Has global agricultural investment gone to the areas most in need?

Evidence from FDI Market database

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INTRODUCTION

Food security is a fundamental issue for human well-being. 2030 Agenda for Sustainable Development proposes to "End hunger, achieve food security and improved nutrition and promote sustainable agriculture". However, the number of people affected by hunger globally has been slowly on the rise since 2014. Especially after the outbreak of Covid-19, this situation will continue to deteriorate. According to FAO (2020), current estimates are that nearly 690 million people are hungry, or 8.9 percent of the world population - up by 10 million people in one year and by nearly 60 million in five years. In 2019, close to 750 million - or nearly one in ten people in the world - were exposed to severe levels of food insecurity. The Covid-19 pandemic may add between 83 and 132 million people to the total number of undernourished in the world in 2020. And the United Nations predicts that the number of hungry people will double by the end of 2020 as a result of the outbreak and widespread of Covid-19 (United Nations World Food Program, 2020). If recent trends continue, we could not achieve Zero Hunger by 2030. So more related research and urgent action is needed now.

FAO (2018a) emphasizes the need to create an inclusive environment for improving food security through appropriate investment and better policies, in order to address food security issues that are high on the international research agenda. Indeed, investment has contributed to the improvement of food security in host countries, and many literatures have focused on this topic and verified this conclusion. Agricultural investment improves food security in three ways. First, investment improves food security in host countries by increasing the efficiency of food production. Investment has a positive effect on accessibility to factors of

production (knowledge, technology, capital), improvement of agricultural TFP and availability of food for the local population (Fan and Pardey, 1997; Huang et al., 2013; Fuglie, 2018). Second, the expansion of farmland resulting from overseas arable land investment reduces food supply problems and increases food security in host developing countries. The expansion of arable land can increase food production, which will provide food for local farmers and increase the income of local residents (Cui et al., 2018; Nyantakyi-Frimpong and Bezner-Kerr, 2015). Third, foreign investment can increase foreign exchange earnings, promote international food trade and improve food supply and stability in host countries (Bouët and Laborde, 2017; Chen and Han, 2015).

Under the impact of Covid-19, it is very important to discuss how to better solve the problem of food insecurity by increasing efficient agricultural investment. A variety of factors cause food insecurity, including economic, social, natural, cultural traditions, eating habits and other factors (Bublitz et al., 2019; Leng et al., 2017). Food insecurity issues in developing countries are the lack of access to a nutritious diet due to insufficient purchasing power, and food insecurity issues in developed countries are mainly lacking access to a healthy diet (Perez-Escamilla et al., 2018; FAO, 2018a; FAO, 2018b). According to FDI market data, from January 2003 to June 2019, there are 7,352 investments projects, launched by private companies, in food and tobacco sector. These capital investment flows from 111 countries and regions to 161 countries and regions, a total of $286 billion in investment funds. The fact is that the number of hunger people has been slowly on the rise since 2014. Here comes the questions: So far, which countries are top destination countries that receiving most agricultural investment? How much agricultural investment do food-insecurity countries receive? Why there are differences in the amount of agricultural investments received between food security countries and food insecure countries? These three issues will be the focus of this paper. On this basis, we also hope to find some policy implications.

DATA AND METHODS

There are fewer global databases on agricultural investment, mainly because investment data are highly confidential and many companies generally do not disclose their investment data to the public (Chen et al, 2017; Oya, 2013). Currently commonly used are two databases, one is Land Matrix (https://landmatrix.org/), which is a global and independent land monitoring initiative led by the International Land Coalition (ILC), this database collects information on large-scale land deals in low- and middle-income countries since 2000. The other is FDI market (https://www.fdimarkets.com/), which is the most comprehensive online database of cross-border greenfield investments. More than 20 sections, including investment amount, project time, source country, destination country and etc, can help us track and understand the situation of companies investing overseas. Since the data in the Land Matrix database is mainly large-scale land transactions, and these lands are used for different fields, such as food crop, tourism, timber plantation, industry and etc. After screening the data of concluded and contract agriculture, we find that the sample is too small. So we use the data of FDI market, by selecting the investment in the food and tobacco sector. Using the data from January 2003 to June 2019, we analyze the current state and flow of global agricultural investment.

