

# Internationalization of NDSU Agriculture

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A recent issue of *Newsweek* (Schwartz, 1991) contained an article titled "the great FOOD MIGRATION," subtitled "forget the gold. The real treasures the explorers brought back from the New World were corn and a lowly tuber. Chocolate wasn't bad either." From the new world came corn, potato, peppers, chocolate, vanilla, tobacco, beans, pumpkin, cassava, avocado, peanut, pecan, cashew, pineapple, blueberry, sunflower, and wild rice. From the old world to the new world came cattle, pigs, sheep, chicken, honeybees, wheat, barley, oats, soybean, sugar cane and beet, onion, citrus fruit, banana, crabgrass, and leafy spurge.

These lists point out the transnational linkages of agriculture, and specifically the dependence of North Dakota agriculture on crop and livestock imports from the old world. Nearly all the major products of North Dakota agriculture originated on other continents.

The international linkages go further, of course. The state's cattle industry was founded to provide meat for a growing United States (U.S.) population of hard working immigrants from European countries. Moreover, North Dakota's crop economy was initially premised on providing wheat to a hungry Europe whose own production was disrupted by war.

North Dakota State University (NDSU) agriculture also has had a long history of international involvement, starting with the founders of the College of Agriculture and the Agricultural Experiment Station. H. L. Bolley toured Europe and Latin America gathering genetic stock to support his flax research and made several trips to Russia which resulted in his developing rust resistant strains of hard red spring wheat and durum (Reid, 1989). H. E. Stockbridge, an early North Dakota Agricultural College (NDAC) scientist, served as professor at the Imperial College of Agriculture and Engineering in Japan (Reid, 1989). E. W. Ladd's research on durum wheat was based on varieties from Russia. L. R. Waldron, NDSU's premier wheat breeder of the 1920s and 1930s, based much of his success on genetic stock from Canada, Scotland, and Australia (Danbom, 1990).

Of the major crops grown in North Dakota, only sunflower is native to North America and corn to Latin America. North

Dakota was and still is partially dependent upon the rest of the world for genetic materials and cooperation in its research program. Even sunflower underwent much of its early development in Russia which still is the world's leader in production.

North Dakota's dependence on export markets for the sale of products dates from the breaking of the then territory's prairie. That dependence continues. The percent of the U.S. crop of hard red spring wheat exported in recent years is 57%, of durum wheat is 53%, of barley is 19%, and sunflower oil is 76%. North Dakota is the nation's dominant producer of these crops. The importance of international markets to the state's agricultural economy could become even greater if the current General Agreement on Tariffs and Trade (GATT) negotiations are successful in removing trade barriers and market-distorting government subsidies.

As with North Dakota's international interdependency in the production and sale of agricultural products, many of the agribusinesses in the state either purchase much of their inputs from foreign companies, sell a significant portion of their product overseas, and/or are partially owned by international interests. Ongoing changes in input and product markets imply that North Dakota agriculture, at all levels, will become even more internationally dependent in the future than in the past. In light of these circumstances, it is both important and understandable that NDSU continues to build on a wide range of international linkages and research.

## CURRENT INTERNATIONALIZATION EFFORTS

In education and training, NDSU is expanding its international linkages, recognizing the growing importance of international cooperation in developing new technology, varieties, and breeds, and in understanding the increasingly competitive markets into which we sell our products. Perhaps even more critical is that our most important resource, our sons and daughters, need to understand world cultures and economies in order to be successful in international competition.

In order to be competitive in international labor and product markets and to compete as businessmen and women in a global market, knowledge and understanding of other peoples and cultures are needed. NDSU's faculty are encouraged to include

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international perspectives in their courses and new courses are being developed which focus on international issues. For example, the Department of Agricultural Economics offers courses on world agriculture and international trade, Crop and Weed Science offers a course on tropical agriculture, and several seminars on third world issues are coordinated by the Tri-College University. Internationalization of the instructional program is a major goal in NDSU's strategic plan.

