

# Production and processing of small seeds for birds



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by  
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# Contents

|  |            |
|--|------------|
| <b>Acknowledgements</b>  | <b>vi</b>  |
| <b>Abbreviations and units of measurements</b>                             | <b>vii</b> |
| <b>1. Introduction</b>   | <b>1</b>   |
| <b>2. General overview of the market</b>                                   | <b>3</b>   |
| Introduction   | 3          |
| Market segments  | 3          |
| Ingredients of bird food   | 3          |
| Origin   | 4          |
| Substitution   | 4          |
| Trends   | 5          |
| Major players  | 6          |
| Brokers  | 6          |
| Packers/wholesalers  | 6          |
| Retail   | 6          |
| <b>3. Major grains used in bird seed</b>                                   | <b>7</b>   |
| Wild bird mixtures   | 7          |
| Caged and companion birds  | 8          |
| Nutritional needs  | 8          |
| Bird classification  | 8          |
| Basic mixtures   | 8          |
| Treats   | 9          |
| Sprouted seeds   | 9          |
| Pigeon food  | 9          |
| Introduction   | 9          |
| Typical composition of pigeon food   | 9          |
| Cover crops for hunting and wildlife habitat creation                      | 10         |
| <b>4. Bird food grains with potential for the tropics and semi-tropics</b> | <b>11</b>  |
| Niger seed ( <i>Guizotia abyssinica</i> (L.f.) Cass.)                      | 11         |
| Description and agronomy   | 11         |
| Varietal development   | 12         |
| Production and trade   | 12         |
| Opportunities  | 12         |
| Canary seed ( <i>Phalaris canariensis</i> L.)                              | 13         |
| Description and agronomy   | 13         |
| Processing and storage   | 14         |
| Varietal development   | 14         |
| Production and trade   | 14         |
| Marketing  | 14         |
| Opportunities  | 15         |

|   |           |
|---|-----------|
| Millets   | 15        |
| Proso millet ( <i>Panicum miliaceum</i> L.)   | 15        |
| Spray millet ( <i>Setaria italica</i> (L.) Beauv and <i>Eleusine coracana</i> (L.) Gaertn.) | 17        |
| Japanese millet ( <i>Echinochloa crusgalli</i> var. <i>frumentacea</i> )                    | 17        |
| Other millets used in bird food   | 18        |
| Sunflower ( <i>Helianthus annuus</i> L.)  | 18        |
| Opportunities   | 18        |
| Sorghum ( <i>Sorghum bicolor</i> (L.) Moench)   | 19        |
| Opportunities   | 19        |
| Groundnuts ( <i>Arachis hypogaea</i> L.)  | 19        |
| Opportunities   | 19        |
| Minor crops used in bird food   | 19        |
| Safflower ( <i>Carthamus tinctorius</i> L.)   | 19        |
| Quinoa ( <i>Chenopodium quinoa</i> Willd.)  | 20        |
| New crops   | 21        |
| <b>5. Processing, quality and trading standards</b>   | <b>23</b> |
| Processing and storage  | 23        |
| General guidelines for quality bird food  | 23        |
| Packaging   | 23        |
| Packaging for transport and export  | 24        |
| Packaging for storage   | 24        |
| Packaging for retail  | 24        |
| Non-GMO certification   | 24        |
| Traceability, HACCP and GMP   | 24        |
| <b>6. Possible entry strategies for farmers and entrepreneurs in developing countries</b>   | <b>27</b> |
| Introductory remarks  | 27        |
| Production of commodity grain   | 27        |
| Non-grain ingredients   | 28        |
| Manufacturing and selling of prepared bird food   | 28        |
| <b>7. Conclusions and recommendations</b>   | <b>29</b> |
| Conclusions   | 29        |
| Recommendations   | 29        |
| <b>References and selected bibliography</b>   | <b>31</b> |
| <b>Appendixes</b>   | <b>33</b> |
| 1. Useful references and sources of information   | 33        |
| 2. Major brokerage and packing firms in bird seed   | 35        |
| 3. Genetic resources  | 41        |
| 4. Typical composition of some bird foods   | 45        |
| 5. Typical retail prices for selected bird food (ingredients)                               | 47        |

## List of tables

|  |    |
|--|----|
| 1. Imports of Niger seed to the United States of America in 2003 | 12 |
| 2. Yield of canary seed in Canada (1998 – 2003)                  | 14 |
| 3. Main countries importing canary seed from Canada in 2001      | 15 |

## List of plates

|                           |    |
|---------------------------|----|
| 1. Niger seed             | 11 |
| 2. Canary seed            | 13 |
| 3. Proso millet           | 16 |
| 4. Spray millet           | 17 |
| 5. Black sunflower seed   | 18 |
| 6. Striped sunflower seed | 18 |
| 7. Sorghum seeds          | 19 |
| 8. Safflower seed         | 20 |

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# Abbreviations and units of measurement

|         |   |
|---------|---|
| AGST    | Agricultural and Food Engineering Technologies Service          |
| AVMA    | American Veterinary Medical Association                         |
| BSA     | Birdcare Standards Association                                  |
| BSE     | Bovine Spongiform Encephalopathy                                |
| FAO     | Food and Agriculture Organization of the United Nations         |
| GMO     | Genetically Modified Organism                                   |
| GMP     | Good Manufacturing Practices                                    |
| HACCP   | Hazard Analysis Critical Control Points                         |
| ICRISAT | International Crop Research Institute for the Semi-Arid Tropics |
| ISO     | International Organization for Standardization                  |
| RSPB    | Royal Society for the Protection of Birds                       |
| hl      | Hectolitre (100 litres)   |
| ha      | Hectare   |
| Mt      | Million tonnes  |



## Chapter 1

# Introduction

The market for bird food<sup>1</sup> is growing rapidly. By some estimates, growth is 4 percent per annum (Plimsoll, 2003). More disposable income and more leisure time in industrialized countries have led to an increased number of people keeping companion birds<sup>2</sup>. In addition many people have taken up breeding of exotic birds as a hobby, demanding bird food of high quality. At the same time, environmental awareness and an increase in nature-related and outdoor activities have stimulated the interest in bird watching as a backyard hobby and have led to an increase in the amount of backyard feeding of wild birds. Whereas until recently, the market for bird food was mainly concentrated in the industrialized countries of the northern hemisphere, sales of bird food in Mexico, Brazil and the Pacific Rim countries (notably Australia, Japan, Malaysia and Indonesia) have increased substantially over the past five years.

Bird food statistics are difficult to find because bird food is grouped under the general heading of pet foods. However, some published data give an indication of the global scale of the market. It is estimated that in the United States of America alone 52 million people regularly feed wild birds in their gardens, spending US\$2.5 billion on food plus an estimated US\$850 million on accessories like bird feeders, water fountains, etc<sup>3</sup>. In addition, 4.6 million households in the United States of America own 12.6 million birds (AVMA, 2001). The total northern European market has an estimated value of more than US\$1 billion, mainly in the United Kingdom, Belgium, the Netherlands, Luxembourg, Sweden and Norway. Conservatively estimated, the global market represents between US\$5 billion and US\$6 billion.

The growth of the bird food industry has led to greater sophistication in formulating small-grain mixtures. While the actual number of grain species used in bird food formulations is relatively small, packers and distributors are increasingly segmenting their offer to cater for specific bird species or consumer expectations. Currently most suppliers offer more than ten different mixes including organic bird food and bird food that is free from Genetically Modified Organisms (GMO), both for caged and wild bird feeding. In addition, there is a developing market for plants for game cover or wildlife habitat creation.

Small grain mixtures are the mainstay of bird food. Several of the grain species commonly used in these mixtures are of tropical or subtropical origin or are species that can be grown in tropical and subtropical countries. In addition, premium mixes being sold often contain pieces of dried tropical and subtropical fruits such as papaya, banana, kiwi and mango. As packers look for new formulations to differentiate their product from those of competitors, it is likely that new ingredients, in particular underutilized and indigenous tropical and subtropical crops, will find a place in premium bird food mixes, which could provide opportunities for the producers of these crops.

The purpose of this report is to give an overview of the market for bird food and to highlight some of the plant species that can be successfully grown and processed

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<sup>1</sup> The word “bird” in this context implies companion (i.e. pet) birds and also wild birds that are fed for leisure. It excludes poultry birds. The word “feed” is generally used when discussing feeding animals. However, in most of the literature, the word “food” is preferred in relation to feeding companion birds and wild birds.

<sup>2</sup> “Companion bird” is currently the preferred term used in the United States for what are known more commonly as “pet bird”.

<sup>3</sup> Source United States Fish and Wildlife Service, 2001.

in developing countries to supply this market. Major constraining factors to be taken into consideration are also identified. The document provides information that will be found valuable by entrepreneurs of small enterprises and farmer groups looking for new cash crop alternatives, as well as service providers and policy makers in the agro-industrial sector in developing countries.

## Chapter 2

# General overview of the market

### INTRODUCTION

Although the keeping of birds as pets and the feeding of wild birds has a long history, bird keeping and outdoor feeding have seen a tremendous increase in the past decade. The interest in keeping birds as pets is in line with the general increase in the number of households that keep pet animals, and birds rank fourth after dogs, cats and fish. This increase can partly be explained by the increase in leisure time and disposable income, and a shift in demographics (rising proportion of elderly and retired people in the total population and an increase in single-person households) in industrialized countries. At the same time, over the past two decades, people have become more conscious of nature and wildlife in general, which explains the explosive growth in outdoor feeding, wildlife habitat creation and wildlife observation.

Although statistics for birds as a group are hard to come by, some data are illustrative. In the United States of America 4.6 million households keep 12.6 million companion birds, an 8 percent increase over the number in 1996 (AMVA, 2001). In addition, in the United States of America, 52 million people regularly feed wild birds, spending US\$2.7 billion on food plus an estimated US\$800 million on feeding accessories. In Australia, 1.2 million households (19 percent of all households) own 8 million pet birds, spending US\$300 million on food and accessories<sup>1</sup>. The United Kingdom market for companion bird food amounts to 1600 tonnes with a retail value of US\$2.6 million. At the same time, the United Kingdom is one of the leading countries in outdoor feeding with an estimated expenditure of US\$200 million<sup>2</sup>. The French Pet Food Manufacturers Association estimates that one in six households in France own companion birds<sup>3</sup>.

### MARKET SEGMENTS

The global bird food market can roughly be divided into the following sectors:

- Caged birds and companion birds. These are predominantly budgerigars (*budgies*), canaries, finches, parrots, parakeets, cockatoos, cockatiels, etc, that are kept indoors or in outdoor cages or aviaries.
- Wild birds.
- Pigeons. This is a separate sector due to the nutritional needs of pigeons, especially if they are used for racing.

