国际货物的海洋物流系统研究（英文版）

——以全球小麦运输为例

Study on Maritime Transportation and Logistics Systems of International Cargo-Focusing on the Global Wheat Transportation

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内 容 提 要

在人口增加和粮食问题日益严峻的背景下，从货物创造这一视点来研究粮食的海上运输的不多。本书从这一视点出发，选择有代表性的小麦，以大洲为单位对小麦的生产、供给及其海上运输状况做出了预测，构筑了小麦不足地区的海上运输模型，试算了小麦不足地区亚洲和非洲的海上运输发生量。预测结果表明，小麦不足地区可以依靠其他地区的补充来达到平衡，但作为货物创造的海上运输量能否实现需要依靠农业政策的支持来实现。

本书适合从事物流管理、物流工程、农业经营与管理、交通运输规划与管理、环境管理的研究人员以及实务人员参考阅读。

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Foreword

Wheat is the principal food of about half of the world's population. It is well known that the trade volume of wheat occupies the half of that of grain. In the 21st century, a steep increase in the global population is expected, mostly in Asia and Africa. According to statistics of FAO, the growing population can be maintained by increased cereal production. But the unbalance between supply and production of grain still exists in the world. In developing countries, about 800 million people do not get enough food or adequate nutrition for daily life. So, the food problem is still serious for people.

On the other hand, shipping continues to be dominant mode of transportation, accounting for almost two thirds of world trade (metric tons). With the economic globalization, maritime transportation will become more and more important. In recent years, the transportation sector have been facing a number of pressing system-wide environmental issues such as the emissions of greenhouse gases, etc.

Facing these problems, we make some detailed discussions about the system of wheat maritime transportation and logistics as follows:

Firstly, we estimate the supply and import/export of wheat on the basis of the continental method. Using the continental method, we can obtain the volumes of wheat shortage and the trade features about the import/export. Secondly, we show a clear situation of wheat trade by analyzing the trade flow data. Thirdly, although many researchers pay more attention to the container market, the bulk market has already been a new field in mari-

time transportation and logistics. In the research, we develop the forecasting model for required number of wheat bulk carriers. Fourthly, we mainly discuss about how to develop an analyzing system of wheat maritime transportation and logistics including transportation tons, ton-miles, valve, number of bulk carriers needed and emissions of CO_2 in the transportation from the viewpoints of the cargo creation and environmental problem. Finally, a comparative study is undertaken on maritime trade and bulk carriers of wheat and rice destined for Africa. We believe that this research is very useful for maritime transportation and logistics of grain in the world.

CONTENTS

Chapter 1 Introduction

1.1 Research Background

Wheat, the principal food of about half of the world's population, is grown in most areas of the world. Even people groups who eat mostly rice also eat some forms of wheat. It is well known that the trade volume of wheat occupies the half of that of grain.

The global population has increased since World War Ⅱ, and it is anticipated that it will increase rapidly in the 21st century (NIRA, 1982). Currently, about 4.4 billion of the world's 6.3 billion people live in developing countries. The population is increasing most rapidly in developing countries that attained political independence after World War II. In developing countries, about 800 million people do not get enough food or adequate nutrition for daily life. Meanwhile, developed countries are saturated with food. The food-shortage problem is becoming increasingly serious (FAO, 2001).

Shipping continues to be dominant mode of transportation, accounting for almost two thirds of world trade (metric tons) (UNCTAD, 2001). With the economic globalization, maritime transportation will become more and more important.

In recent years, many countries have been facing a number of pressing system-wide environmental issues related to the combustion of fossil fuels for mechanized applications, including air pollution, heavy reliance on the

extraction and processing of petroleum, and emissions of greenhouse gases. The transportation sector is a leading contributor to these problems, and within this sector, freight transportation is a significant contributor especially to energy use and carbon emissions (Schipper et al., 1997).

