developed and developing countries.

4.4.4. Case studies

Case Study 1 Scotia Bank in Canada

Scotia Bank has over 180 years of experience serving the agricultural sector. It provides comprehensive financial support to farmers and agri-businesses, through such services as loans, investment services, inheritance planning, and rural community construction. In particular, typical value chain finance services include:

- Via “Scotia Indirect Business Finance”, link clients with large-scale crop production input companies and fuel suppliers, provide individualized credit services matching the need of both parties;
- Cooperate with over 300 independent agricultural traders to provide “point-of-purchase financing” for crop and livestock producers. It is an on-the-spot financial service for producers on the location of transactions based on up-front agreements signed between traders and the bank.

Case Study 2 Farm Credit Canada (FCC)

Farm Credit Canada has established alliance or cooperative relationships with a number of regional financial institutions to provide inclusive financial services and products for actors in every segment of agricultural production, including:

Crop Input Financing Program. This program operates on the grounds of an alliance between FCC and crop input suppliers. Farmers can obtain the money needed for purchasing anytime according to pre-approved credit lines, and arrange appropriate repayment schedules according to the changing situations of their cash flow. And certain types of loans can be approved by suppliers in the alliance.

Retail Financing. For example, FCC cooperates with the United Farmers of Alberta (UFA) and the 95,000 members of the association, providing financing for their purchase of production facilities, construction, and many other innovative programs. UFA operates over 30 input supply stores around the province. All clients who go to these stores for input merchandises are eligible for FCC credits, varying from 4,500 to 35,000 CAD for common goods and up to 200,000 CAD for large equipment. This process can even be completed over the telephone. Besides, clients can apply for increases in credit lines which can remain valid for a year, helping to prevent having to hastily apply when the additional credit is urgently needed (Bai & Xu, 2006).

Both of these two types of financial services extend the credit into the hands of actors involved in the value chain, which makes the financing approaches more flexible and targeted. The simplification of operation procedures is also crucial in increasing the liquidity of fund flow along the chain and improves the vitality of market transactions.

Case Study 3 Gujarat Cooperative Milk Marketing Federation in India

The Gujarat Cooperative Milk Marketing Federation (GCMMF) is a milk producer cooperative based in the Kaira District. The value chain has a three tier organizational structure so as to include small holders. At the base level individual dairy farmers engaged in milk production join as members of Village Dairy Cooperatives (VDC). The VDC, in turn become member units of a District Level Cooperative Milk union. The district level unions are then federated in to a State Level Cooperative organization. Thus the GCMMF is a state level federation in Gujarat with a member

base at the grass roots of 3.18 million milk producers.

At the farm level loans for the purchase of cattle and working capital expenses are available from the banking system for farmers who are members of the VDCs. The VDCs are able to facilitate loans from banks and in many cases retail the loans by availing bulk loans from the banks. But where the VDCs are weak, farmers have to directly approach banks without the facilitation of VDCs.

Typically dairy farmers get funded for their animal purchase under a tripartite agreement under which the installments of repayment of loan are deducted from periodic milk payments and passed on by VDC to the bank. This hassle free mechanism comprised with widely distributed small farmers works better in the cooperative form. Participation of producers and autonomy of institutions of producers ensure that economic decision-making is objective and secures member interests. This facilitates better income realization for the members. Member based organizations invest more in production and productivity enhancement and member capacity building (Srinivasan, 2012).

Case Study 4 *Informal inventory credit in Niger*

Niger's informal inventory credit system, also known as warehouse receipt financing (in which farmers provide a loan guarantee in the form of the partial storage of their harvest in order to obtain short-term credit from local financial institutions via their associations), which was first pioneered by the FAO in 1999, has played a key role in reducing rural poverty. Through this project, the FAO sought to identify innovative mechanisms to promote farmer usage of agricultural inputs (e.g. fertilizers) and to establish technical and economic standards that would guarantee its sustainability. The system promotes farmer use of quality agricultural inputs, thereby stimulating significant yield increases and helping to ensure rural food security. The system relies on the presence of a guarantee for its duration and development, and the resilience of this guarantee is determined by the extent to which the potential benefits (profit, new types of loan guarantees, food security, securitization/finance of agricultural cycles, release from debt/impoverishment, etc.) motivate the stakeholders (farmers and their associations, rural financial institutions, development projects, NGOs, government, donors). The effectiveness of the model has qualified it a 'good practice' for implementation at a regional level in Niger, Burkina Faso, Mali and Senegal through a FAO/Belgium multilateral cooperation programme. Niger's experiences with inventory credit don't only help to expand the system as it currently exists, but to also help develop programs focused on other strategies, such as farmers' association-run farm input stores. In this case, donors played several key roles, namely the organization of farmer associations (FAO) and the promotion of correct fertilizer usage (the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)). While, FAO provided farmers, their associations, and participating local banks with technical support, essential training and capacity building, ICRISAT worked to ensure the successful experimentation with adequate and affordable doses of fertilizers (LeCourtois and Olofsson 2010).