A related segment, which is growing in importance, is cover crops for hunting or wildlife habitat creation. It is included here because many of the small grains that are commonly used in bird food are also used in cover crops mixes and, in addition, contain other seed species of tropical and subtropical origin.

### INGREDIENTS OF BIRD FOOD

Bird food for companion birds and wild birds consists largely of mixes of small whole or broken grain. In addition to grains, bird food may contain dehydrated fruits and berries, peanuts, rice, dried egg, honey, dried insects, grits, and mineral and vitamin

<sup>1</sup> Source: <http://www.petnet.com.au>

<sup>2</sup> Source: Personal communication from a leading United Kingdom producer.

<sup>3</sup> Source: FACCO (<http://www.facco.fr>)

supplements. Mixes can be relatively simple and consist of one or two different grains. An example is standard budgerigar mix, which will typically contain canary seed and white millet seed (proso millet). Some mixes, especially those for exotic birds like parrots, may contain 20 to 25 different ingredients. The most complex mixes are found in so-called treats<sup>1</sup>.

The most common small grains in bird food are:

- Cereals: crushed maize (*Zea mays*); barley (*Hordeum vulgare*); proso millet (white millet) (*Panicum miliaceum*); red millet (Japanese millet) (*Echinochloa frumentacea*); sorghum (*Sorghum bicolor*); oats (*Avena sativa*); canary grass seed (*Phalaris canariensis*); rice (*Oryza sativa*); wheat (*Triticum aestivum*); spray millet (foxtail millet) (*Setaria italica*); finger millet (*Eleusine coracana*); buckwheat (*Fagopyrum esculentum*).
- Oil seeds: Niger seed (*Guizotia abyssinica*); black (oil), striped (confection) and white sunflower seed (*Helianthus annuus*); safflower (*Carthamus tinctorius*); groundnut (*Arachis hypogaea*); rapeseed (*Brassica napus*); linseed (*Linum usitatissimum*); hempseed (*Cannabis sativa*).
- Other seeds: pine seeds (*Pinus edulis*); (flaked) peas (*Pisum sativa*); mung beans (*Phaseolus aureus*); lettuce seeds (*Lactuca sativa*); anise seeds (*Pimpinella anisum*).

Other ingredients:

- Fruits (dehydrated): banana, mango, papaya, coconut, almonds, pecans and sultanas.
- Vitamin and mineral supplements, brewers yeast, alfalfa meal, wheat gluten and corn gluten.
- Vegetable or fish oil.
- Grits (crushed shells).

Typical caged bird food contains between 12 and 16 percent protein, 12 percent fat, 6 to 10 percent fibre, and has a maximum moisture content of 11 percent. In addition to dry mixes, birds may be offered sprouted seeds, which are rich in vitamins and also are easily digested. Seeds for sprouting are sometimes sold in mixtures and may contain any of the following: mung beans, safflower, quinoa, sorghum, millet, lettuce seeds, Niger seed, proso millet and other cereal seeds. Seeds are soaked for several hours and then germinated for 24 to 48 hours.

## ORIGIN

Although many of the ingredients are of tropical and subtropical origin, most of them are also cultivated as large-scale agricultural crops in North America. Sorghum (known in the United States of America as milo), millets, maize, safflower, sunflower and groundnut are readily available commodities. The only major birdseed species that is predominantly grown in the tropics is Niger seed, which is produced in India, Nepal, Ethiopia and Myanmar. Niger seed has recently been introduced into the United States of America as an alternative crop for grain growers.

## SUBSTITUTION

Most of the grain crops that are used as ingredients in bird food have their main market in human or animal nutrition. Only canary seed and Niger seed are used exclusively for bird food in the industrialized world. One implication of this is that components of bird food are often rejected for human or animal consumption, or rejected from the seed industry. For instance, sub-standard grain for the milling industry can

<sup>1</sup> Kaytee Cockatiel Exotic Nut Treat stick, for example, contains 55 different ingredients including mineral and vitamin supplements.

still find an outlet as bird food. The same applies to undersized striped sunflower or sunflower kernels that become de-hulled during transport, or seed crops that do not meet germination standards. Depending on the price of commodities, formulators of bird food can easily switch between crops, which makes the market volatile. However, at the same time, in order to make an attractive product presentation, packers will include a certain percentage of seeds like canary seed, Niger seed and sunflower seed, irrespective of the price of the commodity.

## TRENDS

The bird food market is currently growing at a rate of 4 percent per year, in line with changing demographics and increased disposable income and an increase in outdoor activities and environmental awareness. Within the packing and distribution sectors, it is likely that there will be further segmentation and brand creation to target niche markets. Appearance of the seed mix and packaging of the product will become more important as marketing tools. In wild bird feeding, which was traditionally a winter occupation, there is a trend towards promoting outside bird feeding during spring and summertime<sup>1</sup>.

At the same time, since the 1990s, consumers have become more discerning of bird food composition and more knowledgeable about which seeds are preferred by certain bird species. For instance Niger seed is attractive to finches while black sunflower is particularly attractive to larger beaked birds. In order to attract certain species and discourage others into their gardens or balconies, consumers make more and more demanding choices.

In caged and companion bird feeding there is debate over the merits of seed mixes versus extruded formulated balanced diets in pellet form. The nutritional requirements for caged birds are still poorly understood, but research conducted since the 1990s indicates that the traditional grain mixes (supplemented with minerals and vitamins) may lead to unbalanced protein intake, shortage of essential amino acids, or lack of vitamins or trace minerals. The new forms of food have a consistent and balanced dietary composition, which should overcome these imbalances. During the production of pelleted extruded bird foods, alternative raw materials that are not traditionally used for bird feeding, such as soybeans, can be used. The use of these alternative grains allows processors more flexibility in their choice of raw materials, but competes with the traditional grains. The growing acceptance of, and shift towards, these formulated diets could in the long term reflect negatively on the use of small grains in grain mix bird foods.

Breeding of exotic birds has, since the 1990s, become an important hobby in the industrialized countries and large sums of money are being paid for breeding pairs of exotic species. To keep breeding birds in optimum condition and to ensure high breeding rates and longevity, high demands are made on quality bird food that provides a balanced diet. With the breeding of exotic birds comes a new class of food, which can be used for hand rearing chicks. This specialised food is high in proteins, calcium and vitamins and is marketed as “egg-food”.

The growing trend to treat companion animals as members of the family who deserve the best possible care and the longest possible life expectancy leads to the demand for premium pet foods with perceived health benefits. It is therefore to be expected that the market for organically grown food, GMO-free food, special treats and food containing exotic ingredients will expand in the coming years.

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<sup>1</sup> Spring and summer feeding of wild birds is officially endorsed by the Royal Society for the Protection of Birds (RSPB) of the United Kingdom.

## MAJOR PLAYERS

### Brokers

Commodity brokers are the link between the producer of commodities and packers or wholesalers. There are a number of brokers who have departments that specialize in bird food commodities. In the United States of America, commodity brokers specializing in bird food tend to be concentrated in the High Plains (especially in Nebraska and the Dakotas), which is the main sunflower and millet growing area of that country. Appendix 2 lists the major brokers, wholesalers and packers of bird food.

### Packers/wholesalers

Packers and wholesalers<sup>1</sup> buy bird food ingredients from brokers or import independently. They may pack own-brands or supply packing and formulation services for third party brands. In keeping with other industries, the pet food industry has seen a large degree of consolidation. Many of the smaller national companies have merged or been taken over in recent years. Large players in the pet food industry include the multi-national companies Nestlé (Ralston Purina, Friskies), Proctor & Gamble (bird food brand *Iams*), Mars (bird food brand *Trill*), Heinz and Colgate-Palmolive.

### Retail

In the United States of America, the large supermarket chains such as Walmart, Winn Dixie and Kroger retail large volumes of bird food. For these supermarkets, bird food is a high value/margin product and considerable space is devoted to it, especially towards the autumn and winter seasons. Supermarkets account for about 50 percent of all bird food sales in the United States of America. In addition, there are two large chains, PetSmart and Petco, which each have about 500 stores in the United States of America.

The situation in Europe is different in that more bird food is retailed through garden centres and specialised pet shops, rather than through large supermarket chains. The last five years have seen a proliferation of Internet-based bird food retailers. Typing the words “bird food” into an Internet search engine such as Google<sup>2</sup> will generate thousands of Internet references to websites offering this product.

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<sup>1</sup> There is not always a clear distinction between brokers and packer/wholesalers, and several companies combine these functions.

<sup>2</sup> <http://www.google.com>

## Chapter 3

# Major grains used in bird seed

### WILD BIRD MIXTURES

Feeding of wild birds is predominantly a winter activity in northern Europe and North America where wild birds are provided with food at times when foraging is difficult because of the weather. Most wild bird feeding is done around the home. With the increased awareness of nature conservation and outdoor activities such as bird watching, wild bird feeding is now a major hobby and the number of bird food mixes, feeders and other accessories available has proliferated. At the same time there are numerous recommendations to feed wild birds during the spring and summer time which, in the long term, could have a positive effect on the total use of small grains in bird feeding<sup>1</sup>.

Originally wild bird seed mixtures varied widely in composition, depending on the availability and price of the raw materials. The most common grains found in these mixtures are black or striped sunflower seeds, decorticated sunflower (also called sunflower hearts or meats), wheat, barley, (hulled) oats, millet, sorghum, Niger seed, (cracked) maize, safflower, groundnut or groundnut pieces, pine nuts, canary seed and quinoa. In addition to grain mixtures, there is a large market in “fat balls” that are made from grains mixed with solid fats or suet. Although basic wild bird seed mixtures are rather unsophisticated blends of grains, the past ten years have seen an ongoing diversification of mixes aimed at particular bird species. One major supplier of wild bird seed in the United Kingdom lists no less than 20 different mixes in its catalogue<sup>2</sup>. These mixes range from single grain (black sunflower, peanuts) to premium mixes that include sultanas, pieces of apple and rosehip, rowan and juniper berries, papaya, banana and sunflower hearts. Some companies include in their product range special mixes that are intended to attract particular groups or species of birds. A high proportion of Niger seed in the mix will attract finches, while peanuts and other large seeded grains will attract woodpeckers and nuthatches. Some mixes will include dried insects or insect larvae to attract insect-eating birds, or pieces of dried fruits for fruit eaters.