Classes and texts are useful. However, nothing substitutes for hands-on experience. Linkages for student and faculty exchanges are being developed with several countries including England, the Netherlands, Australia, and Japan. Currently, student work exchanges are available in the Netherlands and Japan. Student academic exchanges are also being arranged for NDSU students. Students are also informed of opportunities available through other universities and organizations. Both academic and work experiences are aimed at preparing students for effective roles in an international and technologically advanced 21st century agriculture and agribusiness.

NDSU researchers have, in a few short years, developed a strong set of linkages to agricultural specialists in a number of countries that are or could become important customers for Northern Plains products. NDSU agriculture's role as a training site for foreign managers and scientists has grown in size and reputation. A major source of that growth has been the Northern Crops Institute (NCI) located on the NDSU campus.

The NCI came into existence as the result of a shared vision by the North Dakota legislature, commodity groups, and NDSU of the need for a focused effort to promote northern grown crops and their uses in targeted customer countries. From the concept's approval by the legislature in 1981, the program moved quickly to reality. Currently the states of North Dakota, Minnesota, South Dakota, and Montana participate in the funding of NCI's programs and benefit from its market development activities.

Today the NCI conducts an active program of market promotion and training for foreign managers/technicians in the use of northern crops. Foreign delegations come to NCI for specialized training in cereal technology including commodity grading, pasta processing, baking, food processing, and analytical laboratory procedures to better enable them to utilize northern grown grains. Training foreign customers in the functioning of the U.S. market system is another important component of the NCI program.

NDSU's College of Agriculture faculty assist in teaching components of these courses. In addition, NCI personnel travel to customer countries around the globe to introduce buyers and processors to the quality of northern grown crops and to train processors in the most effective use of these crops. In less than a decade, the NCI has become a major player in market promotion and works with commodity organizations, the U.S. Department of Agriculture (USDA), government, and industry groups from more than 60 countries. The NCI has developed a very effective track record and has a high likelihood for strong contributions in years to come.

NDSU's College of Agriculture also has conducted a variety of training programs for international groups during the past few years. These have included training sessions for Turkish scientists, USSR agricultural managers, Saudi Arabian grain industry personnel, and Japanese extension agents.

During the fall of 1991, programs have been conducted for extension agents sponsored by the Japanese Agricultural Exchange Association and in cereal grains processing sponsored by the Food and Agricultural Organization of the United Nations. The Department of Agricultural Economics conducted a grain marketing system training program for a delegation of Turkish agribusiness executives and Yugoslavian and Czechoslovakian government officials sponsored by the Office of International Cooperation and Development of USDA. Agricultural Economics also conducted a bank management training program for officials from the Agricultural Bank of China in October 1991, sponsored by their government.

Opportunities are available for College of Agriculture faculty exchange programs and for research initiatives. A special "international research linkage development" program was organized in 1990 to stimulate joint research programs on issues of mutual concern with scientists of foreign countries. Several faculty each year have followed the path of the North Dakota Agricultural Experiment Station's founding fathers' travel abroad in search of knowledge to improve North Dakota agriculture. During the past two years, the quest for new understandings and knowledge has taken faculty to Thailand, the Netherlands, South Africa, Australia, New Zealand, India, Kenya, and England.

The Departments of Plant Pathology and Cereal Science & Food Technology have agreements for joint research projects with academic institutes in the new commonwealth of former USSR republics. Several personnel from NDSU and these republics are participating in the projects.

A funded project by the U.S. Agency for International Development on the economic impact of wildlife related tourism in Botswana was recently completed. It is expected that more research to assist less developed countries strengthen their economies will occur. North Dakota has a vested interest in assisting countries to improve their economic performance, since their need for food only translates into effective demand when consumers have the income necessary to purchase agricultural products imported from the U.S. Several agricultural faculty have participated in providing technical assistance and assessing the productive capacity of several potential customer countries including Thailand, Kenya, Poland, USSR, and India.