Case Study 5 *LAFISE Group in Central America*

Nicaragua has traditionally suffered from high intermediation expenses and costs of

financing due to process inefficiency and low returns to farmers and in response, the LAFISE Group recognized that promoting the development of the chain, and not simply providing direct financing to smallholder farmers while leaving the existing production and marketing system unchanged, was the key. LAFISE built on its already considerable financing capacities, especially those associated with its Bancentro banking network, such as financing resources, international presence, and extensive experience with capital markets, international finance and other commercial banking instruments, by creating Agropecuaria LAFISE, an agribusiness company that enabled it to both enhance and expand its lending to the sector as well as diversify its activities in and direct knowledge of value chains. In addition, as Agropecuaria LAFISE's direct interaction with small-scale producers relied on more than just financing and market linkages, it emphasized collaboration with NGO's and the government (via formal and/or informal collaboration agreements) to effectively train and organize stakeholders to meet the firm's requirements. The LAFISE Group currently provides over 5,000 small-scale producers with an integrated system of financial services and value chain addition activities across the value chain, including processing, commodity management, and national and export marketing. And in addition to its Bancentro banking network and Agropecuaria LAFISE (agriculture), LAFISE now also functions through three other associated group companies – Almacenadora LAFISE (storage and commodity management), Seguros LAFISE (insurance) and LAFISE Trade (Zamora and Miller 2010).

Case Study 6 *DrumNet in Kenya*

The DrumNet rural value chain management system was first launched as a pilot project in March 2003 and was specifically targeted at smallholder farmers in Kenya. The network is facilitated by the system's policies, processes, and IT systems which enable financial, marketing, and information transactions via purchase contracts and master contract frameworks, which are invaluable to the value chain model and to reducing farmers' market risk. Partnership has also been central to the DrumNet project, both with organizations to ensure product quality by providing farmer capacity building and certification and with commercial banks to structure producer group credit and banking services according to the sales proceeds injected into the bank by buyers. The resulting ICT platform maps all the members, logistics, credit flows, payments, and accounting events. Although DrumNet was originally and remains donor sponsored (IDRC, IFAD and Monsanto), it has pursued ambitious market-oriented goals during its first two phases, specifically: 1) Achieve operational self-sufficiency in three years; 2) Grow to become a commercially viable business in five years, reaching 500,000–1,000,000 clients throughout eastern and southern Africa. Following this, the development of a commercial model in partnership with BIDCO, Equity Bank, and Farmer Field Schools (FFS) (a FAO established and Gates Foundation supported nationally organized network of farmer groups) is currently underway and is expected to transform DrumNet into a resilient, commercially-viable African organization (Campaigne 2010).

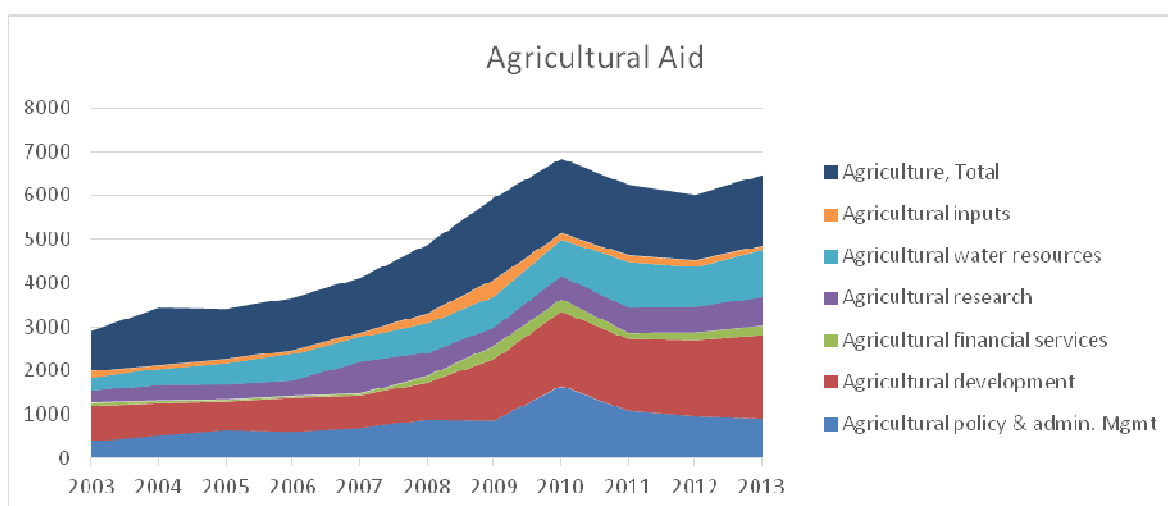
Case Study 7 *Integrated agro food parks in India*

