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FLAX (*LINUM USITATISSIMUM* L.) BASED CONMMERCIAL SECTORS: RECONCILIATORY ISSUES FOR DEVELOPING ECONOMY

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INTRODUCTION

Flax (*Linum usitatissimum* L.) is a broadleaf with very small, narrow leaves that are less than an inch long. Stems are branched near the base of the plant, with plants reaching 30 to 40 inches in height. The multiple stems or branches of a flax plant are slender and flexible, dividing at their tips into inflorescences bearing attractive blue and white flowers. Flowers are mostly self-pollinated, with some cress-pollination by insects. New about one-third inch in diameter. Each capsule contains 4 to 10 seeds; researches indicate that 6seed per capsule is the average, Glossy in appearance, flax seeds have traditionally been brown in color; however, a new variety of flax seed, Omega, is golden-colored to make it more acceptable in the food market. If exposed to water, flax seeds will become sticky due to mucilage in the seed coat. The renewed interest in flax has been partially based on increased demand for linen clothing, but more so because of certain healthful properties of the seed oil. Flax (*Linum usitatissimum* L., Linaceae) is not a new crop. There are six references to women and flax in the Bible, indicating that flax spinning and weaving were household industries in antiquity. The center of origin of flax is thought to be in the Near East, but the exact area is a topic of debate. A highly selected cultivar dating from 5500-5000 BC was found in Iran (Dempsey, 1975).

HISTORICAL USAGE

Flax has been used in food in Europe and Asia since 5000 BC, and the fibre of flax stem has been used for linen cloth, and many other uses. Approximately 200 species of Linum (flaxseed or linseed) are known (Carter.1993). As a natural botanic fibre, its cultivation dated from the time of ancient Egypt.

Flax was first brought to North America for its stem fibre to use in making of linen and paper. The stem fibre of flax makes a fine parchment paper. In the Northern Great Plains region of United States and Canada, flaxseed has been grown as a commercial oilseed crop for over 100 years. Linseed oil is pressed from flaxseed and further extracted with a petroleum solvent. Industrial linseed is not useable for food or feed, although the linseed meal remaining as a by-product after oil extraction is used for animal feed rations. Use is increasing for flaxseed as a food. Approximately 2,340,000 bu [60,000 tonnes (t)] of flaxseed are used for food annually in Germany (Prentice, 1990). Although cold-pressed flaxseed oil is not considered suitable for frying at high temperatures, flaxseed oil is used for low-temperature stir-frying in hundreds of villages in the flax-growing region of the People's Republic of China (Pan, 1990).

Flax has been used in the Middle East since the fifth millennium BCE. In Egypt, its role was probably more important than in many other cultures, as Egyptians rarely used wool and cotton was unknown during much of their ancient history.

Woven linen has been known in Egypt since 5000 BCE. The oldest depiction of a loom was found at Badari on a pottery dish dating from the middle of the 5th millennium BCE while the first known pictures of weavers were drawn during the Middle Kingdom.

Flax production was critical during both World Wars to make paint for military equipment, and as feed-flax cakes – for livestock overseas in World War I. Flax acreage dropped sharply after World War II and again as synthetic fibers were developed, and almost disappeared by 1980 as latex paint displaced oil based products. Today, flax is grown on limited acreage, but there is a renewed interest in the fibre for papermaking and as healthy edible oil, thanks to plant breeders.

CROP OF COMMERCE

Flax, *linum usitatissimum*, is one of the best fibre's grown in temperate regions. Flax has tow general markets, one group grown for its textile, and a second type grown for its seed, which is converted to linseed oil for paints and other industrial products, with a smaller but growing portion converted into linseed meal and oil as a health supplement. The same species is used for both fibre and seed, with breeding of specialized cultivars for the two different products. The seed-producing varieties have short stems and are heavily branched. The fibre varieties pursue stem development resulting in a taller plant more sparsely branched.