The North Dakota Agricultural Experiment Station regularly hosts 20 to 30 visiting scholars who work with NDSU faculty for periods of a few months to a few years on their research programs. NDSU's College of Agriculture currently hosts an annual reception for these scholars in recognition of their contribution to agricultural research in North Dakota.

To round out its training and educational role, NDSU's College of Agriculture provides graduate education to students

from many different countries across the agriculturally related academic and research disciplines represented within the College. Currently, about 76 graduate students from 27 different countries are pursuing Master's and Ph.D. degrees within the College of Agriculture. Most of these students continue productive professional relationships with NDSU faculty throughout their careers once back in academic, government, and private sector positions within their own countries.

## RESEARCH ON INTERNATIONAL TRADE AND MARKETING

A rapidly expanding internationalization effort in NDSU's College of Agriculture is the trade and marketing research being conducted in the Department of Agricultural Economics. A wide ranging array of issues that impact international trade and marketing provide impetus for this research. These issues can be expected to grow in importance with changes occurring in macro trade policies (GATT), greater diversity of crops and products exported from the U.S., and as international food and fiber competition becomes more intense. Such issues include the effects of GATT and bilateral trading agreements; economic analysis of specific trade expansion tools; administrative policies related to quality, grade standards, and regulations; and organization of trading industries in the U.S., competitor countries, and importing countries.

In addition to the GATT, which will impact all regions and commodities, the bilateral Free Trade Agreements (FTA) with Canada and Mexico will have important impacts on trade in the Northern Plains region. While the overall impacts of the North American FTA are generally expected to be positive for the United States, the impact on regionally important commodities and products is a focus of substantial research interest at NDSU. In addition, the FTA indicates a potential longer-term trend toward greater reliance on bilateral agreements, rather than the traditional multilateral agreements.

The markets and competitive environment for agricultural commodities and products grown in the U.S. Northern Plains region include a number of important characteristics. Many of the products are differentiated to some extent and command premiums in some domestic and international markets including high protein spring wheat, durum, malting barley, and sunflower oil. Each of these must compete with other countries or regions and with suppliers of substitute products (e.g., soybean or canola oil for sunflower oil, lower protein wheats for hard red spring wheat, and other types of wheat for durum). Price differentials in these markets are important in international trade and marketing.

## TRADE RESEARCH AT NDSU

The Department of Agricultural Economics has been able to expand efforts in international trade and marketing research due to a number of multiyear grants. A 5-year grant for a study titled "International Marketing and Trade Policies for Northern Grown Crops" is one example. The overall objective of this project is to facilitate the study of markets, institutions, trade practices,

and policies that influence the exports of grain and their products (primarily, but not limited to, hard wheats, durum, specialty oilseeds, and barley) from the Northern Plains region of the U.S. Another is a 3-year cooperative agreement to evaluate the impacts of alternative policies on grain cleanliness. Research under these projects is described below.

### • Trade and farm policies

Trade policies in the United States and abroad have changed significantly. Some of the policy changes include the U.S. and Canadian FTA, liberalization of agricultural products trade through bilateral trade negotiations with major agricultural importers, and the Uruguay Round of the GATT negotiations. All of these policies have affected agricultural production and exports of the Northern Great Plains.

The traditional gravity model, based on the partial equilibrium condition of demand and supply of aggregated commodities, was revised for a single commodity and applied to the world wheat trade analysis (Koo and Karemera). The objective of this study was to evaluate impacts of trade policies, such as long-term agreements, credit sales, the U.S. Export Enhancement Program (EEP), and the European Community's (EC) Export Refund Programs (ERP), on U.S. exports of wheat. Long-term agreements worked best to enhance international wheat trade. Credit sales increased wheat movement. But, the U.S. and the EC export subsidy stimulated world wheat trade less effectively. On the import side, protectionist policies of supporting domestic prices greatly impaired wheat trade.