Wild bird seed mixes are generally packaged in small (500 g) packs but bulk supplies (25 or 50 kg bags) are also available. Retail prices vary widely but, for simple mixes, prices are around US\$1 per kg (see Appendix 5 for some typical retail prices). Most wild bird seed mixes are sold in transparent plastic bags which is important for marketing. The following factors should be considered when formulating a bird seed mix:

- Seeds must be attractive and shiny;
- Grains must be whole (except for maize and rice chips);
- Mixtures tend to be colourful (black or striped sunflower, red milo, cream canary seed, black Niger seed, yellow maize chips, white millet);
- Mixtures must be balanced. For instance, sunflower seeds are the largest component in the mixture but, because of the relative weight, make up less than 5 percent on a weight basis when mixed with grains;
- Seed mixtures need to be free of dust or dirt.

<sup>1</sup> Recent concerns in Western Europe about the decline of common birds from the landscape may contribute towards this trend to feed wild birds in summer.

<sup>2</sup> For an example see <http://www.bamfords.co.uk>

In general, the wild bird food markets in the United States of America and the United Kingdom are the most sophisticated. The seed mixes tend to contain the more expensive components such as canary seed and Niger seed. The markets in other western European countries are more price sensitive, which is reflected in the inclusion of cheaper “filler” ingredients such as flaked maize, red sorghum, wheat and barley in the mix.

## **CAGED AND COMPANION BIRDS**

### **Nutritional needs**

The nutritional requirements of caged and companion birds remains poorly understood. Nutrition in commercial poultry operations has been well researched, and the initial nutrient requirement figures for caged and companion birds were extrapolated from poultry feeding studies. However, it was soon realized that the digestion efficiencies of exotic companion birds were not the same as commercial poultry. This meant that the metabolizable energy values established for maize, soybean meal and other common ingredients used in feeding commercial poultry were not valid for companion bird foods. Since the 1990s more research has been carried out on the nutrient and energy requirements of companion birds and the metabolizable energy content of specialised bird food ingredients.

However, as companion birds cover such a wide range of species, each with its own evolutionary development regarding feeding, this research is far from complete<sup>1</sup>. Many of the current recommendations are based on the experiences of individual bird owners or anecdotal evidence of successful formulae. The need for further research is created by the following developments:

- regulatory departments increasingly have to determine testing procedures for nutritional adequacy of prepared pet foods (especially in cases in which manufacturers make specific label claims);
- growing animal welfare concerns;
- the growing interest in breeding exotic birds as a hobby. Breeding pairs are costly and breeding performance and longevity are important considerations.

Balanced bird food diets need to take into account the different dietary requirements during the life cycle of the bird and the specific requirements of different species. For instance, breeding or moulting birds will have different nutrient requirements from younger or older birds.

### **Bird classification**

Broadly speaking, the most popular companion birds can be classified into two large groups:

- psittaciformes, which include parrots, macaws, lorries, cockatiels and parakeets;
- passerines (also known as perch or songbirds), which include canaries and finches.

Each group has specific feeding requirements. While passerines require more seed-based diets, psittaciformes require a more varied diet with fruit and vegetables in addition to seed mixes.

### **Basic mixtures**

Bird food mixes can be classified into the following categories:

- Unsupplemented seed mixtures

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<sup>1</sup> For example, budgerigars, cockatiels and other grass parakeets originate in the vast arid interior of Australia and have adapted to a sparse seed-based diet, while parrots from the New World tend to eat a vastly varied diet including substantial amounts of fresh vegetable matter.



This is the most basic of bird foods and consists of pure seeds or mixes of two or more seed varieties. Old-fashioned canary food would typically be 50 percent canary seed and 50 percent proso millet.

- **Supplemented seed mixtures**

Basic seed mixtures are often deficient in vitamin A, vitamin D, calcium and some amino acids. They can be supplemented with any of these compounds to produce a more balanced bird food. Supplements can either be added as a seed coating or as specially extruded pellets.

- **Manufactured diets**

The trend in the past decade has been to move towards extruded types of bird food. During the extrusion process, the identity of the individual ingredients is lost and the product is sold on the nutrient specification of the final product (total protein, fat, vitamins, minerals, etc.). This process allows the producer greater flexibility in the use of raw materials for formulation of the product so long as the final product meets the label description. The trend towards manufactured diets in extruded form is most prevalent in the United States of America, while in Europe it represents only a small portion of the market.

### **Treats**

Treats are supplementary foodstuffs that are given to caged birds to encourage active foraging behaviour. One of the most important bird treats is millet sprays, which are intact heads of millet seed that are hung in the birdcage or outside for wild bird feeding. Foxtail millet (*Setaria italica*) is the most important species in this category. Other treats are manufactured from a mixture of small grains, fruits, honey, vitamins and minerals and are available in stick form or in fancy shapes such as bells or hearts.

### **Sprouted seeds**

Sprouted seeds are recommended as they are easily digested and provide vitamin-rich additions to companion bird diets. Some bird food suppliers offer sophisticated blends of small seeds in specially designed germination boxes. The sprouting mixtures may contain mung beans and seeds of wheat, Niger, safflower, sorghum, millet and buckwheat.

## **PIGEON FOOD**

### **Introduction**

Pigeon keeping can be divided into two categories:

- **Racing pigeons** (sometimes called homing pigeons), which are bred and reared for sport. Racing pigeons are typically released at some distance from their homes, and then their journey back is timed. Pigeon racing is a serious business in several countries and top racing pigeons are sold for large sums of money. They also have special diets that are high in energy and are easily digested for recuperation after the race.
- **Show pigeons.** Show pigeons are bred and reared for their colour and plumage. Breeding pairs can be expensive and specific dietary requirements need to be met for breeding and moulting.

### **Typical composition of pigeon food**

Universal pigeon food may contain whole grains of wheat, barley and maize, red sorghum, various peas (tick peas, maple peas and white or green peas) and oats. Just before racing, safflower may be added for extra energy. After racing, special foods (depurative foods) may be offered that contain easily digestible cereals (such as barley) and safflower for extra energy.

### COVER CROPS FOR HUNTING AND WILDLIFE HABITAT CREATION

The use of cover crops to create wildlife habitats for hunting or conservation/observation is increasing in the United States of America and Europe. This is partly caused by an increase in outdoor leisure activities such as hunting and wildlife observation, and partly by the need to create wildlife habitats for nature conservation. Depending on the season (winter or summer) in which the cover crop is established, cover crop mixtures may contain, amongst others: sunflower; millets (proso, Japanese); maize; safflower; quinoa; canary seed; sorghum; Egyptian wheat (*Sorghum vulgare rosburghii*) (also known as shallu or chicken corn); partridge peas (*Chamaecrista fasciculata*); Bahia grass (*Paspalum notatum*); lespedeza (*Lespedeza cuneata*); dolichos (*Dolichos lablab*); sesbania (*Sesbania grandiflora*) (known as agati or West Indian pea); browntop millet (*Panicum ramosum*); borage (*Borago officinalis*); sesame; clay and iron peas (*Vigna* spp.); tick peas (*Vicia faba*); chufas (*Cyperus esculentus*) and different clover or vetch species. These cover crops provide shelter and feeding for wild turkeys, quail, doves, pigeons and many species of small seed eating birds and waterfowl. Several of the species used in cover crop mixes are originally from the tropics and subtropics or are species that can be grown in the tropics and subtropics.

There are no ready data on the amounts of small grains that are used for wildlife habitat creation, but the market is growing. It should be borne in mind that these seeds differ in their requirements from bird food commodities as good germination and purity are essential quality attributes.

## Chapter 4

# Bird food grains with potential for the tropics and semi-tropics

### **NIGER SEED** (*Guizotia abyssinica* (L.f.) Cass.)

Niger seed<sup>1</sup> is an oilseed crop produced principally in Ethiopia, India, Myanmar and Nepal. Thirty percent of the seed (shown in Plate 1) is oil. When extracted the oil is used in foods, for paint and soap making and for lighting. In Ethiopia this is the main edible oil in use. In India about 75 percent of the harvested seeds are used for oil extraction while the rest is exported for bird food. Roasted or fried seeds are eaten as a snack or used as a condiment. The press-cake from oil extraction contains 31 to 40 percent protein and is used for feeding cattle. In the United States of America, Niger seed is considered a high value crop for the bird food industry, and initiatives have been underway to introduce it as a cash crop alternative for grain farmers in the Mid-West.

### **Description and agronomy**

The annual herbaceous plant of *Guizotia abyssinica* grows to a height of 0.5 to 1.5 m and matures in 110 to 120 days. It is a short day-length, photoperiod sensitive plant that is cross-pollinated with bees as the typical vector. The crop is widely adapted to all types of soil and is commonly grown in India on poor and acid soils or on hilly slopes that are low in fertility. In East Africa, the crop is grown up to 2 500 m altitude. It requires moderate rainfall and, although it is grown in both temperate and tropical areas, does not perform well when the nights are cold. Yield levels are reported to be 200 to 300 kg/ha, although they can reach 500 to 600 kg/ha with good management. Experimental plots with improved cultivars on fertile soils in India have yielded 1 000 to 1 200 kg/ha. Trials in Minnesota (the United States of America) have established the nitrogen requirement to be 60 kg/ha. Trials showed no positive response to potassium and phosphorus fertilisation<sup>2</sup>. The crop can be grown successfully in rotation with wheat or maize. It is susceptible to white mould (*Sclerotinia* spp.), and therefore rotations with soybean or canola should be avoided. Seeding rates are between 3 to 6 kg/ha. Because it depends on bees for cross-pollination, it is recommended that beehives are placed at a density of 2 to 3



**Plate 1**  
*Niger seed*

<sup>1</sup> Also sometimes, mistakenly, referred to as “Thistle seed”. In order to eliminate the confusion and the sometimes offensive mispronunciation of the word “niger”, the Wild Bird Feeding Institute of America introduced the name “Nyjer”™ in 1998.

<sup>2</sup> Source: Duke (1983)

TABLE 1  
Imports of Niger seed to the United States of America in 2003

| Origin    | Quantity (tonnes) | Value (thousand US\$) |
|-----------|-------------------|-----------------------|
| India     | 22 609            | 12 225                |
| Ethiopia  | 18 290            | 9750                  |
| Myanmar   | 7 043             | 4781                  |
| Singapore | 1 463             | 933                   |
| Nepal     | 61                | 42                    |
| Pakistan  | 54                | 31                    |
| Indonesia | 19                | 8                     |
| Canada    | 3                 | 5                     |
| Total     | 49 542            | 27 775                |

Source: United States Department of Commerce, 2003.