Flax has been cultivated for nearly 10,000 years, and was grown in North America as early as 1962. With the invention of the cotton gin in 1793, cotton became an inexpensive substitute, and largely displaced flax as a fibre source in the United States and Canada. Subsequently, flax has been cultivated in North America primarily for its seed (Mo, 1969). An estimated 12 million hectares grow textile flax, while 500,000 hectares are cultivated for the oil-seed variety (Wong, 1990). This crop has a specific gravity of 0.32-0.68, somewhat greater than jute and hemp, but comparable to bagasse. In light of nutrient requirements, flax can only be grown once every five years on a particular acreage (West, 1995).

Flax and oil flax usually cultivated mainly for food and medicine, a little for fibre. In 1906, the Fengtian Agricultural Experimental Farm introduced some varieties of flax from Japan and planted them in the northeast of China successfully. After one century, it formed flax Industry in a certain scale in China where more than 140 flax material companies and more than 30 linen textile companies exist. There are more than 20 countries where the fibre flax is planted internationally, almost in Europe and Asia, especially in E.U. countries. Although all flax cultivars produce fibre in the stems and oil (linseed) in the seeds, fibre flax cultivars have been bred and selected specifically to produce large quantities of very long, high quality fibre, with oil production only a secondary consideration. Flax produces fibres of varying length. The longest fibres can be used in maing fine linens for clothing, draperies, and furniture, medium fibres can be used for canvas and geo-textiles, while short fibres can be used for paper and sacking.

DIVERSIFIED USAGE

In use for ages, flax's natural quality and superior performance make it an important part of many fine products we use today. Flax is environmentally friendly. It makes coatings and floorings friendlier, concretes tougher, and fibre products stronger.

Linseed oil products help manufacturers maintain good air quality, providing modern solutions to protect and beautify our world. Manufacturers today are turning to new linseed oil products such as Dululin in paint products, and Archer a co-adhesive in popular fibre board. These linseed products replace some solvents and petroleum-based chemical in the

products' formulations, thereby combating air pollution. In many places, environmental regulations call for the reduction of dangerous volatile organic compounds (VOCs) which solvents spew into the air, interacting with sunshiny and creating smog.

Linoleum flooring, the most durable sheet flooring material, is attractive flooring for a new century. An all-natural, environ-friendly product, linoleum contains about 30 per cent linseed oil. Not only it is beautiful and long-lasting, but also it is gentle on the environment. As linoleum flooring is completely biodegradable, it decomposes when discarded. With modern colours and performance, linoleum has become the flooring of choice in public buildings and private dwellings throughout the world. Artist-designed inlays are becoming increasingly popular in linoleum flooring because the material lends itself so readily to cutting by water-jet cutting techniques. There are variety of diversified usage of flax which are discussed as follows.

LINSEED OIL PROTECTS WOOD

Linseed oil, derived from flax, is a major ingredient in many fine oil paints, varnishes and stains. However, because coatings' labels seldom carry ingredient lists the linseed oil content may not be visible on these products. Nevertheless, linseed oil preserves and beautifies, providing superior protection on wooden surfaces, fro, decks to marine products.

RAW OR BOILED LINDEED OIL

Raw linseed oil dries very slowly, compared to boiled linseed oil, which is simply raw oil with chemical accelerators, called driers, added. Because boiled linseed oil has a faster during time, people generally prefer it for most uses.

WHAT IS LINOLEUM?

Linoleum was invented in England in 1863 by Frederick Walton who coined the name linoleum from the Latin name, linum, which means flax, and oleum, which means oil. Later in the century, Michael Nair, a flooring manufacturer in Kirkcaldy, Scotland perfected the flooring, introducing qualities such as inlaid patterning- a feature seen today.

Linoleum is a flooring that is manufactured by oxidizing linseed oil to form a thick mixture called linoleum cement, The cement is cooled and mixed with pine resin, and wood flour to form sheets on jute backing. The term, linoleum is often used incorrectly to describe any sheet flooring, when in fact flooring can be made from other material such as polyvinyl chloride.