Depending on the type of data, existing researches about food security evaluation can be divided into two categories. One is the use of macro data at the national level to study food access and food availability. The other is the use of household survey data to study food utilization and food stability. At the macro level, researchers usually assess food security at the national level by indicators like hunger index, proportion of undernourished people, and national food production, etc. At the micro level, in order to study the supply of household food, some studies record the per capita calorie supply, the supply of carbohydrates, the supply of protein or the supply of energy, analyze the number of meals served per unit of time

(Alae-Carew et al.,2020; Hollis et al., 2020; Humphries et al., 2017). Some scholars measure food utilization and nutritional value through dietary diversity or food distribution within the family, such as the quality of food intake (Saha et al., 2015; Laborde et al., 2016; Fiedler and Yadav, 2017).

This paper aims to explain the relationship between agricultural investment and food security among countries. Due to the fact that destination countries include both developed and developing countries, this paper measures the level of food security in countries by per capita protein intake (http://www.fao.org/faostat/en/#data), an indicator that can control differences in food security in different countries while maximizing the integrity and comparability of data. Since this indicator in the FAO database is only updated to 2016, we use the average value for 2003-2016 to measure a country's food security level, which is also consistent with the timing of investment data.

RESULTS

Investment divided by country

The sources of agricultural investment are relatively concentrated and capital investment mainly come from developed countries. The largest source of agricultural investment is the United States, with 18.6 percent of the world's agricultural investment coming from the United States, amounting to $53 billion. Then, $23.9 billion and $23.4 billion investments came from Switzerland and Germany, accounting for 8.3% and 8.1% of total investment, respectively. This is followed by the UK ($17.8 billion, 6%), Japan ($15.2 billion, 5.3%) and China ($13.4 billion, 4.7%). These six countries accounted for 51.35 per cent of total investment, about $145.8 billion. The destination of agricultural investment is more dispersed, mainly to the traditional agricultural countries. The biggest destination of investment is China, with $26.8 billion, or 9.37% of total investment. The second largest destination country is

Russia, with an inflow of $26.8 billion, accounting for 9.37%. This is followed by the United States ($22.5 billion, 7.9%), the United Kingdom ($12.1 billion, 4.3%), Brazil ($9.4 billion, 3.3%), India ($9.3 billion, 3.2%) and Indonesia (8.3 billion, 3%). A total of 40 per cent of the approximately $114.4 billion invested go to these seven countries.

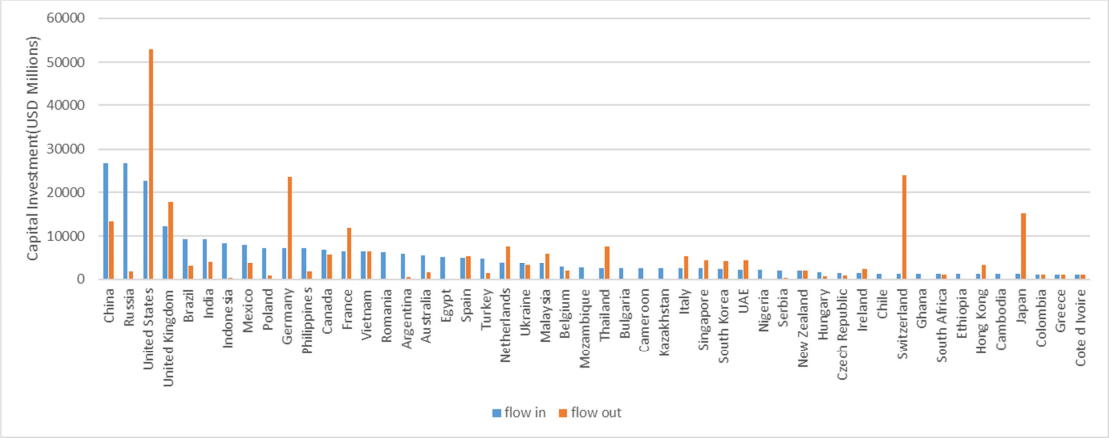

Figure. 1. Capital Investment of Top 50 Destination Countries.