India's agricultural sector has recently begun to undertake value addition through rural service centres' suite of integrated services including agricultural inputs, finance, technical advice, warehousing, and marketing. A variety of models have taken root in

the industry, including village business centres (Kisan-Bandu), electronic and agricultural services (e-Choupal) and one-stop service shops (Hariyali Kisaan Bazaars). One innovative model is the YES BANK's usage of rural transformation centres (RTCs) that are linked to Integrated Agricultural Food Parks (IAFP), which promotes spatial clustering of varied agro- production chains. Through this system, IAFP's contain modern production and processing facilities and are linked to catchment-located RTCs. In addition, IAFP's increase producer access to modern management practices and processing technologies, as well a cheaper credit through products customized for the various levels of the chain. Ultimately, IAFP's shorten the value chain, enhance product quality, improve productivity while also reducing the risk of producers having to resort to distress sales, and other major triggers for default and credit risk, which has enabled YES BANK to expand its financial service coverage and spread risk throughout the value chain (Chakravathy and Poosapati 2010).

4.5. Donor support

In a number of developing countries, agricultural finance development has also benefited from the support of donor countries and multilateral agencies. Despite the downward trend in ODA to ARD⁹ (agriculture and rural development) since 2010 (see figure below), as well as the overall shift away from donor support of the productive sector to donor attention to policy development and administrative capacity strengthening, meaningful donor engagement in agricultural financial systems and services continues to occur.



Source: OECD (2014)

For example, Rutten (2012) encourages innovative and integrated approaches to existing donor support of the development of warehouse receipt financing and commodity exchanges, and in providing capacity strengthening to local banks.

Table 5 Suggested new approaches for the development of commodity exchanges and warehouse receipt systems

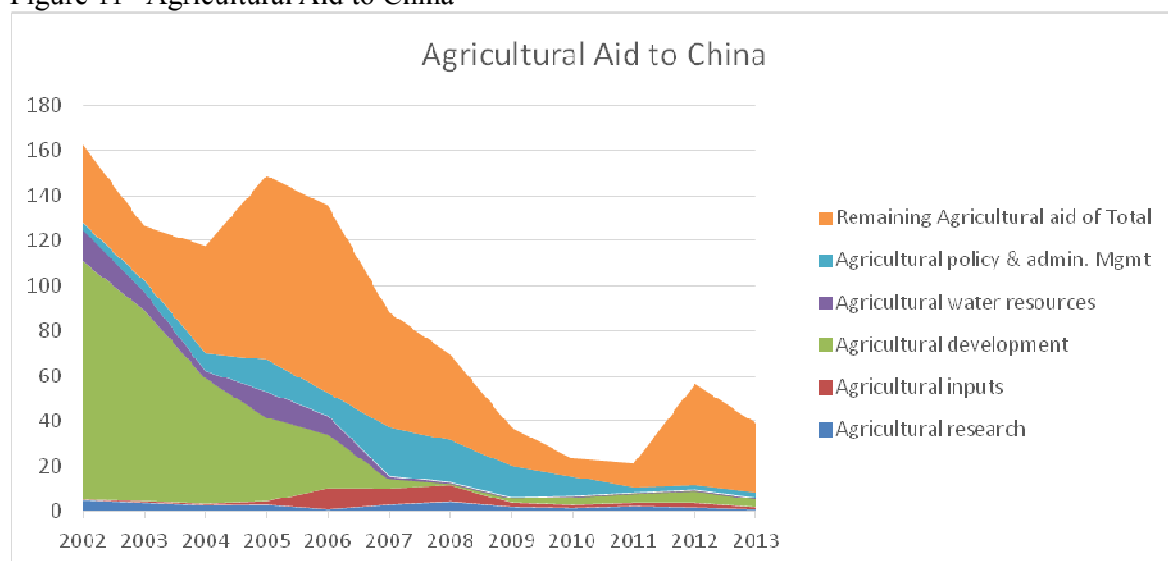
⁹ For in-depth analysis of the development of agricultural aid, see to Islam (2011) and Chimhowu (2013).