Appendix 3 gives details of research institutes where germplasm accessions may be found.

### Production and trade

The main production areas of Niger seed are Ethiopia and India. The crop is also grown in Nepal, Myanmar, Bangladesh and several countries in eastern and central Africa. In Ethiopia, Niger seed production accounts for 50 to 60 percent of vegetable oil production. After internal needs are met, the surplus is exported for bird food, mainly to the United States of America and Europe. Global seed production is estimated at between 300 000 and 350 000 tonnes<sup>1</sup>. India produces an estimated 80 000 to 100 000 tonnes with the states of Madhya Pradesh, Andhra Pradesh and Orissa accounting for about 80 percent of the total. Ethiopia produces 200 000 to 250 000 tonnes. Production is widespread over the country, but the most important production areas are Begemdir, Gojam and Welega.

In 2003, the United States of America imported 49 542 tonnes having a total value of almost US\$27.8 million (Table 1). Long supply lines and political instability in the producing areas have resulted in initiatives to start production in the Mid-West states of the United States of America such as Minnesota.

For export to the United States of America, seeds should be heat sterilized (60 °C) before shipment. This is done to eliminate possible contamination by the parasitic dodder *Cuscuta* spp.

### Opportunities

Niger seed is a high value bird food ingredient, especially in the United States of America. It is small seeded and therefore particularly attractive to finches. Its use as a bird food ingredient in Europe and other parts of the world is increasing, following the example of the United States of America. In the key production countries (Ethiopia and India) it is grown primarily as an oil crop. Any excess that remains after the domestic demand for oil has been met is exported for bird food. The crop is mainly grown on marginal soils and as a result, yields fluctuate widely. These circumstances, together with long supply lines, have led to an interest in its production in the United States of America<sup>2</sup>.

Niger seed is also cultivated to a lesser extent in other sub-Saharan countries and parts of Asia. Its production has been reported in Malawi, Sudan, Uganda and the

<sup>1</sup> This figure is probably misleading as it only reflects traded Niger seed. It must be assumed that total production is higher as no account is taken of locally produced seed for own consumption or local trade.

<sup>2</sup> For more information visit <http://mda.state.mn.us/mgo/crops/Niger.htm>

hives per hectare. Harvesting can take place once all the flowers have withered. The seed is usually swathed and dried completely (to a moisture content of 10 percent or lower) before threshing.

### Varietal development

Although Niger seed originated in Ethiopia, the crop is now widely grown in India and, to a lesser extent, in Bangladesh, Nepal and Myanmar. On the Indian sub-continent, the Niger seed germplasm is differentiated from that of African origin. Yields of Niger seed on the Indian sub-continent are generally lower, plants are shorter and mature earlier.

Congo, and production in these countries could be expanded and improved by better agronomic practices and varietal selection.

### **CANARY SEED** (*Phalaris canariensis* L.)

Canary grass is native to southern Europe and the Middle East. Commercial production was introduced into the United States of America in the 1950s and spread to Canada in the 1970s. Canada is currently the largest producer with an estimated 75 percent of world production (200 000 tonnes). The other major production areas are Argentina (12 percent), Australia (3 percent), Hungary (2.5 percent) and Mexico (2.5 percent). Other producing countries include Turkey, Uruguay, Thailand and Morocco.

#### **Description and agronomy**

Canary grass is an annual grass that can grow up to 1 metre in height and matures in 105 to 110 days. It is a cool season crop, which prefers long warm days and cool nights. Plants tiller strongly after the fourth-leaf stage, and thereafter form a dense ground cover. The root system is rather shallow and therefore less tolerant to heat and drought than crops such as wheat. The crop grows best on heavy clay or clay loam soils with good water retention characteristics.

In Canada the grass is mainly grown in Manitoba Province. Sowing starts in May when the soil temperature has reached 7 °C. It is promoted in southern Australia (South Victoria), where winter rainfall is between 300 and 500 mm. Standard sowing equipment for small grain cereals can be used, but the seedbed must be firm and moist. Planting depth should not exceed 50 mm. Seeding rates are 30 to 38 kg/ha. The seeding rate is a compromise between getting a good cover to exclude weeds and the desired seed size. If planted too densely, product will have small-sized seeds and will be less acceptable to the market.

Canary seed is very susceptible to herbicide carry-over or herbicide drift from adjacent fields (especially for trifluralin and ethafluralin herbicides). Therefore, it should not be planted within 24 to 30 months after such herbicides have been applied to the same land. The susceptibility to herbicides makes annual grass weed control difficult. The use of a non-selective herbicide before planting, or delayed planting, are control measures that can be considered. Fertilizer requirements have not been extensively studied for canary seed but requirements are similar to wheat.

The seeds are relatively shatter resistant and can be direct combined or swathed. Harvesting takes place when the seed heads are 20 to 50 mm long and the seeds have reached 13 percent moisture content. The appearance of the seed is similar to flax seed. The brown seed coat is covered by a glossy, papery yellow hull that is attractive to birds (Plate 2). During harvesting and handling, care must be taken not to damage this coating. De-hulled seeds are dark brown and are thus less valuable to the bird seed trade. Under good conditions, the seed stores well for long periods without quality loss.

Yields vary widely from season to season. Table 2 illustrates this point using Canadian



**Plate 2**  
*Canary seed*

TABLE 2  
Yield of canary seed in Canada (1998 – 2003)

| Year                  | Area sown<br>(thousand ha) | Average yield<br>(tonnes/ha) |
|-----------------------|----------------------------|------------------------------|
| 1998–1999             | 208                        | 1.13                         |
| 1999–2000             | 146                        | 1.14                         |
| 2000–2001             | 164                        | 1.04                         |
| 2001–2002             | 164                        | 0.70                         |
| 2002–2003 (estimated) | 214                        | 0.77                         |

Source: Statistics Canada, available at [www.statcan.ca](http://www.statcan.ca).

statistics. In Australia (southern Victoria) yields vary between 0.5 and 0.6 tonnes/ha.

### Processing and storage

Canary seed has tiny hairs that can cause skin and lung irritation during handling and processing. Therefore, workers need to use some form of protection and take care during handling. In addition to cleaning, seeds are also polished (to remove the hairs) and sometimes oiled to increase the glossy appearance.

### Varietal development

The varieties Keet and Elias were developed in Minnesota in 1983 and 1988 and are now extensively grown in Canada. The Crop Development Centre in Saskatchewan, Canada, maintains breeders' seed. A few commercial varieties have been developed in Australia (for instance, variety Moroccan). In 1997 a new hairless (glabrous) variety was introduced in Canada, which has now been commercialised under the name Canario™. Removal of the hairs from seed has several benefits: it reduces the irritation to handlers and processors; reduces the volume of seed and hence the shipping costs by up to 12 percent; reduces the processing costs by eliminating the need for polishing of the grain<sup>1</sup>.

### Production and trade

The market is highly volatile. For example, world production varied from 300 000 tonnes in 1995 to 167 000 tonnes in 1997. Most of the seed is exported, with Canada leading, followed by Argentina and Hungary. Table 3 shows the main importing countries in 2001.

Most exports take place as bulk, unprocessed seed shipments and, to a lesser extent, as pre-packaged seed mixtures. There is no futures market, therefore prices are negotiated between producers and customers depending on the supply and demand. Prices fluctuate over the years as production goes up and down. Long-term averages suggest a range of US\$200–US\$240 per tonne. For the year 2002/03 prices were around US\$480 per tonne, illustrating the volatility of the market.

Accepted standards for export are a minimum of 99 percent pure seed and a maximum of 4 percent dehulled seed. If clean and dry, the seed stores well for several years. At present there are no grading standards, but purchasers pay attention to uniformity, seed size, appearance, smell and the percentage of dehulled seed. There are no packaging standards for bulk canary seed. Most international trade takes place by the container load, while smaller markets accept bagged seed.

### Marketing

Canary seed is a minor crop and is not quoted on grain markets. In Canada there are about 30 companies that buy, process and trade the seed. Although predominantly a spot market, some contracting of production takes place. Contract prices typically have a fixed price component and a flexible component that is determined, according to market prices, at the time of harvest. Belgium and the Netherlands are major importers of Canadian canary seed, which is mainly repacked and re-exported. Appendix 2 lists some of the major brokers. Agri-food of Canada publishes market

<sup>1</sup> Canary seed has recently received attention as human food. The development of hairless varieties may clear the way for food approval. Hairless canary seed would be useful for the health food sector for instance in multi grain breads.

and price information on canary seed on a bi-monthly basis (see Appendix 1 for website and subscription details).

### Opportunities

Bearing in mind that it is a cool season crop with a preference for cool nights and warm days, opportunities are probably limited to temperate and subtropical areas either during the main season or during winter. At present the seed is used for the bird seed market and is less subject to substitution than the other small grains. Packers may vary the amount used in their mixes, but will always include the seed because of its attractive appearance.

Quality requirements are high with a special emphasis on uniformity, seed size and seed colour. Undersized seeds are undesirable, while extra care should be taken during harvesting, processing and storage to maintain the papery seed coat, which imparts a glossy appearance.

A large proportion of the Canadian export goes to Mexico and Brazil, a volume that increases when the Argentine crop is insufficient. There may be opportunities for Central and southern American countries to increase production of the crop.

### MILLETS

Millet is a generic name that includes several small-seeded cereals. Millet classification is complicated by the fact that certain names appear to be used exclusively in the bird seed sector to denote an origin or colour rather than a genus/species.

Millets can be grown over a wide range of environments, but are particularly adapted to hot and dry regions. They are probably amongst the first cultivated crops of ancient civilisations and are still staple foods in Asia and Africa. Developing countries in Africa and Asia account for 94 percent of the global production of 28 million tonnes. Of this, pearl millet accounts for 15 million tonnes, foxtail millet for 5 million tonnes, proso millet for 4 million tonnes and finger millet for 3 million tonnes. India is the world's largest producer with about 40 percent of world production. China is the world's largest producer of foxtail millet (3.7 million tonnes). Developed countries produce exclusively proso millet which is used mainly for fodder or bird food grain. Only a small proportion (1 percent) of global production is traded internationally. Fifty percent of traded millet is proso millet exported by the United States of America, Australia and Argentina.

#### Proso millet (*Panicum miliaceum* L.)

Proso millet is also known as white millet, common millet, French millet, broomcorn, ravi, yellow plate millet or simply panicum. In the bird food trade, the preferred names are proso millet or French millet. It is one of the oldest food crops known to man. Its origin is disputed, but it is generally assumed to have originated in Egypt or Asia Minor. It is still widely cultivated in India, China, Russia, the Middle-East and Afghanistan.