Source: FDI Market

Overall, the ratio of countries with net outflows of agricultural investment to countries with net inflows is 1:3, which means 41 countries are net outflows of agricultural investment and 120 countries are net inflows of agricultural investment. The top five countries with net outflows are the United States ($30.5 billion), Switzerland ($22.7 billion), Germany ($16.2 billion), Japan ($14 billion) and the United Kingdom ($5.7 billion). Among the countries with net inflows of agricultural investment, the top five are Russia ($25.1 billion), China ($13.9 billion), Indonesia ($8.1 billion), Poland ($6.5 billion) and Brazil ($6.4 billion).

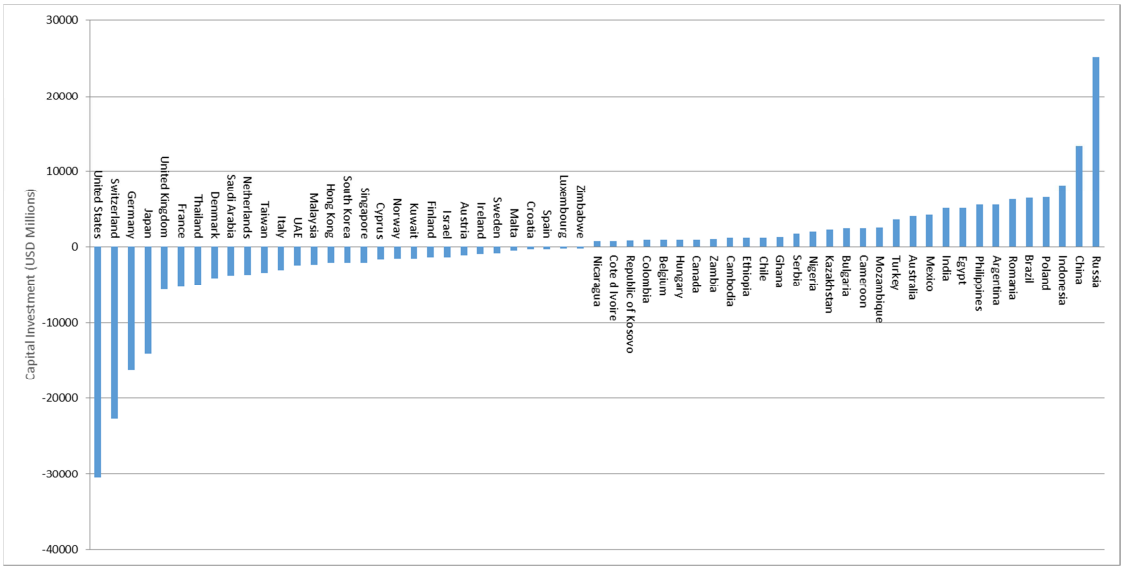

Figure. 2. Net Inflow of Main Countries.

Source: FDI Market

Investment divided by production process

There are 19 sub-sectors in the Food and Tobacco industry in the FDI Market database. This paper classifies all data as agricultural production investment and processing investment. Among them, processing involves eight sub-sectors, including animal slaughter and processing, bakeries and tortillas, restaurants (food and tobacco), food services, seasonings, snacks, sugar and confectionery products, wholesale trade (food and tobacco). The remaining 11 are classified as agricultural production, including tobacco, seafood products, Grains &oilseed, Fruits &vegetables &specialist foods, Fishing hunting &trapping, Dairy products, crop production, coffee &tea, animal production, animal food and all other food。

As for agricultural investment in the processing process, a total of 2858 transactions, involving investment of $106.4 billion, which flowed from 90 countries to 131 countries. Investment funds came mainly from the United States ($19.7 billion, or 18 %), Germany ($18 billion, or 17 %), Switzerland ($7.2 billion, 6.7 %), the United Kingdom ($6.6 billion, 6.2 %), and Japan ($6 billion, 5.5 %). These five countries account for 54 per cent of total investment

in all countries, showing a more concentrated trend. Investment funds went mainly to the United States ($9.4 billion, 8.8%), China ($8.8 billion, 8.2%), Russia ($8.2 billion, 7.7%), the United Kingdom ($6.6 billion, 6.2%) and India ($4.8 billion, 4.5%). In the U.S., the largest destination country, $9.4 billion flowed into eight industries. Of that amount, about $2.9 billion went to bakeries and tortillas, $1.6 billion to sugar and confectionery products, $1.4 billion to food and beverage stores, $1.3 billion to animal slaughter and processing, and snack food ($700 million), Seasoning and dressing ($700 million), Food services ($600 million) and wholesale retail ($30 million). China is the second-largest recipient of agricultural investments, mainly in Food and Beverage Store ($2 billion), animal slaughter and processing ($1.9 billion), sugar and confectionery products ($1.7 billion), bakeries and tortillas ($1.6 billion).