Traditional approach	Suggested approach
First, set up a legal framework for WHR finance, then promote deals.	First, look at potential deals and structure them around legal constraints; then work to improve legal and regulatory framework.
Refinance WHR finance originated by selected banks.	Promote innovation towards the development of a secondary market of tradeable WHR instruments, using a wide range of refinancing options including the equivalent of discount windows.
Look at commodity exchanges as stand-alone projects.	Consider instruments beyond agricultural futures and options, which target the needs of physical trade and/ or finance such as repo contracts or project bonds. Then, work with potential partners to introduce instruments one by one.
Commodity exchanges should look like the exchanges in the west.	Make full use of available technology to develop cost-effective approaches, targeting specific needs on a country-by-country basis.
Electronic registration is of little importance.	Make EWR systems the basis of WHR projects and use this technology to attract new participants to the sector.

Source: Rutten (2012)

China's unique development status and the rise of the trilateral aid regime, however, require that innovative partnerships must be developed in order to formulate effective and feasible projects (see figure 11 to see the declining trend of agricultural aid to China).

Figure 11 Agricultural Aid to China



Source: OECD (2014)

5. Public policy – government support to agricultural finance in developed countries

It is a common practice for governments of developed countries to support and protect

agriculture through public finance, credit, and insurance schemes. Public finance provides funding for the subsidies for agricultural product prices, farmers' income, and export, as well as infrastructure construction, disaster compensation, and fallow land subsidies.

5.1. Support for agricultural finance from government public finance

5.1.1. General agricultural subsidies

Price support is a commonly applied strategy of agricultural promotion in many countries. Examples include the target price scheme applied in the U.S. (recently replaced by a reference price scheme, which serves similar objectives), a price intervention scheme in the OECD, rice price support in Japan, government purchase of rice in Korea, etc. In OECD countries, price supports accounted for 77.1% of all agricultural subsidies during 1986-1988. Although it has decreased in recent years, the share has remained relatively high, accounting for 47% in 2007-2009.

With increases in the supply of agricultural products, problems with product surplus, the heavy burden of public expenditure on subsidies, and intensified competition on the global market became more and more severe. These concerns caused a change of focus in many countries to stabilizing farmers' incomes and strengthening the competitiveness of domestic products. The main strategy was to decrease the level of price support and replace them with direct income subsidies. For instance, the decoupled subsidies in OECD countries increased from 1% in 1986~1988 to 23% in 2007~2009. The U.S. announced its production flexibility contract subsidies, a subsidy decoupled from prices, in 1996 to replace the subsidy based on target prices. And a fixed direct subsidy decoupled from both price and production was introduced in 2002 to replace the former ones. Japan and Korea also revised their subsidy policies in 1995 and 1998 respectively to gradually increase the share of direct subsidies.

However, many drawbacks come along with agricultural subsidies, mainly concerning the distortion of production and the market. For example, subsidies can be blamed for causing the overuse of fertilizers and pesticides, crowding out the private sector, inequality in target selection, overdependence on subsidies, etc. (Huang et al., 2011).

5.1.2. Subsidies for credit

Under the usual circumstances, funding agencies need particular incentives to be motivated to provide credit services to most farm households and meet their demands. Such incentives mainly involve the transfer of operational costs, including government subsidies, tax deductions, etc. Specifically, on the grounds that the elasticity of the credit supply for loan applicants is high, subsidies could help cover the costs of loan application, monitoring, and recovery, in order to reduce risk premiums and thus decrease the cost of borrowing.

Several forms of subsidy can be adopted to expand the supply and demand for agricultural finance products. For example, subsidies could be provided to financial institutions, either via direct subsidy or indirect subsidy. Direct subsidy was a very common practice in the past. It provides interest subsidies to financial institutions, to decrease the borrowing interest for farmers and the lending costs for financial

institutions. Indirect subsidies include tax deductions, favorable policies or services and products, etc., designed to decrease lending costs.

Another example includes subsidies provided to facilitating institutions within the government finance system, that facilitates support to agricultural finance via government policies and administrative regulations. For example, subsidies for the input of basic financial service institutions (such as credit bureaus, collateral registration and management offices), and investments and regulation reforms for market trade guarantees, intellectual property protection etc. could increase the credibility of borrowers, decrease the risks faced by lenders, and expand market demand for credits. Other instruments also include subsidies for programs dedicated to improving financial knowledge extension and production technology training. These programs help farm households get better involved in value chains and at the same time broaden the client base of financial institutions.