In the bird food trade, proso is a staple ingredient for both wild and caged birds. The seed coat colour is important and there are regional differences in preference. However, the trend seems to be towards white or yellow creamy colours. In western Europe there is a preference for yellow-coloured millet from the Plate Region of Argentina,

TABLE 3  
Main countries importing canary seed from Canada in 2001

| Countries                | Proportion of total Canadian canary seed export (%) | Quantity imported (tonnes) |
|--------------------------|---|----------------------------|
| Mexico                   | 19  | 25 650                     |
| Brazil                   | 18  | 24 300                     |
| Belgium                  | 14  | 18 900                     |
| Spain                    | 8   | 10 800                     |
| United States of America | 7   | 9 450                      |
| United Kingdom           | 5   | 6 750                      |
| Italy                    | 5   | 6 750                      |
| The Netherlands          | 4   | 5 400                      |
| Germany                  | 3   | 4 500                      |
| France                   | 2   | 2 700                      |
| Others                   | 15  | 20 250                     |

Source: Statistics Canada, available at [www.statcan.ca](http://www.statcan.ca).

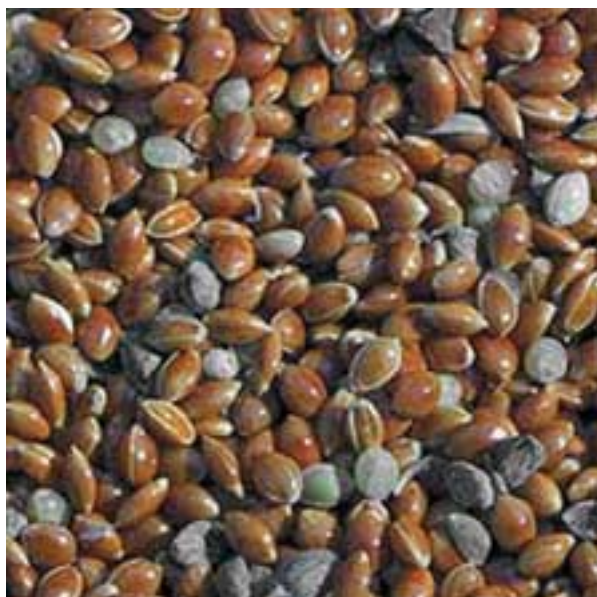


Plate 3  
*Proso millet*

which is reported to be softer than white or red millet. White proso millet can still contain up to 5 percent red coloured seed, which makes it less acceptable to the trade.

#### *Description and agronomic notes*

Proso millet is easy to grow, has a low water requirement and is widely adapted to different soil and climate conditions. It is a short season crop that matures in 60 to 90 days. The crop is relatively tolerant to cooler climates and can be grown at higher latitudes and higher elevations than most other millets. For instance in Russia it is grown at altitudes up to 1 200 m and in India up to 3 500 m. It is a short-day length plant, which grows up to 1 m tall. The plant is predominantly self-pollinated but out-crossing may occur to the extent of 10 percent. The seeds are oval in shape (Plate 3), smaller than finger millet or

sorghum, about 3 mm long and 2 mm wide. Seed colour may vary between varieties from creamy white to red. Proso millet efficiently converts water into dry matter/grain and can yield between 4 000 and 5 000 kg per hectare. Response to fertilizers is low. In Nebraska, nitrogen application at 45 kg/ha is recommended on proso following a wheat crop. In India, optimum application levels are 40 kg N/ha, 20 kg P/ha and 20 kg K/ha for irrigated proso (FAO/ICRISAT, 1996).

#### *Varietal development*

The Nebraska Millet Improvement Centre has carried out major improvement work and during the past decade, several new varieties have been released such as Huntsman, Sunrise, Dawn and Sunup. ICRISAT in India holds over 50 000 proso millet accessions while varietal improvement is also carried out by the Indian Council for Agricultural Research (ICAR). Other breeding and germplasm evaluations are carried out in Australia and Germany. The University of Queensland in Australia has released a selection of white proso with a reduced level of red seed contamination.

#### *Production and trade*

The global area sown with millets is relatively stable at around 38 million hectares. However, only about 1 percent of world millet production is traded internationally. This represents 200 000 to 300 000 tonnes or approximately 0.1 percent of the global cereal trade (FAO/ICRISAT, 1996). Out of all the millets, proso millet is the most important species being traded with a volume of 100 000 to 150 000 tonnes per year. This proso millet is predominantly produced in the United States of America, Australia and Argentina and is exported almost exclusively to other developed countries (European Union, Japan, Switzerland and Canada) for bird food use.

Exact statistics on production and trading are hard to come by as they are mostly grouped with other millets under the heading "other cereals". Prices of internationally traded proso millet are highly volatile and depend on supply and demand. Over a five-year period (1993–1998), proso millet produced in the United States of America sold for between US\$88 and US\$550 per tonne. The current (March 2003) prices are high (US\$690), as a result of severe drought in the United States of America production areas (Burgener *et al.*, 2002). In general, prices are higher than other cereal prices.



### **Marketing**

There is no organized trading. Most trading takes place between a few commodity brokers on a sample basis.

### **Opportunities**

Proso millet can be grown in temperate climates under low rainfall conditions. It is one of the staple ingredients of bird food grain mixtures. The predominant place of production for non-food proso millet is the United States of America, where about 200 000 hectares are grown annually in the arid parts of the High Plains. The harvested area fluctuates annually as a result of climatic conditions and farming cropping decisions, which has consequences for bird food packers. In 2002, the proportion in bird food mixes was severely reduced as a result of low supply and high prices. Some of the major brokers place contracts for growing the crop.

### **Spray millet (*Setaria italica* (L.) Beauv and *Eleusine coracana* (L.) Gaertn.)**

Spray millet is included as a treat in bird feeding. It consists of the intact heads of foxtail or finger millet with the grain still attached (Plate 4). The heads are hung in birdcages or aviaries to stimulate active foraging behaviour in caged birds. It is produced by specialized farms in the United States of America or imported from other countries such as China. There are no readily available data on the production or trade of spray millets.

### **Japanese millet (*Echinochloa crusgalli* var. *frumentacea*)**

Japanese millet is closely related to barnyard grass and is widely cultivated in the tropics and subtropics. It has the highest protein content of all the millet species. It is mainly grown for grazing and haymaking, although a small volume is harvested as grain for the bird food industry. It is also popular in cover crop mixes as the plant and seed are attractive to waterfowls.

### **Production and trade**

There are no data on the production of, and trade in, Japanese millet for the bird food industry. However, Japanese millet is often cited as an ingredient in companion bird food mixes, which indicates a global trading<sup>1</sup>. Japanese millet is grown in Australia (Queensland), China and the United States of America mainly for grazing or hay. Average yields obtained in Queensland, Australia are 1200 kg/ha.

### **Quality standards**

The Australian standards for Japanese millet as bird food are 98 percent purity, a maximum moisture content of 13 percent, and a hectolitre weight of at least 46 kg.

### **Opportunities**

Japanese millet is of tropical and subtropical origin and could be grown in most developing countries. The crop is relatively drought tolerant, has a low fertiliser requirement and matures early. To date there are no registered varieties, but in Australia improved varieties with bigger seeds are known as Shirohie millet.



**Plate 4**  
*Spray millet*

<sup>1</sup> Japanese millet is in many commercial mixes present as 2–4 percent by weight.



Plate 5  
*Black sunflower seed*



Plate 6  
*Striped sunflower seed*

### Other millets used in bird food

Other millet species included in bird food mixtures include finger millet (*Eleusine coracana*) and pearl millet (*Pennisetum glaucum*).

### SUNFLOWER (*Helianthus annuus* L.)

Sunflower is a major ingredient in bird food, both for outdoor and indoor feeding. Both black (oily) and striped (confection) sunflower seeds are used (see Plates 5 and 6).

It is estimated that black sunflower represents 80 percent, while striped sunflower represents 20 percent of all sunflower going into bird food. A minor crop is white sunflower seed which is used in parrot food mixes. Sunflower seed provides energy and protein in the diet. However, energy in the form of oil is not always desired and several commercial bird food mixes exclude sunflower. Sunflower hearts (sometimes called *meats*) are dehulled striped kernels that are used in the health food industry, in baking, for sprouting, and also as an added value component for the bird food industry. Dehulling can be an intentional process but it is also common that seeds become dehulled during handling and transport. The seeds and hearts are either marketed in a mix with other seeds or as straight sunflower. Cultivation is done in many countries of the world under a wide variety of climatic conditions. The principal producers include the Russian Federation, Ukraine, Argentina, France, Spain, Romania, Hungary, the United States of America of America, India, and China.

It is difficult to obtain statistics on the use of sunflower seed for bird food as there is no organisation that monitors this trade. Moreover, depending on the price for

commodity sunflower and the oil content in the seed, sunflower can easily switch from the oil extraction market to secondary markets such as bird food. To give an indication of magnitude, between 1991 and 1993, the annual use of sunflower for bird food consumption in the United States of America was 240 000 tonnes of black oil sunflower seed and 35 000 tonnes of striped confection sunflower. This represents an annual economic value of US\$170 million per year<sup>1</sup>.

### Opportunities

Opportunities for farmers in developing countries are limited. The United States and European sunflower crops are large and will remain the major source for the bird food

<sup>1</sup> Source: National Sunflower Association ([www.sunflowernsa.com](http://www.sunflowernsa.com))

industry. In addition, the large size of the seed and its relative weight and bulk, make it an expensive crop to transport. Egypt and Kenya are the major suppliers of white sunflower seed. China is an important supplier of organic sunflower seed.

#### **SORGHUM** (*Sorghum bicolor* (L.) Moench)

Sorghum (also referred to as milo in the United States of America) has long been a staple in bird food mixes even though the tannin content in the seed coat is not attractive to birds. Plate 7 shows sorghum seeds. It may be added to the mix to provide a colour contrast and make the mix look attractive to buyers, rather than for its nutritional attributes. Although sorghum is one of the most important food crops in the world, global trade is strongly linked to the demand for livestock feed products. Only 6 percent of globally traded sorghum is used for human food consumption, while the remainder is used in animal feed. There are no data available on the proportion of traded sorghum intended for bird food production (other than poultry), but in recent years the use of sorghum in bird food seems to have declined.