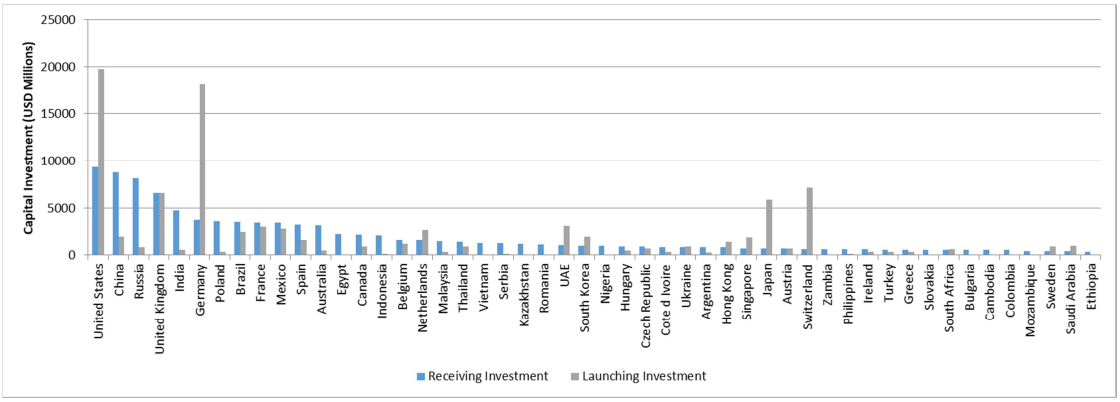

Figure. 3. Capital Investment of Top 50 Countries in the Initial Processing Process.

Source: FDI Market

As for production sector, a total of 4,494 transactions involving $179.8 billion flowed from 94 countries to 150 countries. Investment funds came mainly from the United States ($33.3 billion, or 19 %), Switzerland ($16.8 billion, or 9.3%), China ($11.4 billion, 6.4%), the United Kingdom ($11.3 billion, 6.3%), and Japan ($9.3 billion, 5.2%). All these five countries' capital investment accounted for 46 per cent of total investment. The top destination countries were Russia ($18.7 billion, 10%), China ($18.1 billion, 10%), the United States ($13.2 billion,

7%), the Philippines ($6.6 billion, 3%), Indonesia ($6.2 billion, 3%). In Russia, the largest destination country, $8.4 billion went to dairy products and $2.3 billion went to animal production. Four sub-sectors received more than $1 billion in investment, namely, Grains &Oilseed ($1.6 billion), Fruits &Vegetables &Specialist Foods ($1.1 billion), coffee &tea ($1.4 billion) and animal food ($1.7 billion), with the rest sectors receiving less investment. In China, dairy products is the most popular sub-sector for investors, which attracted $2.9 billion. Besides, $3 billion went into All other food, $2.5 billion went to Grains &oilseed, $2.2 billion went to Fruits &Vegetables &Specialist Foods, $1.9 billion went to animal production, $1.5 billion went to Tobacco, $1.4 billion went to crop production, and $1.3 billion went to animal food. Two other sectors received less than $1 billion in investment, seafood products ($400 million) and coffee &tea ($900 million).