LINSEED OIL PRESERVES CONCREATE, NATURALLY

Linseed oil effectively preserves concrete surfaces, naturally. A coating prevents destructive water and salts from penetrating concrete. It stabilizes the smooth concrete surfaces in parking structures, bridges and concrete buildings, and prevents the breakdown of reinforcing steel.

A testing program at the University of Hong Kong in 1996, proved conclusively that linseed oil-based preservatives extend and enhance the life of concrete. Linseed oil-based preservatives have significant potential in areas such as Hong Kong and other parts of southeast Asia. These regions have high concentrations of real estate, which is principally concrete.

A HISTORY OF GOODNESS

People have eaten flaxseed since ancient times, and evidence of its health and nutritional benefits is plentiful. The first recorded uses of flax come from Southern Mesopotamia where flax was grown as long ago as 5,000 B.C. In the succeeding millennia. Flax spread across Europe, Africa, Asia and finally to North America. Today, flax enjoys increasing popularity throughout the world as a nutritious food.

CRECK AN OMEGA-3 EGG FOR GOOD HEALTH

Today, new eggs with a fat formulation different from regular eggs are on supermarket shelves, and breakfast tables, everywhere. The eggs from hens fed a special poultry feed containing flaxseed-provide and excellent way to add omega 3 fatty acids to the diet. Called "modified fat" omega-3 enriched," these eggs are fast becoming very popular in North America. The eggs have captured close to four per cent of the Canadian market, according to the latest figures form the Canadian Egg. Marketing Agency. Sold under several labels in the retail market, they are especially attractive to anyone concerned with omega-3 intake.

The good news is that the enriched eggs contain eight to 10 times more omega-3 fatty acids, (yet all of the vitamins and other nutrients) of regular eggs. In addition when the hens digest flaxseed, the alpha-linolenic fatty acid is broken down into Eicosapentaenoic ACID (EPA) and Docosahexaenoic acid (DHA) fatty acids, and all three geed fatty acids wind up in the egg yolks, Two eggs supply more than half Health Canada's recommended daily intake of omega-3s for adult men and women.

Current nutrition information about fats in the diet has changed the foods people eat. A better understanding of the health benefits of polyunsaturated fatty acids overall, and omega-3 fatty acids in particular, has made people "food smart" The best health advice available today calls for more omega-3s in the Western diet.

For Commercial Bakers

Whole flaxseed adds a delightful nutty flavor and crunchiness that consumers love. Larger than sesame seeds, flaxseeds are flat and oval and have a reddish brown hue. Smooth and shiny, their unique shape and colour make flaxseed an attractive garnish for a variety of baked goods (simply use flaxseed at a 3 to 1 ratio to the shortening or oil being replaced). Baked goods made with flax instead of oil tend to brown more quickly.

USAGE OF WHOLE FLAXSEED

Recommended usage levels

In most bakery products, the optimum level for flaxseed or flax meal is up to 8 per cent of the total dry-ingredient weight. In breads, however, 10 to 15 per cent (flour basis) yields excellent results. Some snacks and cereal bars use up to 30 to 40 per cent flaxseed. Equal substitution is not possible because flaxseed does not contain any gluten, resulting in products with less volume. Where gluten is less of a factor, like muffins and some sweet breads, more flaxseed can be used. Alternatively, additional gluten can be added to the recipe to ensure adequate volume of breads.

Garnishes

Whole flaxseed adds and special look to many types of foods. Some bakers prefer to soak the seeds before application or use an egg- based wash to enable flaxseed to stick to products.

Storage

In the Western nations whole flaxseed is usually supplied to the bakery industry in 25 kg multi-walled paper bags. It has a long storage life, making it ideal for a variety of commercial baking needs.