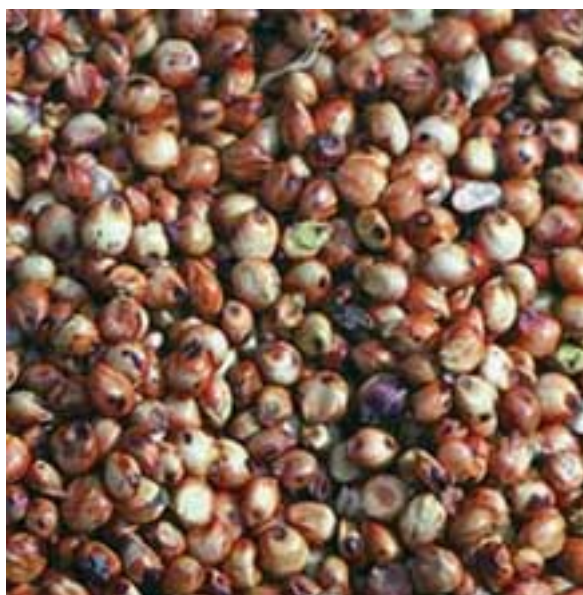


Plate 7  
*Sorghum seeds*

#### **Opportunities**

Opportunities for developing countries to trade sorghum for bird food in the international market place are limited. The international trade is dominated by the United States of America and prices closely follow the world market price for corn. The value for sorghum is about 90 to 95 percent of that of corn.

#### **GROUNDNUTS** (*Arachis hypogaea* L.)

Groundnuts (or peanuts) are popular in bird food mixes, both for outdoor feeding and for caged or companion birds. They are used unshelled, shelled, whole, or broken. Their use for bird feeding is more popular in Europe than elsewhere, although during the last decade there has been an upward trend in use in the United States of America. There are no statistics on the use of groundnut in bird food, but the total volume used is believed to be small.

#### **Opportunities**

There appears to be no groundnut production that is specifically targeted at the bird food market. Therefore, opportunities for developing countries to enter this sector of the bird food market are limited. Any requirements for the commodity are readily met by the general groundnut market.

#### **MINOR CROPS USED IN BIRD FOOD**

##### **Safflower** (*Carthamus tinctorius* L.)

Safflower (Plate 8) is also known as *kusum* (India/Pakistan), *cartamo* (Latin America), and *rufu* (Ethiopia). It is traditionally grown for its petals from which an orange dye can be obtained, but today is mainly grown for its oil and use as birdseed. The major exception is China, where it is mostly used for traditional medicines. Global



Plate 8  
*Safflower seed*

production is estimated at 1.1 million tonnes, the majority of which is produced by India – India produces 41 percent of the world's safflower for domestic oil extraction and 50 percent of the world's seed production. In addition to India, the other main producing countries are the United States of America, Mexico, Canada, Australia, China and Argentina. The only African country with a substantial safflower production is Ethiopia (80 000 ha).

Safflower is drought tolerant and can be cultivated in regions where seasonal rainfall is around 375 mm. However, the best yields (up to 2.5 tonnes/ha) are obtained under irrigation. It is tolerant to soil salinity and low temperatures at the early plant stages, and matures in 110 to 140 days. In rotations with small grain cereals it helps to break disease and insect cycles.

### *Trade*

For the bird food market, the seeds should be uniformly white in colour, free of bristles at their ends, and have a high test weight (minimum of 47.5 kg/hl). Brown striped seed of some varieties are not acceptable to the bird food trade. Most of the safflower for the bird food market is produced in the United States of America, especially in the arid parts of the High Plains. Yields vary according to the season, but range between 800 and 1 800 kg/ha. Most production is contracted before planting and prices range between US\$0.17 and US\$0.23 per kg. The quantity used as bird food is estimated to be 25 000 tonnes, which is approximately 2.5 percent of global production.

### *Varietal development*

Private seed companies carry out most of the breeding work. Most attention is paid to the fatty acid composition (oleic acid content), agronomic characters and oil content. Although generally considered as a day-length neutral, long-day plant, the origin of the variety of safflower to be grown is important. Varieties adapted to summer cropping in temperate climates could have an extremely long vegetative stage when grown under short day conditions in tropical and subtropical regions. Varieties well suited for the bird food market in the United States of America are Finch, Montola 2000 and S-208.

### *Opportunities*

Safflower for bird food use is almost exclusively grown in the United States of America for the domestic bird food market, where it is a prized addition to bird food mixes. Its use in bird food mixes in other countries is limited. Although India produces 50 percent of the world's safflower crop, it is almost entirely used for domestic consumption. Only small volumes are traded internationally. Production opportunities for the international bird food market appear to be limited. However, because the plant is tolerant to drought and soil salinity, it may be an alternative crop in some developing countries provided that the quality demands can be met (high specific weight, colour, etc).

### **Quinoa (*Chenopodium quinoa* Willd.)**

Also known as “goosefoot”, “Inca wheat” and “pigweed”, quinoa is a pseudo-grain, native to the Andean mountain region of South America. Although it has been

cultivated since 3000 BC, it has only recently been discovered by consumers in the northern hemisphere as a grain with excellent nutritional value, a well-balanced amino acid composition and a high calcium, phosphorus and iron content. It is a premium product in health food stores and is used in small quantities in bird food mixtures. Because of its premium as a health food, its use for bird food is expected to remain small.

### *Production and trade*

Quinoa is a high altitude crop which has problems with sterile pollen at lower altitudes. The main areas of production are Bolivia, Peru, Colombia and Ecuador. Bolivia is the largest producer and about 65 percent of the production is consumed in-country. The crop has been tried in several locations within the United States of America. The main importing countries are the United States of America, Germany, the United Kingdom and the Netherlands. Trade statistics are difficult to compile, as quinoa is usually grouped under “other cereals” in most trade statistics. Export prices in Ecuador are between US\$1.16 and US\$1.60 per kg<sup>1</sup>.

### *Opportunities*

There is some evidence to suggest that international demand for quinoa is higher than the supply, but it is not clear how much of the demand from the bird food sector is not being met. Quinoa represents one of the few cropping options for small farmers at high altitudes. Evidence from the United States of America and the Himalayas suggests that it can be successfully cultivated outside its native area of the Andes.

## **NEW CROPS**

The birdseed market, both for caged birds and wild bird feeding is highly competitive. Bird food companies try to be innovative and continuously find new formulae. Key words in advertising are “healthy”, “exotic”, and “premium”. At present, the number of grain species used in bird food is limited, and the most common ones have been described above. However there are probably numerous (wild or semi-domesticated) grains, fruits or nuts in the tropics and subtropics that have so far escaped the notice of bird food manufacturers, but which could offer new opportunities for product diversification and brand identification. For example, Harrison in the United States of America adds chia (*Salvia columbariae*) to its organic bird food. Chia is a “mythical” energy food of the native American Indians that can be found as a weedy plant in the deserts of California. Other minor innovations include the addition of seaweed and algae.

Through the observation of bird behaviour and indigenous knowledge of dietary habits of birds, it may be possible to identify (semi) wild fruits, nuts and other seeds that could be used in bird food mixes. The production and supply of these raw materials to bird food manufacturers and packers may present income generating opportunities for indigenous communities.

Most bird food packers are constantly seeking new sources and suppliers of raw materials, both to diversify their product lines and to maintain a competitive price. Most have product development departments where new potential ingredients can be tested for their nutrient profile, food safety and suitability for inclusion in bird seed mixes. A very important factor that potential suppliers of raw materials need to consider, however, is that packers will only be interested in changing their bird food formulae when supplies of reasonable quantities of the new ingredients can be guaranteed.

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<sup>1</sup> [www.sica.gov.ec](http://www.sica.gov.ec)

## Chapter 5

# Processing, quality and trading standards

### PROCESSING AND STORAGE

Most of the birdseeds mentioned in this report can be cleaned by means of simple air/screen cleaners or by traditional methods such as hand threshing and winnowing. For most grains 98–99 percent purity is standard. In addition, the seeds should be shiny, look and smell fresh and have a high specific weight (as expressed in hectolitre weight or bushel weight).

It is essential that birdseed be free of dead or live insects, mould and noxious weed seeds. Another important consideration is the moisture content at which the seed is processed and stored. Mouldy seed or seed with a musty smell are not acceptable in the trade. The moisture content for most grains at processing should not exceed 8–12 percent. Niger seed that is exported to the United States of America must undergo heat treatment (60 °C) before shipping to kill any cuscuta seeds that might be present. Groundnut seeds for the United States of America and the European Union must be free of aflatoxin contamination for which there is zero tolerance.

An organisation in the United Kingdom, the Birdcare Standards Association (BSA), aims to formulate feed standards for wild bird feeding. The member companies of the BSA agree to have regular testing of their products by independent laboratories. Standards have been formulated for the level of aflatoxin contamination in groundnuts and the minimum and maximum content of certain small grains in bird food mixes. Complying companies may carry the BSA logo.

### GENERAL GUIDELINES FOR QUALITY BIRD FOOD

The following are general guidelines for quality bird food:

- Freshness of the ingredients. This applies especially to seeds such as sunflower which tend to go rancid during prolonged storage because of their high oil content. Ingredients should have a fresh smell and a clear and shiny appearance.
- Clean and dust free. Dust released during seed processing settles at the bottom of mixes and adds weight.
- Free from pesticide residues.
- A correct ingredient mix is important, especially if the bird food is packaged in transparent containers. Care should be taken with the actual proportion of cheap fillers such as wheat and milo that are used in the mix.
- Ingredients should be free from mould and live or dead insects.
- The grain should have a high specific weight (bushel weight or hectolitre weight).

### PACKAGING

Packaging serves several purposes:

- to protect and contain the material during transport
- to protect the material during storage
- to attract buyers and provide information about the contents.

Different types of packaging material are required according to the desired purpose.

**Packaging for transport and export**

For transportation, the material should be lightweight but sturdy. The most usual packaging for seeds is jute or polypropylene bags of 25 kg. For export, the required type of packaging depends on the importer and the type of installation available.

**Packaging for storage**

During storage, the seed must be protected from the external elements such as water and sunlight, prevented from coming into contact with chemicals and pesticides, and protected from predators such as insects, birds and rodents. Seed can be stored in bulk in storage pits. Often storage is done in gunny bags, jute sacks or baskets. Sometimes pesticides are added to protect the seed from damage during storage. The most important factor is to ensure that the seed does not take up moisture during storage, because this leads to spoilage. Stored seed should be checked frequently for signs of spoilage such as insect attack, and its moisture content should also be monitored.