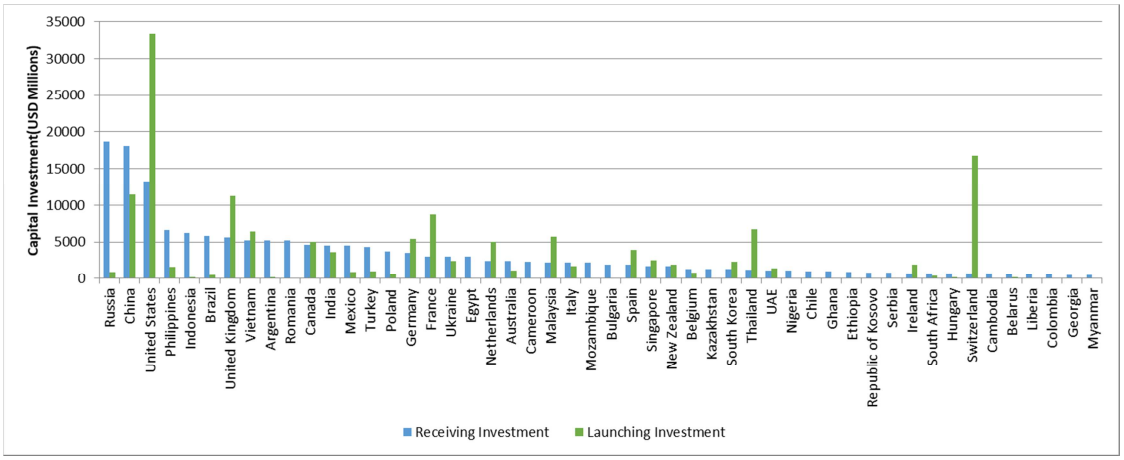

Figure. 4. Capital Investment of Top 50 Countries in the Agricultural Production.

Source: FDI Market

The current state of food security in the destination country

As we can see, the United States, China and Russia are top 3 destination countries, both in total investment and sub-sector investment. These three countries are highly developed economies and are not suffering from food insecurity. What about the food security levels of the other destination countries? We mapped the number of investment projects and the level

of food security in the world, using per capita protein intake as an indicator. We try to find the relationship between agricultural investment and food security.

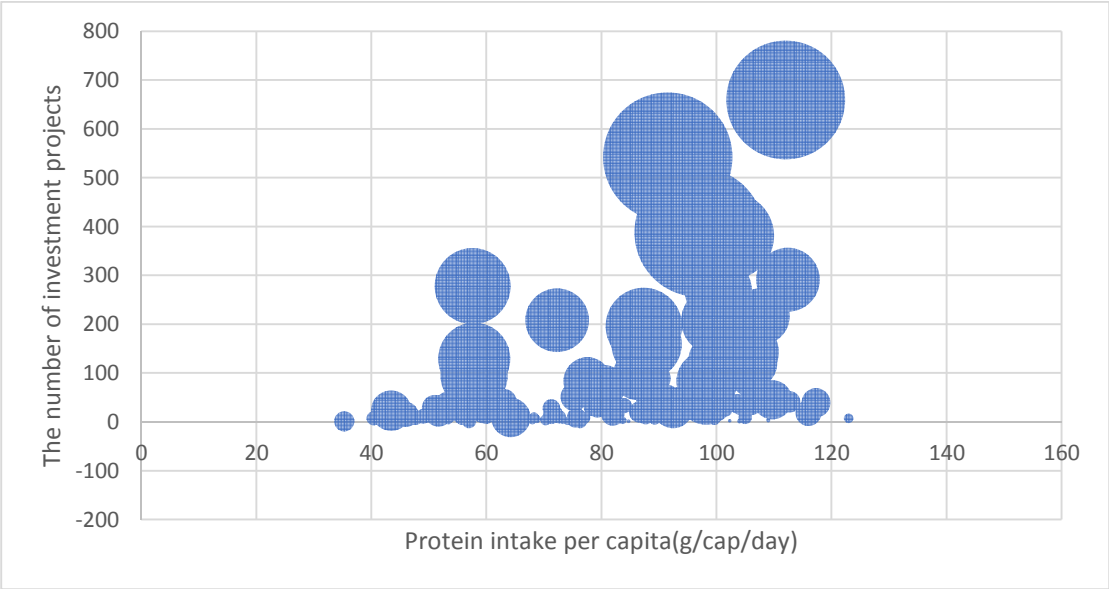

Figure. 5. Food Security in Destination Country.