Processing temperatures

Because of its high lipid (oil) content, flaxseed tends to roast and darken when exposed to high temperatures. It this regard, bakers should treat flaxseed as they would nut meats.

Flavour

Flaxseed has a pleasant, nutty flavour that complements many flavour combinations. As the amount of flaxseed in a product increases, the flavour intensifies, enabling flaxseed to serve as the primary flavouring agent in many applications.

Pre-treatment

Flaxseed can be soaked in water before use. Soak seeds for 10 minutes in warm water or for two hours in 20°C (70°F) water (although some bakers prefer to soak flaxseed overnight). After soaking, the water turns opaque and slightly viscose from the soluble fibre and gums found on the surface of the seed. Add this water to the bakery mix to retain the maximum inherent benrfits and functional properties found in flaxseed.

USAGE OF MILLED FLAXSEED

Recommended usage levels

Flaxseed meal can be used to substitute for flour in baked goods. The meal contains soluble fibres, namely flaxseed gum. The gum's properties resemble those of gum Arabic, a widely used stabilizer. The gum has been shown to improve loaf volume, oven spring, and keeping quality, and it significantly improves bread characteristics. Optimal usage level are about 15 per cent (flour basis) or 8 per cent of the total dry ingredient weight.

Storage

Like whole flaxseed, milled flax is quite stable. In a 1996 study conducted by the Canadian Grain Commission and the University of Manitoba, flaxseed exhibited no deterioration in flavour, odour, or nutritional value when stored at room temperature 25°C (78°F) for up to four months.

Water

Milled flaxseed has excellent water binding properties, which enhance its ability to extend shelf life in products. The water added to a formula should be increased by an amount equivalent to 75 per cent, by weight, of the flax flour added. This recommendation applies in most baked goods.

Yeast

Milled flaxseed may replace 10 to 15 per cent of the flour used in yeast-bread formulations. Increase the yeast added by 25 per cent to maintain the same proof time, texture and consistency.

FLAXSEED IN EGG PRODUCTION

The Omege-3 Connection

The manor component of flaxseed, alpha-linolenic acid (ALA), heads the omega-3 fatty acid family. The omega-3 fatty acids, and particularly ALA, are recognized contributors to good health in infants and adults.

ALA is receiving special attention for its role in heart health. Consumption of omega-3 fatty acids from eggs has been reported to reduce blood pressure and serum triglycerides in humans. Researchers have also noted that omega-3 fatty acids decrease platelet activity (Aggregating platelets contribute to plaque formation in arteries which can lead to coronary artery disease.) In fact, researchers have reported that consuming as little as 800 mg of omega-3 fatty acids from eggs per week significantly reduced platelet aggregation in a human study group.

At present, levels of omega-3 fatty acids in the modern human diet are historically low in comparison to those of omega-6 fatty acids. Nutrition experts, including Health Canada, recommend an increase in the intake of ALA to 0.5% of total energy.

Omega-3 enriched eggs have an important role to play in the diets of consumers and can lead to the prevention of disease. In addition to increasing the ALA content of the diet, some of the ALA elongates in the body into two other omega-3 fatty acids: eicosapentaenoic acid (EPA) and docosahexaenic acid (DHA). Therefore, one omega-3 enriched egg provides nearly half of the optimal intake level of ALA, and about one-quarter of the optimal intake level of EPA and DHA.

Flaxseed to Laying Hen Rations

In modern times people are paying close attention to the foods they eat, modifying their diets to maintain good health. The fat content of the diet is of particular interest to those concerned about heart disease. Health conscious consumers are looking for food products which contain the important omega-3 fatty acids, and especially alpha-linolenic acid (ALA) in which flaxseed is so rich. The fat composition of flaxseed is unique. It contains a very high content of polyunsaturated fat, and 57% ALA.

Including flaxseed in the rations of the laying hen alters the fatty acid composition of the egg yolk, increasing its omega-3 fatty acid content. The resulting enriched eggs provide a convenient way for people to improve their omega-3 intake and achieve better health.