**Packaging for retail**

As the bird food business becomes more competitive, packaging assumes more importance. For wild bird feeding more use is made of transparent containers, which gives the consumer a clear indication of the ingredients used, the cleanliness and the quality of the mixture. The use of transparent containers makes it essential that packers have a consistent use of raw materials to ensure that the outside appearance of the mix does not change too much over the same season or from one season to the next.

Prepared bird food for companion birds is often sold in closed containers such as carton boxes and plastic tubs, which are attractively printed and may be labelled with the ingredients used. There is no legal requirement for labelling bird food unless specific nutritional claims are being made. Companion bird food is generally sold in small packages as customers usually only have one or two birds.

**NON-GMO CERTIFICATION**

Many packers in western Europe require a certificate that attests that the commodity is free from Genetically Modified Organisms (GMOs). This especially applies to maize, soya and rapeseed, the only three crops that are currently commercialised with genetic modifications. Potential suppliers of commodity grains need to be aware of this requirement and check whether such certification can be done in the country of origin or whether testing is necessary in other countries. Certification of this type will add extra costs<sup>1</sup>.

**TRACEABILITY, HACCP AND GMP**

Recent food scares, outbreaks of BSE (bovine spongiform encephalopathy) and contaminated animal feed have to a certain extent also influenced the trade in small grains for bird food. The bigger brokers and bird food packers in western Europe have established systems of quality assurance and traceability that have organisational and financial consequences for suppliers of animal feed ingredients. This applies especially to those who handle commodities, not only for bird food but for animal feed in general.

A detailed discussion of management practices is outside the scope of this report, but it is useful to point out that would-be exporters may be required to have some form of certification, for example from the International Organization for Standardization (ISO) or similar body. The demand for certification works down the supply chain. Processors and packers impose standards on shipping companies who, in turn, will require standards from exporters.

<sup>1</sup> A typical test will cost about US\$110–150 per sample in the case of maize.

HACCP (Hazard Analysis and Critical Control Point) systems are not yet mandatory for the grain trade, but many establishments have put these systems into place on a voluntary basis<sup>1</sup>.

GMP (Good Manufacturing Practices) relate to the conditions and procedures that have been proven to deliver consistent quality and safety based on long-term experience. This set of standards is generally implemented in the European food and pharmaceutical industry.

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<sup>1</sup> HACCP (Hazard Analysis Critical Control Point) is a pro-active management system to assure food safety by identifying and preventing potential physical, chemical and biological hazards associated with a particular food production process or practice.



## Chapter 6

# Possible entry strategies for farmers and entrepreneurs in developing countries

### INTRODUCTORY REMARKS

In spite of fancy packaging and advertising that contains words such as “exotic”, “premium” and “healthy”, the market for bird food is predominantly a commodity market. Most small grains that are traded for bird food, such as millets, sorghum, sunflower, groundnut and maize, are available worldwide. These crops are also grown widely in the most important market for bird food, the United States of America. The market for bird seed is very volatile because grains are readily substituted according to availability and the current market price. This is more the case for the wild bird food sector than the caged bird food market. For example, sunflower seed can be diverted from the oil sector into the bird food sector and vice versa depending on the price. At the same time, packers of bird food will use products that are below food grade for human consumption, for example maize and rice chippings, or sunflower hearts which were dehulled during transport. There is also a substantial part of low-germinating seed that is diverted to bird food uses.

The only grains that are exclusively used for bird food in the industrialized countries are canary seed and Niger seed, and these two grains have greater price elasticity as they are not easily substituted. As bird food retailing becomes more competitive and consumers become more aware of the quality attributes of different grains, for example which one has the best chance of attracting birds into their gardens, the image and presentation become important. As a consequence, manufacturers and packers are less likely to substitute one grain for another as they strive to maintain brand image and to produce a uniform product throughout the year.

For caged and companion bird food, consistency in formulation is a must, especially when manufacturers make claims about the nutritional value on the label. The caged and companion bird owners have become sophisticated consumers, and general notions of animal welfare increase demands for quality.

### PRODUCTION OF COMMODITY GRAIN

Given the commodity nature of the market, there are no specialized birdseed growers (with the exception of canary seed producers and some specialized producers of spray millets). Dedicated production of small grains to supply the bird food markets of the developed countries is *not* recommended. Supply routes are long and expensive which makes competition with domestic suppliers in the United States of America and other countries almost impossible.

Commodity brokers who do not have their own cleaning facilities will demand a high standard of grading and cleaning in the country of origin, which could mean the need for substantial investment in these countries. The demand for transparency in the food and feed industry requires more and more traceability and certification, which might not be possible in many developing countries.

The nature of the commodity market is that there are shortages of some grains in certain years and as a consequence the price varies dramatically from year to year. For

instance, in 2002 and 2003 many packers in the United States of America lowered the proportion of proso millet in the seed mixes because supplies were low and prices high. At such moments there may be opportunities for traders in developing countries to offer commodity grain for the bird food market. Traders in developing countries need to be aware of existing or upcoming shortages, which is difficult, because few of the commodities used in bird food formulations are quoted on futures markets. The websites of some of the leading commodity brokers regularly publish updates on the market for bird food (see Appendix 2). Alternatively, specialty commodity brokers or packers/wholesalers may be contacted directly.

The only ingredient of bird food mixes that is 100 percent imported from developing countries is Niger seed. India supplies the bulk of this commodity and, at the moment, little is sourced from Ethiopia, Myanmar and Nepal. The reasons for the decline in exports from these three countries are not known, but could be as a result of political instability and/or low yields. Niger seed is a premium bird food and there may be potential for this crop to expand in African countries such as Sudan, Malawi and Uganda where Niger seed is traditionally grown, but on a limited scale.

Currently, the total production of canary seed is for bird food. Canada is the world's leading producer and the major importing countries are Argentina and Mexico, Belgium and the Netherlands. It would appear that there is potential to produce and market canary seed closer to the destination countries. Traded canary seed is almost exclusively from Canadian origin. Some of the brokers contacted in the preparation of this report expressed an interest in accessing alternative sources of canary seed.

#### **NON-GRAIN INGREDIENTS**

In many cases exotic companion bird food contains non-grain ingredients such as desiccated tropical fruits. Popular ingredients are banana, mango, papaya and pineapple. Currently, little is sourced directly as desiccated product from tropical countries. Statistics on the use of these ingredients are not available, but it may be worthwhile for entrepreneurs in tropical countries who already operate fruit drying installations, to make contact with the larger bird food packers.

#### **MANUFACTURING AND SELLING OF PREPARED BIRD FOOD**

The manufacturing and selling of complete bird food mixes should be aimed at domestic or regional markets. The substantial increases in Canadian exports of canary seed to Mexico over recent years indicates a growing bird food market in that country with possible opportunities for regional producers to participate with other small grains such as proso millet. There are also several indications that the keeping of companion birds is on the increase in other countries around the Pacific Rim and in Asia. This has the potential to provide markets for regional suppliers and manufacturers. Statistics on the use of other pet food in, for example, China, Japan and Malaysia, indicate a steady growth in expenditure on prepared foods for dogs and cats. Although exact statistics are lacking, it can be assumed that the use of prepared pet foods increases with the disposable income of the urban middle classes.

## Chapter 7

# Conclusions and recommendations

### CONCLUSIONS

1. The main ingredients of bird food are small grains of tropical and subtropical origin or small grains which could be grown in the tropics and subtropics. This opens possibilities for farmers and entrepreneurs in developing countries to participate in the production, processing and marketing of these grains.
2. The main market for bird food is in the northern hemisphere with the United States of America accounting for 50 percent of world consumption. Brokers and packers source substantial amounts of small seeded grains from developing countries to supply this market. There are also emerging markets in developing countries and countries in transition which opens possibilities for grains to be grown and packed locally.
3. In the bird seed trade long-term relationships based on mutual trust are a necessity because communication between buyer and seller is sometimes difficult, supply routes are long and difficult, and volumes traded are low. Also, because most commodities used for bird food have no international standards, they are traded on the basis of samples.
4. The participation of developing countries in the trading of bird food ingredients has the potential to increase, especially for high value seeds such as Niger seed and canary seed. Increased supply and lower prices will have a positive impact on the amount of these seeds that are used by packers, while a spread in production geography will take some of the supply uncertainty out of the market.
5. Bird food packers are continuously looking for novelties that help them to segment the market and differentiate their product from competitors. This opens possibilities for under-utilized crops in developing countries. However, all new crops must first undergo rigorous testing to assess their suitability for use. Packers demand a steady flow of material of consistent quality, which producers must guarantee to meet.
6. Although specific quality standards for bird food do not exist, there is a growing tendency by packers to ask for traceability. This applies especially to animal feed producers for whom bird food is a secondary business.
7. For producers in developing countries to be successful in the international trade in bird food, attention must be paid to the following:
  - the high price sensitivity of the market, especially for grains for outdoor feeding;
  - the importance of quality with regards to cleanliness (absence of foreign materials), specific weight, smell, and freedom from insects or fungal infestation;
  - availability of the product in sufficient quantity with a minimum of one full container load (about 20 tonnes).

### RECOMMENDATIONS

1. The emergence of bird food markets in developing countries and countries in transition needs to be studied in more detail to better understand the potential production and marketing possibilities within these countries.
2. Interested producers in Africa, Asia and Latin America should make contact with the major international brokers or packers to find out their specifications regarding quality, quantity, etc. These brokers and packers already source substantial quantities of raw materials from developing countries and it is possible they may be

interested in expanding their sources of supplies of raw materials such as Niger seed, canary seed, proso and Japanese millet. They may even be interested in contracting production.

3. Long-term relationships between buyers and producers should be emphasized. This assures the producers of a reliable outlet for their production and the buyers of a reliable source of high quality product. These relationships, based on mutual trust, are especially important for commodities for which there are no international quality standards and which are traded on the basis of a sample.
4. Potential suppliers should obtain as much information from prospective buyers as possible regarding colour, specific weight, purity, etc. Although there are no published international standards for bird food commodities, product specifications set by packers and distributors are high. Specifications can differ from country to country and are often based on particular consumer preferences and traditions.
5. New varieties of the crops used for bird seed should be tested for local adaptation. Appendix 3 lists the public institutes that hold germplasm accessions or which have developed improved varieties.
6. It is recommended that prospective producers gather as much information as possible about agronomic trials and crop responses to improved management in order to produce crops competitively. Good sources for information on under-utilized crops are available at FAO Rome and Purdue University in the United States of America<sup>1</sup>.
7. There is a growing market for organically produced bird food ingredients. China is currently a major supplier but there could be possibilities for other developing countries. To be able to supply organically grown bird food, internationally recognized certification agencies need to be identified in the countries of origin.