1.2 Research Purpose

In the 21st century, a steep increase in the global population is expected; mostly will happen in Asia and Africa. According to statistics of FAO, the growing population can be maintained by increased cereal production (Gilland B., 2002). But the unbalance between supply and production still exists in the world. The food problem is still serious for people. Firstly, the purpose of this research is to estimate the supply and import/export of wheat on the basis of the continental method. Using the continental method, we can obtain the volumes of wheat shortage and the trade features about the import/export. Secondly, by analyzing the trade flow data, we show a clear situation of wheat trade. Thirdly, we made an assessment to emissions of CO_2 in the wheat transportation. Finally, considering the cargo creation, we developed an analyzing system of wheat maritime transportation and logistics including transportation tons, ton-miles, valve, necessary number of bulk carriers and emissions of CO_2 in the transportation.

1.3 Structure of This Research

The flowchart is constructed for this research as shown in Figure 1.1.

Chapter 1 presents background of the research and purpose. Besides that, chapter 1 also describes the structure of this research.

Chapter 2 reviews the related research from the following viewpoint. They are global model, marketing of grain, time series analyses and mathematical programming. We also explore the positioning of this research from

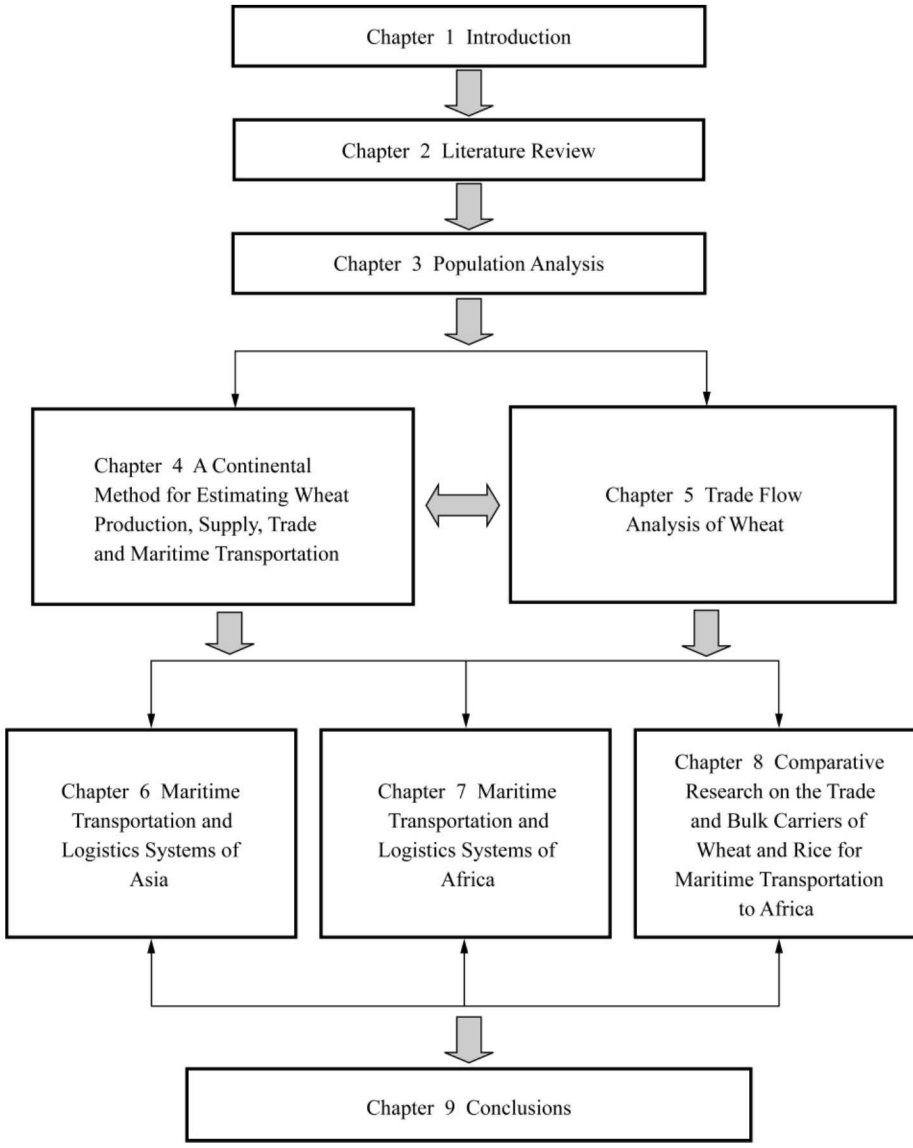

Figure 1.1 Flowchart of This Research

cargo creation and environmental problem.