Using flaxseed as 10 or 20% of a poultry ration can increase the ALA content of egg yolk fat from 0.4% in the ordinary egg to 4.6% and 8.9%, respectively.

Effect of Flaxseed Rations on Yolk Fatty Acids

When feeding milled flaxseed to laying hens, alpha-linolenic acid (ALA) in the yolk increases proportionately with increasing dietary inclusion. For example, feeding 5% milled flaxseed yields approximately 8.5 mg/g yolk ALA, 10% yields an average of 16.3 mg/g of yolk, 15% provides about 19 mg/g yolk, and 20% has been reported to provide 30 mg/g of yolk. Accordingly, researchers have reported amounts of ALA as 5.8 and 8.8% of total yolk fatty acids following feeding of 8 or 16% full fat flaxseed, respectively.

Studies also show an increase in yolk docosahexaenoic acid (DHA) following flaxseed supplementation. Several studies have reported DHA yolk content from flaxseed in rations to range between 5-7 mg/g of yolk.

Length of feeding time

The incorporation of alpha-linolenic acid (ALA) into egg yolk from flaxseed-enriched rations is a gradual process, occurring over several weeks. Researchers have determined egg-yolk fatty acids after 14, 90 and 180 days. Consistent yolk ALA was obtained between 14

and 90 days of feeding. Scientists have reported that yolk ALA, eicosapentaenoic acid (EPA), and docosahexaenoic (DHA) contents stabilized after four weeks of feeding.

Importantly, once the desired yolk omega-3 fatty acid contents are obtained, the dietary supply of omega-3 fatty acid must remain consistent. Researchers reported a 20% reduction in yolk ALA following just once a week of feeding an omega-3 fatty acid free-ration to previously supplemented hens.

Addition of vitamin E

Researchers have reported a 2% increase in hen/day egg production when hens fed either typical or omega-3 fatty acid rich rations were further supplemented with 50 IU of vitamin E per kg diet. Researchers have reported that excess dietary vitamin E is deposited in egg yolk such that yolks may contain up to eight times the content normally found in an egg. This excess yolk vitamin E could further enhance the nutritional quality of omega-3 fatty acid rich eggs. The flavour quality of vitamin E/omega-3 fatty acids enriched eggs may also be superior to eggs solely containing enhanced omega-3 fatty acids.

Current practice in feed formulation is to stabilize flaxseed with the addition of a tocopherol/ Vitamin E antioxidant at the level of 10 mg/100g of feed.

Market opportunity

The opportunity for economic gain from the production of omega-3 fatty acid enriched eggs in significant. As omega-3 enriched eggs offer a taste and quality similar to regular eggs, but with enhanced nutrition, this segment of the egg market should continue to grow. At present, in Canada, omega-3 enriched eggs account for about 4% of the shell egg market. In South East Asian market, it can be a meaningful beneficial proposition.

In a consumer survey conducted in Texas, USA, more than half of those surveyed suggested a willingness to pay more per dozen for these nutritionally enhanced eggs. As consumers become more informed about the health benefits of omega-3 fatty acids, the popularity of the enriched eggs with become more widespread.

Human Health

Flax's high nutritional value makes it a popular choice among people demanding healthy and delicious foods. That's because flaxseed has pleasant nutty flavour. Flaxseed is also rich in dietary fibre and liganans, plentiful in vitamins and minerals, and very high in essential fatty acids a natural fit for better health diets.

The essential omega-3 polyunsaturated fatty acid alpha-linolenic acid (ALA or LNA), found in flaxseed must be eaten as part of the diet. The body then converts it into two other: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). They each play an important role in good nutrition.

Evidence from dietary and animal students show that omega-3s may reduce the rate of blood clotting and therefore the likelihood of heart disease. Nutritionists know that these fatty acids aid the proper development of the brain and vision in babies. Scientists also think that they have a beneficial role in other disease prevention, including hypertension, cancer, and inflammatory and immune disorders such as rheumatoid arthritis.