Subsidies as a form of credit support are a major component of the resource of agricultural funding in many countries. It is a common practice in developed countries to provide subsidies to banks as a way to support its supply of low-interest or interest-free loans, with flexible repayment schedules and other criteria. For example, in the U.S., the Commodity Credit Corporation provides non-recourse loans to farmers, using surplus agricultural products as the collateral. The Bank of France provides loans with favorable conditions to farmers, benefiting from the subsidies from national public finance. The subsidy targeted at expanding credit access is of significant importance in funding the process of agricultural modernization.

It is worth noting that credit subsidies, as another form of subsidy, also have similar drawbacks with general subsidies. They need to be carefully designed and applied to avoid distortions, overdependence, and other undesired impacts.

5.1.3. Government guaranteed loans

Governments typically guarantee an upper limit of loss suffered by borrowers and lending institutions, under very usual natural or social circumstances when the loss incurred by lending institutions and borrowers exceed a certain amount. Guarantees provided by the government are an effective measure to mitigate the risk faced by lending institutions as well as to incentivize borrowers to utilize credit advantages. As a way to encourage the supply and demand for credits, they are better targeted and more efficient, compared to interest subsidies. As indicated in the earlier sections, they have become a major instrument for supporting agricultural finance in developed countries such as the U.S. and Canada.

5.1.4. Financing for agricultural infrastructure construction

The development of agricultural infrastructure is at the heart of expanding economic opportunities, elevating living standards, strengthening social cohesion, and facilitating the modernization of agriculture in rural areas. As a public good, construction of infrastructure needs large amounts of capital investment and cannot earn revenue in short order, which makes it impossible to be undertaken by the private sector. Governments of developed countries commonly put significant emphasis on the construction of infrastructure in rural areas. In countries such as the U.S., France,

and Japan, government public finance invest fully in this in order to motivate mechanization and other forms of agricultural modernization (Ji & Wang, 2014).

5.1.5. Promote the development of agricultural insurance

Agricultural production faces various risks and uncertainties, both from natural disasters or domestic and international price volatility risks, and the resulting losses are very hard to predict. Therefore, insurance becomes a widely-applied instrument to protect agricultural production and development. The governments of developed countries often provide strong support to agricultural insurance schemes, including through the formulation and improvement of relevant legislations, favorable policies for institutions engaged in insurance, premium deduction or subsidies by government public finance, bearing of most risk losses by the government, etc. Please see related information in Section 4.3.

5.2. Encourage investment from the private sector

Apart from the ever varying profit motive, the following measures are often employed by the government to encourage private investment in agricultural finance: tax deductions or subsidies, government bonds, flexible and favorable legislation and policies, as well as various investment guiding funds. In addition, governments put a great deal of effort into the intellectual protection of technological innovations to ensure the interests of R&D practitioners.

5.3. Public-private partnership

Public-private partnership on value chain finance and many other agricultural investments concerning agricultural modernization is also an essential element of government support.

Case Study Federal Agricultural Mortgage Corporation (Farmer Mac)

The Federal Agricultural Mortgage Corporation (Farmer Mac) is both a shareholding company and a Government Sponsored Enterprise (GSE). It was founded in 1987, when the Agricultural Credit Act was revised on the basis of the 1971 version and approved its establishment in order to strengthen the supply of long-term loans related to agriculture. Farmer Mac provides a secondary market for commercial agricultural guaranteed loans, rural infrastructure loans, as well as the loan guarantees for agricultural and rural development offered by the USDA. Through buying loans from lenders, buying the equity guaranteed for loans (i.e., providing advances for loans), and many other market transactions Farmer Mac improves the liquidity of capital and enhances borrower access to credit. The trade, transfer, and circulation of bonds related in agriculture provide a pool for the large amount of loan products, and therefore diversify risks, increase liquidity of the capital market, and promote the development of the agricultural finance market.

Case Study Agricultural and food value chain roundtable in Canada

The AAFC and the Ministry of Industry jointly established an agricultural and food value chain development roundtable scheme. Inclusive discussion and negotiations

with industrial representatives greatly improved the support of the agri-food sector via policy guidance and institutional incentives. In the meantime, corresponding promotion schemes dedicated to value chain development are also set up at the provincial level. For instance, the provincial value chain program in Alberta not only corresponds with the promotion scheme initiated by the federal government, but also cooperates closely with the private sector, including capital support for the AVAC, an investment company investing in promising early-stage commercial ventures in value-added agri-business, in order to promote its businesses through the extension of agricultural value chain development and modernization.