Source: FDI Market and FAO

As shown in the figure above, the horizontal coordinates represent the per capita protein intake (g/cap/day), the vertical coordinates represent the number of investment projects, the different bubbles represent different countries, and the bubble size represents the amount of investment received (USD million). As the figure shows, larger bubbles are mainly concentrated in countries with high protein intake, while countries with low protein intake are mainly small bubbles. This tells us that agricultural investment is polarized, with larger agricultural investments in food-security countries and small- and medium-sized investments concentrated in food-insecurity countries. If we use protein intake of 70g/cap/day as a criterion to distinguish between food security and food insecurity countries. In terms of total investment, the share of total investment received by all food security countries was 81 per cent, while that of food insecure countries was only 19 per cent, which shows that investment in agriculture is extremely uneven. China is the largest recipient of investment among all

countries. China received a total of $26.8 billion in investment between 2003 and 2019, of which $18.1 billion was received in production and $8.8 billion in processing. In both sub-sectors, China is the second largest destination country. China's protein intake is 91g/cap/day, well above the 70g/cap/day standard. Russia is the second largest destination country of agricultural investment, with $26.8 billion flowing into Russia, of which $18.7 billion are in the production sector, the largest recipient in this sub-sector, and 8.2 billion in the processing sector. The per capita protein intake in Russia is 96 g/cap/day. The United States receives a total investment of $22.5 billion, of which $9.4 billion in processing and $13.2 billion in production. The per capita protein intake in the United States is 112g/cap/day. In food insecurity countries, the largest destination country is India, which receives a total of $9.3 billion in investment, followed by Indonesia at $8.3 billion and the Philippines at $7.2 billion. The per capita protein intake in all three countries is 58g/cap/day, far less than those in China, the US and Russia. Overall, we found that agricultural investment flows mainly to countries with relatively higher food security level, while countries suffering from food insecurity receive less investment. This result is quite the opposite of what we expected, then what is the reason for this?

ANALYSIS OF INVESTMENT MOTIVATION

According to the theory of international production compromise proposed by Dunning(1981), enterprises choose to invest a foreign country needs to meet three advantages (OLI): ownership, location, internalization. Ownership is an extension of the monopoly competition theory, which means that multinationals should have unique advantages that are not available to the native company in host country. Location refers to the countries or regions that companies choose have the best investment environment, taking into account production costs, market potential, resource endowments, trade policy and socio-cultural factors. Internalization means that companies will get more benefit in choosing to invest a foreign

project than in technology transfer. There are four motivations for enterprises to invest in a foreign country: market seeking, resource seeking, efficiency seeking, and strategic asset seeking.

The market seeking guidance

The most common purpose of overseas investment is to open up new markets. According to Factor Proportion Theory, changes in product prices have a magnifying effect on changes in factor prices, and commodity trade can be an alternative to factor trade. In reality, the trade policies of different countries will lead enterprises to seek overseas investment projects and develop new markets, which in turn will reduce production costs. The top seven countries received 40 per cent of total investment in agriculture in 161 countries, which shows a strong concentration. The more received investment in a country, the higher level of its economic development. The GDP of all seven countries in 2019 is more than trillion dollar, and three-sevenths of them reach more than 10,000 dollars in per capita. The number of the US and UK are $64,865 and $41,895 in 2019, respectively. India is the lowest of the seven countries, with a Per capita GDP of only $2,175. The volume of the economy determines the current size of the market. When a company enters a country with a larger market, it is more likely to make a profit in the short term. At the same time, the population is also large in these seven countries. China has a population of about 1.4 billion, while India's total population reached 1.3 billion in 2019. In addition, the Population of the United States, Brazil and Indonesia is more than 200 million. The huge population and rapid economic development mean huge market potential. By choosing these places as destinations for investment, companies can capture a larger market share in the early stages of market development and gain long-term benefits as the market expands.

Table 1. The main economic and arable land resources indicators of Top 7 countries

Country	Received investment (billion)	GDP 2019 (trillion)	Population 2019 (million)	GDP per capita 2019	Arable land 2018 (1000ha)	Arable land per capita 2018 (ha)
China	$ 26.8	$ 14.34	$ 1,397	$ 10,261	119,488	0.086
Russian	$ 26.8	$ 1.69	$ 144	$ 11,585	121,649	0.845
U.S.	$ 22.5	$ 21.37	$ 328	$ 65,118	157,736	0.481
U.K.	$ 12.1	$ 2.82	$ 660	$ 42,300	6,037	0.091
Brazil	$ 9.4	$ 1.83	$ 211	$ 8,717	55,762	0.264
India	$ 9.3	$ 2.87	$ 1,366	$ 2,104	156,416	0.115
Indonesia	$ 8.3	$ 1.11	$ 270	$ 4,135	26,300	0.097