GLOBAL PRODUCTION SCENARIO

The flax plant when commercially cultivated for fibre is known as 'flax' and when it is grown as oil seed it is known as 'linseed'. Production technology is different in both the cases. The demand for flax fibre in India is met out from the import of nearly 800 metric tons annually amounting approximately to the rupees of 400 millions. Linseed is being cultivated

extensively in India whereas flax is not grown in that resonance of need. Flax production for 2000 was about 1.25 million tons, with over 40 percent grown in Canada. Britain and France are other major producers. Much of the U.S. flax production occurs in the north-central United States. In 2001, the United States produced 11.5 million bushels of flax on 585,000 acres . North Dakota is the biggest U.S. producer with 327,000 acres of flax that yielded 6.8 million annually, while in 2000 Minnesota had about 10,000 acres of flaxseed, yielding 198000 bushels. The United States imports about 1.9 million and exports about 2.4 million bushels of flax annually.

Following table depicts the exponential growth rate in flax area, production and productivity at the global level. The comparative aspects of global exponential growth rate between flax and linseed can also be out looked through the following figure.

Table 1: Flax Fibre and Tow, Area, Production and Productivity at the Global Scale and its Exponential Growth Pattern fig 2. Comporative Assessment Between Linseed and Flax in terms of Exponential Growth Pattern

Year	Flax Fibre and Tow Area Harv (Ha)	GRRE(Exponential Growth Rate)from 1993-2003	Flax Fibre and Tow Yield(Hg Ha)	GRRE(Exponential growth Tate) From 1993-2003	Flax Fibre and Tow production (Mt)	GRRE(Exponential Growth Rate) from 1993-2003
	World/Asia	World Asia	World/Asia	World/ Asia	World/Asia	World/Asia
1993	662,443/70,400		8,005/26,810		530,3081/88,743	
1994	532,116/94,480		11,132/26,604		592,328/251,350	
1995	638,820/115,110		11,584/30,706		740,004/353,456	
1996	546,576/94,320		10,719/28,247		585,860/266,425	
1997	452,017/62,400		9,318/24,735		421,171/154,349	
1998	459,220/40,300	-2.88 /5.29	9,071/24,984	5.24 /1.61	416,545/100,684	2.21/6.98
1999	481,184/54,700		10,334/31,104		497,279/170,138	
2000	437,411/97220		11,568/22,103		505,995/214,884	
2001	509,563/142,300		12,387/24,293		631,209/345,692	
2002	464,173/139,500		16,900/37,620		784,430/524,801	
2003	480,338/143,000		16,099/35,001		773,319/500,520	

The economics of flax cultivation is a prime concern for the cultivators like other industrial crops, we can have an insight into the following general economics of flax cultivation.

Possible issues for Research and Development of flax in India

In this paper we are also trying to embark upon the issue related to the innovative researchable topics in the possible diversified areas of researches on biomedicines, nutraceuticals and textiles as follows for ensuring sustainable market economy for flax and

helping the Indian Agro-economy entwined with newer trade domain of flax industrialization as a part of value added best fibre crop diversification. The issues for the research are:

- Agronomics Increasing flax yields: A closer look at fertilizer utilization and weed management
- Feeding value of flax, and sensory evaluation of eggs.
- Use of flax oil to modulate inflammation in broilers
- Effect of flaxseed, flaxseed oil and lingam on rat growth and development
- Development of a microspore derived doubled haploid system for flax
- Dietary effect of flax seeds and vitamin E in the diet of pregnant and lactating animals
- Develop polymerize chain reaction (PCR) molecular markers for identifying resistance genes controlling wilt and rust in flax
- Use of flax oil to prevent ascites and improve the nutritional qualities of broiler meat
- Nutraceuticals/ Functional products from flaxseed
- A Rapid screening method for distinguishing high and low cadmium accumulating lines of flax
- Effect of various levels of flaxseed on human breast cancer growth and metastasis
- Flax lignan, metabolism in mammals
- Flaxseed components in baked products: Effects on glycemic control in diabetes
- Modulation of bone mineralization by dietary n-6 and n-3 fatty acids in a piglet model.
- Modification of renal interstitial inflammation and fibrosis by flax diets.
- Enhancement of transformation efficiency in flax.
- Effects of flaxseed oil on glycemic control, insulin resistance, and adipose metabolism.
- Processing and enzyme supplements for poultry diets containing flaxseed
- Germplasm development-screening for elevated levels of lignans
- Rapid analytical tests for predicting oil quality.
- Flax growth and development: Understanding yield formation and the effects of critical stress factors on grain yield.
- Development of methodology for nutrition labeling of flax seed eat content
- Flax seed in menopausal women: A randomized clinical trial.
- Cellular basis for the cardio protective action of flax
- Influence of flax seed on human tumour growth, Metastasis and recurrence.
- Growth, health, and immune response of piglets given diets enriched with flaxseed oil.
- Effects of flaxseed oil on insulin sensitivity, adiposity and atherogenesis
- Molecular mechanisms of flax product modification of kidney disease
- Can the oil formation machinery of flax accommodate nutraceutical fatty acids?
- Flaxseed oil, Inflammatory bowel disease and osteoporosis
- New markers of cardiovascular disease and flaxseed versus placebo among menopausal women: A satellite study.
- Nitrogen source and placement for optimum flax yield
- Effects of feeding micron zed flaxseed on milk yield, milk fatty acid composition of dairy cows
- Identify/ pathogen variability and sources of resistance in flax
- Antioxidant status after consuming flax products
- Flaxseed and fractions as an antibiotic replacement in livestock diets: Impact on intestinal microbial profile and health
- Measure of gynogenic glycosides in flaxseed by HPLC and rapid glucose or CN Analysis

In addition to its upcoming global usage in the health and nutrition sector no one can deny its age-old usage as finest fabrics. For this we need to have an insight into the world market for woven fabrics of flax in its global trade perspective. This paper is exclusively for the strategic planners, international executives and import/export managers who are concerned with the market for Nutraceuticals bio-pharmaceuticals, woven fabrics of flax. With the globalization of these markets, corporate and R&D managers can no longer be contented with a local view. Nor can these managers be contented with out-of date statistics that appear several years after the fact. We need to develop a methodology, based on macroeconomic and trade models, to estimate the market for these products of flax for those countries serving the world market via exports of supplying from various countries via imports. It can be done for the current year based on a variety of key historical indicators and econometric models. For example, on the demand side, exporters and strategic planners approaching the world market face a number of questions. Which countries are supplying these products of flax? What is the dollar value of these imports? How much do the imports of these products of flax vary from one country to another? Do exporters serving the world market have similar market shares across the importing countries? Which countries supply the most exports of these products of flax? Which countries are buying their exports? What is the value of these exports and which countries are the largest buyers?

In what follows, we can begin by summarizing the regional markets for imported and exported products of flax. The total level of imports and exports on a worldwide basis, and those for each region, is supposed to be based on a model, which aggregates across country markets and products these to the current year. From there, each country can represent a percent of the world market. This market may be served from a number of competitive countries of origin. Based on both demand- and supply – side dynamics, market can then be calculated across each country market destination. These shares as generally lead to a volume of import and export values for each country and can be aggregated to regional and world totals. In doing so, we will able to obtain maximum likelihood estimates of both the value of each market and the shares that countries are likely to receive in the year of estimatation. From these figures, rankings can be calculated to allow managers to prioritize markets. In this way, all the figures, which may come out from this type of study, will forecasts about market priorities that can be combined with internal information for strategic planning purposes.

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