5.4. Agricultural development fund

Agricultural development funds are another way of financing support for agricultural modernization that are backed by governments, and are defined by their advantages in targeting, large scale of investment, and explicit guidance of policy indications. Agricultural development funds mainly provide direct R&D support, loans for development programs, etc. Most of them design programs focusing on certain industries or highlights of challenges, collect applications across the country, and grant loans after application evaluations. The objective is to provide comprehensive financial support for agricultural development. For example, the rural development fund managed by the USDA established a number of rural development programs to provide direct allocation of funds or loans targeted at housing and community infrastructure construction, energy utilization and disposal, business cooperation, etc. It includes many forms of support, such as direct or guaranteed loans, subsidies, technological support, and research and extension materials, among many others. Canada has very similar agricultural development fund system as well.

Case Study Canadian Adaptation and Rural Development Fund

The Canadian Adaptation and Rural Development Fund (CARD) was established in 1995 by the Canadian government, with annual investment of 60 million CAD. It was designed to promote long-term growth of the economy, employment, agricultural sector, and rural development. It was established to assist the Canadian agricultural sector in facing structural challenges and market shocks. The main targets included six areas: research and innovation programs, human resource development, seizing market opportunities, environmentally-sustainable development, food quality and safety, and rural development. The fund plays an important role in enhancing the positive cycle and healthy development of the agri-food sector. It encourages market-driven innovations on the basis of food safety and environment sustainability.

The CARD Fund not only supports national programs, but also regional programs, led by provincial governments and industrial associations. Thus the communication and cooperation among industries and regions is strengthened. Approximately 60% of the fund is annually allocated for national programs, covering various production categories and topics, including farm management, biotechnology, etc., and is managed jointly by the federal government (AAFC) and industrial associations. Another 40% is used for regional programs, supervised and operated by regional Adaptation Fund Association. A unified evaluation standard and management framework is applied to all programs in order to ensure consistency with the mandate of the fund. Representative national programs include: Young Farmers' Forum, Farm

Economics Management Program, Farm Debt Conflict Settlement Service, etc.

A number of similar development funds exist in Canada, one of which is the Alberta Beef Development Fund. It was created in November 2004, receiving a total investment of 16.4 million CAD from the federal and provincial governments. The Beef Producers' Association is entrusted by the fund to take the responsibilities of coordination, allocation, and management of the fund. The main goal is to support various researches, such as promoting sustainable beef production, improving land and environment management skills, etc. And the Canada Agricultural Adaptation Program is another example of a development fund. It was designed to operate from 2009 to 2014, benefiting from 163 million CAD of endowment in total. The fund is distributed to various production associations to assist their adaptation for new opportunities and challenges on the domestic and international markets.

6. Lessons Learnt and Implications for China

6.1. Summary

In previous sections, we approached the topic of agricultural modernization through an investigation on its global development, with special focus given to developed economies such as the U.S. and Canada. We also took a close look at how government support is playing a major role in promoting this process.

We then examined the evolution of agricultural finance systems in these economies. Taking a historical view helps us to better understand the stage that China is at and also better evaluate the appropriateness of specific measures. Institutional settings and their functions were examined, and major players and individual case studies were reviewed, in order to analyze the roles these actors play in the agricultural finance system.

We followed this discussion by delving into various mechanisms adopted by different countries to promote agricultural modernization, and as a result, public finance expenditures, agricultural loans, agricultural insurance, and value chain finance were identified as commonly implemented measures. When carrying out a detailed inspection of these mechanisms, we looked at experience from both developed and developing economies.

To further identify opportunities for the government to maximize its impact and achieve better results, the next section discussed the public policies that could possibly be implemented to facilitate the agricultural modernization process. Potential policy instruments include direct support from public finance, encouragement of private sector investments in agriculture, establishing public-private partnerships, and sponsoring agricultural development funds, etc.