Koo and Uhm (1990) developed an econometric model to evaluate the economic effects of the U.S. and Canadian FTA, emphasizing bilateral trade flows of agricultural and industrial products between the U.S. and Canada if tariff and nontariff barriers were removed. The U.S. imports of agricultural and industrial goods from Canada were more sensitive than Canadian imports, not only to import and domestic prices, but also to world prices. This was because Canadian consumers have less domestic substitutes than their U.S. counterparts and also because Canada's internal market is smaller than that of the U.S. Estimated total U.S. imports from Canada will increase \$2.8 billion compared to \$1.2 billion for Canadian imports from the U.S. Of this, U.S. agricultural imports will be larger than Canadian imports which include horticultural products, poultry, feed grains and oilseeds, and malt beverages.

The Uruguay Round of the GATT negotiations has focused on a broad range of trade issues, including liberalizing agricultural products trade. Koo and Drennan (1989) developed a mathematical programming model to analyze the impacts of various liberalization policies that major exporting and importing countries proposed for the region's agricultural production and exports. This model also has been used to evaluate the impacts of U.S. bilateral negotiations with major exporting and importing countries. This study found that the U.S. has a comparative and competitive advantage in marketing hard red winter wheat, corn, and soybeans over other countries and has a disadvantage in producing and marketing spring and soft wheat. If free trade is fully implemented, North Dakota may fare less well than states closer to barge and ocean shipping.

#### • **Competitiveness studies**

Competitiveness is defined as a country's ability to compete with other countries in a market. A country is competitive in a market if the country has the largest market share in the market and maintains and/or increases its market share. A country's competitiveness in producing agricultural products is influenced by the country's resource endowments and trade policies that it and its trading partners adopt. Recent developments in trade policies, which liberalize agricultural trade, have raised some questions: Is the U.S. agricultural sector competitive in the world market under existing trade policies? What trade policies would improve U.S. competitiveness in the world market most? What would be the impacts of recent changes in trade policies on U.S. competitiveness in the world market?

Spatial equilibrium models based on a mathematical programming algorithm have been used to answer these questions with special attention to evaluating impacts of the existing trade policies and their changes on the Northern Plains' agricultural production and exports. Two models were developed: one to evaluate the economic effects of trade liberalization policies such as the U.S. and Canadian FTA in trade flows of durum wheat and semolina (Koo, Golz, and Yang), and the other to analyze competitiveness of the U.S. broiler meat industry in the North American market, focusing on the economic feasibility of Fargo as a broiler processing location under the FTA (Golz and Koo).

The spatial equilibrium model for the world durum market indicates that the FTA will benefit U.S. durum producers more than Canadian producers. Eliminating the Canadian rail subsidy significantly reduces trade flows from Canada to the U.S. The EEP is important in maintaining U.S. durum market shares in the world market as long as the EC uses the ERP. The ERP also enables the EC to maintain its market share. Canada gains market share when either the EEP or the ERP is eliminated. The U.S. has a competitive advantage over other countries in producing durum wheat and benefits the most under a complete free trade system.

According to the broiler study, the U.S. broiler industry is highly competitive in the North American market under the existing trade policies which impair trade flows among the U.S., Canada, and Mexico. Freer trade among these three countries enhances U.S. competitiveness in the market and increases U.S. exports of broiler meat to both of these countries. Free trade with Mexico would increase production for border states like Texas, while free trade with Canada would increase production in Northern border states. The most competitive regions are at Fargo, Portland, and Little Rock. These regions all increase competitiveness under free trade with Canada and Mexico. This study supports Fargo as a new broiler processing location to meet the demand in the Northern border states and Canada.