Source: World Bank, FAO

Resource seeking guidance

With the acceleration of industrialization and urbanization, the global food supply is under great pressure. Arable land, as the most important factor resource in grain production, has become a growing concern of the agricultural-oriented countries in recent years. Due to the extreme imbalance of global population and arable land resources, many countries choose to invest in overseas arable land to ensure domestic food security. The United States is the largest source of agricultural investment. And American companies' agricultural investment is mostly concentrated in the food processing industry, especially cold chain logistics of vegetables and fruits and specialty food processing, less involved in agricultural production. That is because the United States has a relatively rich arable land resources, 2018 per capita arable land of 0.48 hectares, far higher than the world per capita of 0.26 hectares. The main destination countries of U.S. agricultural investment are mainly concentrated in Europe and

Central Asia, such as the United Kingdom, France, the Netherlands, China and other places. These countries have a high level of economic development, good political stability, preferential trade policies, high degree of opening up. By contrast, China's foreign agricultural investment is mainly aimed at obtaining overseas arable land resources, as per capita arable land resources are less in China. According to the Land Matrix database, there are 68 overseas investment projects launched by Chinese companies, of which 32 are in Africa, 20 are in Asia, 7 are in Latin America, 5 are in Oceania and 4 are in Europe. In short, enterprise's foreign investment is to make full use of resource endowment in host country to meet the development goals of their own enterprises. Enterprises in different countries prefer different host countries based on the current state of domestic development and long-term corporate planning. Because of the different domestic development status quo and the company's long-term planning, enterprises prefer different host countries.

Efficiency seeking guidance

Efficiency seeking guidance, that is reducing costs and improving profits, is also an important factor for enterprises to invest in a foreign country. According to the theory of product life cycle, commodities have three life cycles, namely, innovation stage, maturity stage and standardization stage. The innovation of agricultural products mainly involves the cultivation of new varieties, the innovation of production technology, the invention and creation of agricultural machinery, etc. At this stage, enterprises tend to choose countries with dense professionals, high technology productivity and advanced industrial facilities. At maturity stage, companies tend to shift production to countries with lower labor and production costs. During the standardization phase, companies move production to lower-cost developing countries. In this process, enterprises will choose to invest in different places to build factories, industrial chain transfer will follow the principle of comparative advantage of international trade. Developed countries, such as the United States and the United Kingdom,

have advanced agricultural technology and equipment. Choosing these countries to invest can help enterprise enhance innovation ability and promote research and development, with the help of high-quality professional knowledge personnel and advanced management experience. In addition, developed financial markets can also provide adequate financial support for enterprises. In emerging economies, like China and India, national trade policies and related financial support policies will be more friendly and more conducive to the development of enterprises. These countries also have cheaper labor resources, which can help companies reduce production costs. All these conditions meet the strategic needs of the company's overseas expansion and maximize the company's profits. However, in most African countries, especially those less developed countries, it is very difficult to attract a large amount of agricultural investment, because of their low level of economic development, weak industrial base and limited infrastructure conditions.

Strategic asset seeking guidance

Enterprise assets are divided into ordinary assets and strategic assets. Strategic assets include the sales network of enterprises, management experience, innovation ability, brand value, corporate reputation, etc. Agricultural investment, that from developing countries to developed countries, is mostly for the purpose of strategic asset acquisition. This also explains why so much agricultural investment is going to developed countries such as the US and UK. Developed countries often have a mature logistics system, advanced management model and sales experience, these could help enterprises to enhance their own international competitiveness. Investment in developing countries is for corporate reputation or national strategic needs. For example, the Chinese government has continued to implement the "going out" strategy of agricultural enterprises, encouraging native companies to invest abroad by launching factories, participate in local development and open up overseas markets. After the Belt and Road Initiative was proposed, more and more Chinese enterprises try to explore

overseas business and implement foreign agricultural investment projects. On the one hand, these initiatives can alleviate domestic resource shortages and ensure domestic food security by making full use of overseas agricultural resources. On the other hand, Chinese companies could make full use of their production technology and management experience to help raise local food production rates and tackle hunger among local residents. Moreover, it is beneficial to enhance the reputation of Chinese enterprises and take on more humanitarian responsibilities.