6.2. Lessons Learnt and Implications for China

6.2.1. The agricultural finance system

Around many countries in the world, farmers are typically unable to access the services of commercial banks due to the high risk and intermediate term of their financing requirements, and as a result, the agricultural finance system consisted of

financial institutions specifically designed for agriculture that were jointly established by the government and agricultural production organizations. In response, serious attention was paid both to the development of cooperative agricultural banks and to the establishment of market-related regulations and income support policies, in order to enhance agricultural productivity, and especially to protect and stabilize agricultural production incomes. To a certain extent, international and domestic pressures have forced such support policies to be gradually liberalized, yet significant government promotion of advantageous behaviors continues in a more market-oriented fashion. Below the key agricultural finance system interventions and considerations are reviewed:

An office dedicated to the regulation and development of the agricultural finance system. In the ministry of agriculture in most developed economies, an office or division is established to work specifically on agricultural finance and various finance-related services including loans, insurance, etc. Depending on different situations, these offices either supervise or are sometimes directly involved in the operation of these services, i.e. via public-private partnerships.

Freer agricultural finance systems can attract participation by the private sector. The agricultural finance system is heavily regulated by the government and mostly controlled by state-owned institutions. Companies could take the lead in meeting market demand but also be regulated and supported by the government.

Cooperative financial institutions have traditionally played an important role in the agricultural modernization of many developed economies. The development of farmer cooperatives is still at a primitive stage in China. Cooperative financial institutions face strict regulations in undertaking financial activities including taking deposits, engaging in monetary transactions, etc., thus they have a very limited role in the market. In addition, most cooperatives are organized by officials, companies, or large farmers. This leaves the small farmers who constitute the majority of cooperative membership with very little scope for participation or influence. The potential role for cooperative financial institutions in the agricultural sector needs to be carefully assessed.

Expanding the service network coverage of banks is important for agricultural finance. In developed countries, most banks have established service branches in rural areas. Local credit officers have a better understanding of the situations and have long-term relationships with farm households. Deep and comprehensive knowledge of a farm's assets, credibility, and business operations significantly decreases the costs of financial services and loan monitoring, which is conducive to better and broader bank service provision in rural areas.

Other lessons include: Comprehensive legislation and regulations for agricultural finance help to ensure the effective use of policy-based funding; A clear and detailed division of labor within the financial system promotes efficiency through targeted services and the avoidance of credit cost redundancy; and, Efficient and flexible administration based on local conditions encourages the effective use of agricultural credit capital.

6.2.2. Insurance

To reduce the high risk of income loss, farmer households commonly diversify and adopt low-risk activities or technology, which usually have low average returns. However, agricultural insurance can help farmers invest in more profitable activities, which may also be riskier, because insurance facilitates the transfer of excess risk to a third party. The promotion of agricultural insurance as an instrument for risk transfer is favored by many governments attempting to modernize their agriculture. Below the key agricultural insurance interventions and considerations are reviewed:

Public-private partnership in promoting insurance has been proven successful and effective in a number of countries. Compared with fully-intervened systems and pure market-based systems, public-private partnership systems are the most balanced, in terms of government support and product availability. The support from the public sector enables the development and scaling-up of agricultural insurance programs, while the participation of the private sector brings skills, expertise, and innovation into the market.

Innovation of insurance products is desirable and successful examples can be found in both developed and developing economies. In general, index-based insurance products are performing well in developed economies and also piloting quite successfully in some developing economies, while they are met with considerable challenges in some places. Adequate infrastructure, demand-driven contract design, and increased understanding of the products and trust between people are key to successful implementation of index insurance schemes. Catastrophe insurance also shows promise as an agricultural risk mitigation measure.

Agricultural reinsurance is usually performed by the government or accomplished through public-private partnerships. Forms of support range from national reinsurance companies to agreements under which governments act as excess-of-loss reinsurers. Governments also provide support with legislation and research, development, and training. These systems are proven to have advantages for both the government and farmers.

Linking insurance to credit is a common practice to enhance the penetration of insurance products. Interlinked insurance-credit contracts can help relax the constraints that restrict the supply of credit to the agriculture sector. With farmers' risks mitigated by insurance products, financial institutions are more willing to issue loans and their default risks are decreased. And it effectively increases the coverage of insurance products, improves farmers' access to loans, and encourages farmers to take advantage of finance tools to cope with various risks.

6.2.3. Loans

In agriculture, the presence of risk in loan transactions is one of the most important factors affecting supply and demand and its impact is revealed in the influence of borrower collateral status on the outreach of financial services. Farmer borrowers' lack of access to eligible collaterals impedes the entry and deepening of formal credit services in the rural environment and limits the development of agricultural finance. In order to overcome these challenges, a number of loan interventions are undertaken:

Usually subsidies are provided to increase the supply of agricultural credit. One form of credit subsidy is that provided to financial institutions, either via direct subsidies on interest or via indirect subsidy including tax deductions, favorable policies or services and products, etc. Subsidies can also be provided to facilitating institutions within the government finance system, which reinforce the support from government policies and administrative regulations.