In Chapter 3, we analyze the population predictions, population changes and population growth rate according to the UN's data. The factor of

population increasing is clearly shown.

Chapter 4 examines the production, supply of wheat on the basis of the continental method and analyzes the factors that affect the production and supply. Using the continental method, we can obtain the volumes of wheat surplus and shortage. After discussing the relations between the import, shortage and volume of maritime transportation, the requirements for maritime transportation of wheat are investigated and estimated in the future.

Chapter 5 proposes a trade flow analysis of wheat. First of all, we conduct the cross section data of trade flow using programming. Secondly, the share analysis of the international wheat export market is discussed. Finally, we analyze the Asian wheat's import by panel data.

In Chapter 6, the maritime transportation and logistics systems of wheat are analyzed for Asia. Firstly, we analyze the Asian trade condition of wheat. Secondly, from the import condition of Asia, we can make a decision which port can be used as importing ports and exporting ports based on investigating wheat importing ports of Asian countries and wheat exporting ports of others' countries. So the navigation distance between the exporting ports and importing ports can be calculated. Finally, we analyze the maritime transportation and logistics systems of wheat in Asia including maritime Ton, Ton-Miles, trade value, necessary number of bulk carriers and emissions of CO_2 in the transportation. In addition, the effect coming from the international price of wheat is analyzed by cross-correlations.

In Chapter 7, we analyze maritime transportation and logistics systems of wheat to Africa from maritime Ton, Ton-Miles, trade value, necessary number of bulk carriers needed and emissions of CO_2 in the transportation. After an analysis of the wheat transportation, we find that the agricultural policies greatly affect the wheat transportation to Africa. Then, using the two scenarios, we predict how many ships are necessary for the maritime transportation of wheat to Africa in the future.

In Chapter 8, a comparative study is undertaken on maritime trade of

wheat and rice destined for Africa. In the comparison, firstly, the feature of production and supply becomes clear. Secondly, trade feature is also discussed. Moreover, we show that agricultural policies significantly affect the transportation of wheat to Africa. On the other hand, we show that the export of rice to Africa is a regular trend. Finally, based on the comparison of trade, we predict the number of maritime bulk carriers of wheat and rice for Africa. In addition, the effect coming from the international price of wheat and rice is also discussed.

Chapter 9 presents the conclusions of this dissertation. It includes a summary of important results and subject of future investigation.

References

[1] FAO. World Agriculture towards 2015/30[M]. An FAO study, Rome, 2001.

[2] Gilland, B. World Population and Food Supply can Food Production Keep Pace with Population Growth in the Half-century[J]. Food Policy, 2002(27):47-63.

[3] National Institute for Research Advancement (NIRA). The Comparative Study in the Demand and Supply of World Food Prediction(In Japanese)[M]. Tokyo, 1982.

[4] Schipper, L et al.. Energy use and carbon emissions from freight in 10 industrialized countries: an analysis of trends from 1973 to 1992[J]. Transportation Research Part D, 1997, 2 (1) :57-75.

[5] UNCTAD. Review of Maritime Transport[M]. U. N., Geneval, 2001.

Chapter 2 Literature Review

2.1 Related Research

2.1.1 Global Models

Across the globe, the issue of human survival facing food and population crises is being discussed actively. Many international organizations, such as the Food and Agriculture Organization of the United Nations (FAO, 2002) are attempting to quantify the gap between the food supply and the demand. To evaluate this gap, the FAO used a single equation model until 1970, however, now uses the World Food Model. Based on this model, the following predictions can be made in regard to wheat. By 2010, wheat production will reach 679 million tons; supply, 683 million tons; import, 129 million tons; and export, 128 million tons (Alexandrite et al., 1995). By 2030, wheat production will reach 854.9 million tons, and the supply will reach 851.2 million tons (FAO, 2003). The FAO has taken the stance that providing adequate food to developing countries is a duty of the developed world.

The International Food Policy Research Institute (IFPRI, 2001) developed the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT, 2002) and predicted that by 2020, the worldwide production and supply of wheat would be 760 million tons.