#### • **Wheat demand and import market characteristics**

Understanding characteristics of markets is essential to formulate targeted export strategies and to identify growth rates of markets in order to maximize the benefits from export expansion efforts. To address these issues, a research paper is being

prepared entitled WHEAT CONSUMPTION, IMPORT DEMAND, AND GROWTH MARKETS (forthcoming by Wilson and Yang). The purpose of this research is to evaluate characteristics of both wheat consumption and import demand across a wide range of countries.

Growth in imports can be attributed to a variety of factors such as population growth, income growth, changes in tastes, price reductions, or production growth lagging consumption for wheat producing countries. Importance of these factors varies across countries. In addition, parameter values of these variables and growth rates of underlying variables (income, production, etc.) vary across countries. Growth rates were identified for each importing country. The next step in this research is to define 'characteristics' of growth markets, to rank them regarding expected growth rates, and make comparisons to their financial and credit worthiness.

#### • **Export credit**

Since their introduction in the late 1970s, export credit guarantee programs have been an important marketing tool to maintain or increase U.S. agricultural commodity exports. These export credit programs provide a federal guarantee to financial institutes that lend funds to foreign buyers of U.S. commodities. Similar programs are used by each of the major wheat exporting countries. However, the extent of their use varies through time and across countries. Throughout the 1980s, wheat trade under the credit programs was a distinct feature in the international market. Use of credit is expected to increase in the post-GATT era.

A major research effort on export credit programs was initiated in July 1991, including research on four major topics. The purpose of the first study is to explain why countries are deemed eligible to purchase wheat under credit. Comparisons are made across exporting countries and through time. The purpose of the second study is to determine the impact of credit guarantee programs on market shares. In doing so, other market tools (e.g., EEP, PL480, LTAs) are included in the analysis. Results provide insight into the impact of credit on demand, the effectiveness of credit relative to other policy instruments, the impact of credit versus direct price subsidies on market shares, and differences in demand for credit across importing countries. A third study is designed to evaluate the dynamic impact of credit allocation (and other strategies) on dynamic inter-country competition. Of particular importance is to understand how competitor countries respond (via price reductions or other strategic policies) to credit allocation decisions from the U.S. A project currently underway entails developing a quantitative model to determine optimal credit allocation decisions. Important elements of this analysis include obvious sources of uncertainty such as the probability of the credit not being repaid and the impact on market share. Less obvious but crucial sources of uncertainty include competitor provision of credit and effects of credit on purchase probability during the next period. In a multicountry/commodity analysis, important elements include the portfolio effects of providing credit, competitor reactions, and differentials in market share growth rates across importing countries.

#### • **Barley trade**

Barley is an important crop in North Dakota, accounting for over 10 percent of total state acreage. Barley is less significant nationally (relative to other feed grains) and, for that reason, has not been the subject of much economic analysis. Nevertheless, the effects of the U.S. EEP, FTA's with Canada and Mexico, and other trade policy issues are of vital interest to barley producers and merchandisers.

Objectives of the analysis include 1) estimating regional supply and demand for barley, including relevant cross-commodity relationships and 2) simulating the effects of policy changes (e.g., changes in the Canadian transportation subsidy and FTA and EEP subsidies) on prices and interregional trade flows. The model will complement other policy analyses by documenting regional impacts. Predictions of prices and trade flows under trade liberalization scenarios will be of general interest to policy makers and market participants.

#### • **Grain quality**

In recent years, U.S. wheat exports have been a shrinking share of the world wheat trade. That has focused interest on grain quality. Among numerous issues related to quality and export competition, one that is highly visible relates to dockage. The "Grain Quality Incentive Act of 1990" mandated that the Federal Grain Inspection Service estimate the benefits and costs of cleaning grains and the distribution of the economic impacts. NDSU is conducting this study in a cooperative agreement with the Economic Research Service for hard red spring, durum, and white wheat.