Governments can provide guaranteed loans. Along with the development of agricultural credit in many economies, most governments shifted from providing direct loans to providing guaranteed loans, especially on long-term credit products. The common practice is to guarantee coverage of an upper limit of loss suffered by borrowers and lending institutions. It is an effective measure for mitigating the risk faced by lending institutions as well as an incentive for borrowers to utilize credit advantages. As a way to encourage the supply and demand for credit, it is better targeted and more efficient, compared to interest subsidies.

Explore more options for collateral. To alleviate the problem of the lack of collateral, some promising, non-conventional collateral alternatives, based on expected revenues, warehouse receipts, common group funds, etc. could be promoted. Other strategies can also be adopted, including group lending and loans from government lending institutions, both of which provide no-collateral loans.

6.2.4. Value chain finance

Due to the 2008 food crisis and commodity shortage, public sector interest in agricultural financing has enjoyed a renaissance after many years of declining investment, while private sector interest has also been stimulated by the attendant profit opportunities (Miller and Jones 2010). Meanwhile, development agencies have also been drawn to the VCF approach to promote and develop value chains (Miller 2012). In particular, VCF helps to expand the financing opportunities for agriculture, improve efficiency and repayments in financing, and consolidate value chain linkages among participants in the chain. Some key AVCF interventions and considerations are discussed below:

Sources of AVCF. There are two primary forms of AVCF, internal and external or direct and indirect with direct value chain finance as the financing provided among actors (loans provided by retailers to suppliers, advances from suppliers to farmers, etc.) and also the financing inside the segment (credits supplied and provided among farmers, financing provided by cooperatives to their members, by agricultural mutual fund organizations, etc.) and indirect value chain finance that attracts external capital into the value chain (e.g. banks could provide loans to farmers and processors, by recognizing the processing contract or other commodities as collateral).

Strategies. Governments and donor agencies do not need to be fully versed in value chain finance instruments (as described in section 4.4.4). However, it is important that they (a) understand the benefits and risks of the different financial instruments to the various participants within the value chain and (b) ensure that adequate mechanisms are in place to permit and govern their application.

Programmatic Considerations. Non-financial alternatives should be considered

before financial interventions and policymakers/donors should also avoid crowding out the private sector and other ongoing initiatives with grants. Also, although the AVCF approach can be a valuable tool for development agencies, it is merely the means to a larger end. In other words, the AVCF approach should be deployed to demonstrate and promote the use of VCF and/or to expand financial access. And the direct lending or investment in a value chain is often inadvisable for donors or development agencies, which should instead use their funding to, in turn, help attract local or, if needed, international funding and investment.

6.2.5. Public finance expenditures

Public finance investment is the most important agricultural financial support mechanism available to developed countries and involves government provision of full or a major share of funding for the national policy-oriented financial institutions targeting agriculture. The coverage of credit support, interest discounts, and other features of these institutions are closely connected with government policies. Their mandate is not profit maximization; instead, they adjust their service targets and objectives according to the changing situation of domestic agricultural development and of the external environment. Some key interventions and considerations are discussed below:

One focus of public investment is the support of research and development of core technologies, including agricultural biochemical products, breeding, machinery, value chain development, etc., in research institutions, universities, and the private sector as well as the dissemination of these technologies. Comprehensive coverage with detailed programs helps to ensure effective allocation of funds, and often times governments offer initial funding for the commercialization of research outputs. Investment is also needed to promote the adoption of advanced farming technologies through extension services. It is conducive to increased agricultural productivity and it enables farmers to undertake private investments and bear some production risk (Mogues et al., 2011).

Encourage investment from the private sector. Apart from the ever varying profit motive, the following measures are often employed by the government to encourage private investment in agricultural finance: tax deductions or subsidies, government bonds, flexible and favorable legislation and policies, as well as various investment guiding funds. In addition, governments put a great deal of effort into the intellectual protection of technological innovations to ensure the interests of R&D practitioners.

Supporting the construction of infrastructure is of high importance to the development of agricultural modernization. Public spending on infrastructure (e.g. roads, input and output markets, marketing information, weather stations, etc.) has significant importance because it reduces transportation and transactions costs, increases value added and profit margins, and facilitates finance options. Through improved access to education, health, and other production support services, public spending on the transport sector also exerts other multiplier effects that boost the sustainable development of the agricultural sector (Benin et al. 2009).

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