In addition, other models have been developed by the United States

Department of Agriculture (USDA, 1999) and the Organization for Economic Cooperation and Development (OECD, 1976). These agencies have studied the supply and demand of wheat on a global basis. However, little research has been done on the supply, demand and maritime transportation of wheat in specific regions of the world.

Moreover, some pessimists' researches also happen. Meadows (Meadows et al., 1973) used the World 3 Dynamics Model to simulate the consequence of interactions between the Earth's and human systems. Five variables were examined in the original model, on the assumption that exponential growth accurately described their patterns of increase. These variables are: world population, industrialization, pollution, food production and resource depletion. The System Dynamics (SD) Model is updated until now (Meadows et al., 1992, 2004). The other alarming research is conducted by Brown (Brown L., 1994). He discussed food crisis and warned who could feed China.

Finally, Tongeren (Tongeren F. V. et al., 2001) reviews the present state of applied modeling in the area of trade and agricultural policies and a comparative assessment of alternative modeling approaches. These models are as follows in the Table 2.1. Since the results of global prediction model are different, Morisima (Morisima M., 1995) argues that the long-term prediction is more important as the goal or alarm than accurate prognosis. The result of prediction is guided in the desirable direction by performing simulation analysis based on the scenario assumed variously.

2.1.2 Marketing of Grain

The world wheat market is characterized by a limited number of major exporting regions, with the United States, Canada, Australia, the European Union (EU) and Argentina, accounting for about 83% of total exports (FAPRI, 1993). Imports are somewhat less concentrated, although China,

Table 2.1 List of Models Reviewed

Model	Initiating bodies (institutions and/or persons)	Key reference	Current Status
Partial models			
AGLINK	Organisation for Economic Co-operation and Development (OECD)	See http://www.oecd.org/agr/Documents/aglink98.pdf	Used
ESIM (European Simulation Model)	US Department of Agriculture/Economic Research Service, USDA/ERS, and University Gottingen, Germany	Tangermann and Josling (1994)	Used
FAO World Model	Food and Agriculture Organisation of the United Nations (FAO)	FAO (1993) and see http//:www.fao.org/es/esc	Used
FAPRI	Food and Agricultural Policy Research Institute, Iowa State University	Young et al. (1999)	Used
GAPsi (Gemeinsame AgrarPolitik Simulation)	Bundes Forschungsanstalt fur Landwirtschaft (FAL), Germany	Frenz and Manegold (1988)	Used
MISS (Modele International Simplifle de Simulation)	Institut National de la Recherce Agronomique (INRA), France	Mahe and Tavera (1989)	Not used
SWOPSIM (Static World Policy Simulation Model)	US Department of Agriculture/Economic Research Service (USDA/ERS)	Roningen (1986)	Not used
WATSIM (World Agricultural Trade Simulation Model)	University of Bonn, European Commission, Federal Ministry of Agriculture, Germany	Henrichsmeyer et al. (1998)	Used
Economy-wide models			
G-Cubed (Global Computable Genereal Equilibrium Growth Model)	McKibbin and Wilcoxen, US Environmental Protection Agency (EPA)	McKibbin and Wilcoxen (1999), and see http://www.msgpl.com.au/msgpl/msghome.htm	Used
GTAP (Global Trade Analysis project)	Purdue University, GTAP Center and GTAP Consortium	Hertel (1997), and see http://www.agecon.purdue.edu/gtap/Lee et al. (1994)	Used
GREEN	Organisation for Economic Co-operation and Development (OECD)		Used
INFORUM (Inter-industry Forecasting at the University of Maryland)	University of Maryland	Almon (1991), and see http://www.inform.umd.edu/EdRes/Topic/Economics/EconData/Intpartn.html	Used
MEGABARE/GTEM	Australian Bureau of Agriculture and Resource Economics	ABARE (1996), and see http://www.abare.gov.au/	
Michigan BDS (Brown-Deardorff-Stern)	University of Michigan	Brown et al. (1992), and see http://www.spp.umich.edu/rsie/model	Used
RUNS (Rural-Urban-North-South)	Organisation for Economic Co-operation and Development (OECD)	Burniaux and van der Mensbrugghe (1990)	Not used
WTO Housemodel	The World Trade Organisation (WTO)	Francois et al. (1995), and see http://www.intereconomics.com/handbook/disk.htm	Used