As part of this research, a model was also developed to evaluate the optimal level of dockage in exports from the U.S. to various import countries. The model requires country specific data, e.g., cleaning cost, value of screenings, and transportation costs, to simulate the decision making process of a foreign importer and of the U.S. export firm. The results indicate that the "optimal" level of dockage in export shipments may vary according to the demand characteristics of importing countries. In addition, the model defines the trade-off between price and dockage from an importer perspective. The results demonstrate that only in very particular circumstances would regulated dockage limits result in expanded exports from the U.S.

#### • **Value-added products**

A recent grant, titled "Economic Growth Via Exports of Northern Plains Agricultural Products," is focused on seeking ways to stimulate economic growth, income, and employment by export expansion of value-added agricultural related products. The underlying philosophy of this approach is that the Northern Plains needs to diversify its agriculture and to add more value to its products prior to export in order to improve job creation and income growth. The program's mission is to perform research and conduct outreach programs to assist private businesses and industries to export Northern Plains agricultural commodities, value-added products, manufactured goods, and services in order to promote expansion and diversification of the Northern Plains economy.

The specific goals are: 1) to conduct research on the impact of governmental policies, world economic and political trends, and technology upon the competitiveness of the Northern Plains in export markets; 2) to perform export market opportunity analyses for Northern Plains primary, intermediate, and final products and services including product development/modification, technology discovery, and consumer preference; and 3) to evaluate the impact of trade infrastructure and practice factors including credit and legal aspects, nontariff barriers to entry, and transportation issues upon exports.

The mission and goals were discussed and agreed upon in a one-day workshop involving persons from Montana, South Dakota, Minnesota, and North Dakota in May 1991. It is planned that most projects funded under this program will be cooperative efforts among the universities of Montana, South Dakota, Minnesota, North Dakota, and Wyoming, in partnership with private sector entities from the region.

### **BENEFITS TO NORTH DAKOTA**

What then of the payoff to North Dakota from the growing internationalization of NDSU agriculture highlighted in this article, is it really important? The answer in short is, absolutely! The efforts described in this article will prove more and more important in supporting job and income growth as we move toward the 21st century.

A number of reasons can be cited. First, training activities by NDSU acquaint potential customers with our products and familiarize them with how to more readily acquire North Dakota agricultural commodities and products. Training in new uses for these goods enables North Dakota based products to command a favored market position among world suppliers of these commodities and products.

Interchange with researchers across the globe enables NDSU researchers to identify and acquire superior genetic stock and production/processing technology. Not all good ideas or research discoveries are home grown. Our scientists need to be aware of research underway elsewhere, how that could supplement our own ongoing work, and how that knowledge can be quickly and efficiently put to use to improve the competitiveness of North Dakota's agriculture. Two obvious examples of imported knowledge are to be found in genetic stock for plant breeding and in new processing and packaging technology.

Educating foreign scientists, government officials, and private sector leaders will pay large dividends in good will, understanding, and trade in the years ahead as these persons reflect favorably on North Dakota, its people, its land grant university, and reach out to build scientific and business linkages with North Dakota business firms and institutions. Moreover, improving the economic performance of customer countries through educational and scientific exchanges against a growing backdrop of mutual linkages will prove enormously beneficial to our state's business community. More jobs and income growth in these countries will support stronger demand

for North Dakota commodities and products. Our broader knowledge of these countries' needs helps our businessmen tailor their products to address areas of demand growth, as well.

Finally, and very importantly, the growth in trade and marketing research in NDSU's Experiment Station will provide information critical to commodity organizations and business firms in product development and marketing. Moreover, the information supplied by ongoing and future research provides the tools North Dakota agriculture must have to assure it is treated equitably and its future well-being is not jeopardized in the course of ongoing trade discussions. To make good public or private policy, one must understand the linkages through which that policy affects jobs and income for North Dakotans.

In short, effective use of these research findings will enable North Dakota agriculture to build on current markets for its commodities and products and to open new markets as demand growth occurs and as tastes and preferences change.

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