DISCUSSION AND CONCLUSIONS

Global agricultural investment comes mainly from developed countries and is relatively concentrated. Nearly one-fifth of that investment comes from the United States. Top 5 source countries account for more than 50 percent of global agricultural investment. In terms of destination countries, 161 countries around the world receive agricultural investment, while top 7 destination countries receive a total of 40 per cent. The top 3 destination countries are China, the United States and Russia, which receive more than $20 billion in investment, while the least developed countries in Africa receive relatively little agricultural investment.

Most agricultural investment does not flow to food insecurity countries. If food-security countries and food-insecurity countries were distinguished by the 70g/cap/day per capita protein intake criterion, food-security countries (above 70g/cap/day per capita) received 81 per cent of the total investment, compared with 19 per cent in food-insecurity countries (where protein intake per capita are below 70g/cap/day per capita). In food-insecurity countries, India, Indonesia and the Philippines received less than $10 billion in agricultural investment, far less than China, the United States and Russia. African regions that are suffering from hunger, such as Liberia, Angola and Haiti, where protein intake per capita are less than 40g/cap/day, receive less than 700million in agricultural investment. So, those

countries that need investment most to improve food security are not receiving sufficient investment funds.

Companies choose different countries to invest for four main purposes: market seeking, resource seeking, efficiency seeking and strategic asset seeking. From the view of market, countries that receive more investment tend to have high GDP, with strong per capita consumption capacity. It means companies can make a profit by investing in these countries in the short term. Some new economies, such as China and India, are favored by capital because of their large population and large potential market size, which meets the long-term strategic needs of enterprises. From a resource point of view, due to the imbalance of global population and arable land resources, many countries choose to invest in overseas arable land for food security reasons. From the point of view of efficiency, companies at different stages of development may invest in countries with different levels of economic development. Investment in developed countries can promote product update and enhance innovation ability, with the help of their talent and technology advantages. By choosing developing countries, company can reduce product costs and improve corporate profits. Because these developing countries usually have a good policy and institutional environment, enterprises can enjoy the local country's policies, taxes and other advantages. In contrast, countries with weak ability to attract foreign investment tend to have weak infrastructure construction, imperfect industrial chains and low levels of political stability. From the point of view of strategic assets, developed countries have their own logistics system and management experience, which will be valuable for enterprises. It is the reason why the United States, Britain and other developed countries can attract a large number of agricultural investment projects. Enterprises invest in developing and least developed countries mainly in response to national strategies and enhance the reputation of enterprises. For example, Chinese enterprises have responded to the government's “One belt and road” initiative, and launched factors in

African countries to help improve agricultural productivity, and solve the food insecurity problems of local residents.

Large multinational companies play an important role in this process. In combination with their own development needs, enterprises carry out overseas agricultural investment in different countries to maximize profits. How to ensure that much-needed investment benefits those most in need is a topic of concern. In 2014, the Committee on World Food Security (CFS) considered and adopted the Principles for Responsible Investment in Agriculture and Food Systems (RAI). It is a set of principles that were negotiated and reached by Governments, the private sector, social organizations, United Nations agencies and research units. And the RAI aims to provide clear and detailed norms on agricultural investment and food security. Principle 1 states that agricultural investment should contribute to the eradication of poverty, especially for the most vulnerable. It emphasizes that agricultural investment should support countries in fulfilling the progressive realization of the right to adequate food within the context of national food security, i.e. emphasizes the diversity of sustainable food production and nutrition. However, the existing rules fail to pay attention to the investors themselves and lack guiding principles from the perspective of investment motivation. On this basis, the international community should create a more inclusive investment environment actively, and call on large transnational corporations to assume social responsibility in order to solve global food security problems. Especially under the impact of Covid-19, more people around the world are returning to poverty, they are unable to guarantee their own access to adequate food and nutrition. And with the rise of trade protectionism, developed countries are increasingly reluctant to provide international assistance. How to more effectively guide investment to the most needed areas deserve more attention from all over the world.

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