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<sup>1</sup> <http://www.fao.org> and <http://www.hort.purdue.edu/newcrop/index.html>

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- Electronic resources on ornithology.** Available at: [www.chebucto.ns.ca/Environment/NHR/bird.html](http://www.chebucto.ns.ca/Environment/NHR/bird.html)
- FACCO** Syndicat des fabricants d'Aliments préparés pour chiens, chats, oiseaux, et autres animaux familiers (available at [www.facco.fr](http://www.facco.fr)).
- FAO.** Grassland database: *Panicum milliaceum* L. (available at: [www.fao.org/ag/AGP/AGPC/doc/Gbase/Data/pf000280.htm](http://www.fao.org/ag/AGP/AGPC/doc/Gbase/Data/pf000280.htm))
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Note: All Internet document links were valid on 1 May 2003. Due to the nature of the Internet, the continued availability of these documents cannot be guaranteed.

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## Appendix 1

# Useful references and sources of information

| Name/Description of Source   | Internet Address   |
|--|--|
| Avian nutrition site (Australia)   | <a href="http://www.parrotsociety.org.au">www.parrotsociety.org.au</a>   |
| Bird food information (Portuguese)   | <a href="http://www.viveiro-jaimedias.com/livro/livro.html">www.viveiro-jaimedias.com/livro/livro.html</a>   |
| Bird nutrition handbook  | <a href="http://www.harrisonbirdfoods.com/avmed/nut63.htm">www.harrisonbirdfoods.com/avmed/nut63.htm</a>   |
| Birdcare Standards Association   | <a href="http://www.birdcare.org.uk">www.birdcare.org.uk</a>   |
| Birdwatchers Digest  | <a href="http://www.birdwatchersdigest.com">www.birdwatchersdigest.com</a>   |
| Commodity marketing company (United States of America)                                     | <a href="http://www.commoditymarketing.com">www.commoditymarketing.com</a>   |
| Companion bird site with many links  | <a href="http://www.parrotpages.com">www.parrotpages.com</a>   |
| Complete information source on companion birds   | <a href="http://www2.upatsix.com">www2.upatsix.com</a>   |
| Cornell University<br>Laboratory of Ornithology  | <a href="http://birds.cornell.edu">http://birds.cornell.edu</a>  |
| European Pet Food Industry Federation  | <a href="http://www.fediaf.org">www.fediaf.org</a>   |
| FAO Grass and Pasture crops database   | <a href="http://www.fao.org/ag/AGP/doc/Gbase/mainmeny.htm">www.fao.org/ag/AGP/doc/Gbase/mainmeny.htm</a>   |
| HACCP information  | <a href="http://www.inspection.cg.ca/english/fssa/polstrat/haccp/overvuee.shtml">www.inspection.cg.ca/english/fssa/polstrat/haccp/overvuee.shtml</a> |
| Information on racing pigeons  | <a href="http://www.racing-pigeon-fancier.com">www.racing-pigeon-fancier.com</a>   |
| Information on wild bird feeding   | <a href="http://www.birdfeeding101.com">www.birdfeeding101.com</a>   |
| Information resource on companion birds  | <a href="http://theaviary.com">http://theaviary.com</a>  |
| Large Internet supplier in New York, United States of America.                             | <a href="http://www.nybird.com">www.nybird.com</a>   |
| National Agricultural Commodity Marketing Association Ltd. (Australia)                     | <a href="http://www.nacma.asn.au">www.nacma.asn.au</a>   |
| National Birdfeeding Society<br>P.O.Box 23, Northbrook, IL 60065, United States of America | <a href="http://www.birdfeeding.org">www.birdfeeding.org</a>   |
| National finches and softbill society (United States of America)                           | <a href="http://www.nfss.org">www.nfss.org</a>   |
| National Wildlife Federation (United States of America)                                    | <a href="http://www.nwf.org">www.nwf.org</a>   |

| Name/Description of Source  | Internet Address   |
|---|--|
| NewCrops database Purdue University<br>(United States of America)   | <a href="http://www.hort.purdue.edu/newcrop/default.html">www.hort.purdue.edu/newcrop/default.html</a>             |
| Overview of wild bird feeding by Dr. A. Geis  | <a href="http://www.birdware.com/owbf.htm">www.birdware.com/owbf.htm</a>   |
| Pet Food Manufacturers Association  | <a href="http://www.pfma.org">www.pfma.org</a>   |
| Pet Industry Information Service  | <a href="http://www.petindustry.com">www.petindustry.com</a>   |
| Pet site in Spanish with articles on bird feeding   | <a href="http://www.animalls.net">www.animalls.net</a>   |
| Petcare information<br>(Website by Mars Inc)  | <a href="http://www.petnet.co.au">www.petnet.co.au</a>   |
| PetCo Superstores (United States of America)<br>Petco Animal Supplies Inc, 9125 Rehco<br>Road, San Diego, CA 92121, United States of<br>America | <a href="http://www.petco.com">www.petco.com</a>   |
| Petfood Industry Distributors Association,<br>2105 Laurel Bush Rd, suite 200, Bel Air, MD<br>21015, United States of America                    | <a href="http://www.pida.org">www.pida.org</a>   |
| PetSmart Superstores (United States of<br>America)<br>19601 N 27 <sup>th</sup> Avenue, Phoenix, AZ 85027,<br>United States of America.          | <a href="http://www.petsmart.com">www.petsmart.com</a>   |
| Statistics and prices on small grains from<br>Canada  | <a href="http://www.agr.gc.ca">www.agr.gc.ca</a>   |
| Syndicat des Aliments préparés pour chiens,<br>chats et oiseaux<br>46 Blvd de Magenta 75010 Paris, France<br>fax : 0033 140181543               | <a href="http://www.facco.fr">www.facco.fr</a>   |
| The Electronic Zoo – lots of links  | <a href="http://netvet.wustl.edu/birds">http://netvet.wustl.edu/birds</a>  |
| The Petfood Institute   | <a href="http://www.petfoodinstitute.org/">www.petfoodinstitute.org/</a>   |
| Understanding Pet Bird Nutrition. University<br>of Florida.   | <a href="http://edis.ifas.ufl.edu/index.html">http://edis.ifas.ufl.edu/index.html</a>                              |
| US Fish and Wildlife Services   | <a href="http://www.fws.gov">www.fws.gov</a>   |
| Waltham Food  | <a href="http://www.waltham.com">www.waltham.com</a>   |
| The Scientific arm of Mars Pet Foods  |  |
| Wild Bird Feeding Industry<br>P.O. Box 763, Scottsbluff, NE 69631, United<br>States of America, fax: (+1) 308-632-1590                          | <a href="http://www.wbfi.org">www.wbfi.org</a><br><a href="mailto:info@wbfi.org">info@wbfi.org</a>                 |
| Wild Bird Unlimited<br>(Operates 290 stores in the United States of<br>America)   | <a href="http://www.wbu.com">www.wbu.com</a><br>11711 N. College Av, Carmel,<br>IN 46032, United States of America |
| Winged Wisdom (Birds N Ways)  | <a href="http://www.birdsnways.com">www.birdsnways.com</a>   |



## Appendix 2

# Major brokerage and packing firms in bird seed

TABLE A2.1  
Major Brokers

| Broker   | Details   |
|--|---|
| Pacific Northwest Ag Products (United States of America) | Has been trading in specialty agricultural and food products since 1966. Import millet and Niger seed for the United States of America domestic market and export to customers within North America and also to other continents.   |
| Red river Commodities Inc. (United States of America)    | Established in 1983, the company has processing plants in North Dakota, Texas and Kansas. Most bird food (with own brand <i>Valley Splendour</i> ) is processed in a specialized processing facility in North Dakota. Imports commodities such as Niger seed.<br><br>Address: 501 42nd Street NW, Fargo, ND 58102, United States of America.<br>web site: <a href="http://www.redriver.com">www.redriver.com</a>  |
| Specialty Commodities Inc. (United States of America)    | A broker and importer of specialty food and bird food items, with processing plants in the United States of America and China.<br><br>Address: P.O. Box 2667, Fargo, ND 58108, United States of America.<br>tel: (+1) 701-282-8222, fax: (+1) 701-282-7574.<br>web site : <a href="http://www.specialcommodities.com">www.specialcommodities.com</a>  |
| Cereal Byproducts Inc. (United States of America)        | Has been formulating and marketing animal feed since 1917. Offers a range of products for pigeon and wild bird feeding.<br><br>Address: 55 East Euclid, Box 575, Mount Prospect, IL 60056, United States of America.<br>tel: (+1) 847-818-1550, fax: (+1) 847-818-1659<br>web site: <a href="http://www.cerealbyproducts.com">www.cerealbyproducts.com</a>  |
| Diversified Ingredients (United States of America)       | Trades globally in commodity and specialty grains for food and feed. Importers of Niger seed and canary seed.<br><br>Address: 143 West Clinton Blvd, St. Louis, MO 63132, United States of America.<br>tel: (+1) 314-822-0110, fax: (+1) 314-822-5781.<br>web site: <a href="http://www.diversifiedingredients.com">www.diversifiedingredients.com</a>  |
| Teague Australia (Australia)                             | An international broker of food and grain commodities and one of the most important brokers of bird food ingredients in Australia. Deals in millets, Niger seed, sorghum, safflower and canary seed. Web site gives useful information about trading standards of bird food commodities.<br><br>Address: 118 Halifax Street, Adelaide 5000, Australia.<br>tel: (+61) 8 82320664, fax: (+61) 8 82320702.<br>web site: <a href="http://www.tjt.com.au">www.tjt.com.au</a> |

TABLE A2.1  
Major Brokers (Conclusion)

| Broker  | Details   |
|---|---|
| Knight Seed Inc.<br>(United States of America)            | <p>Started trading bird food ingredients in 1964. Sources commodities worldwide.</p> <p>Address: 151 126th Street, Burnsville, MN 55337, United States of America.</p> <p>tel: (+1) 952-894-8080, fax: (+1) 952-894-8095</p> <p>web site: <a href="http://www.knightseed.com">www.knightseed.com</a></p>  |
| Commodity Marketing Company<br>(United States of America) | <p>Specializes in bird food ingredients and dry pulses. News on the trade and trends in the bird food industry is regularly published on their website (<a href="http://www.commoditymarketing.com">www.commoditymarketing.com</a>).</p> <p>Address: 2325 Lakeview Parkway Suite 150, Alphetta, GA 30004, United States of America.</p> <p>tel: (+1) 678-566-7820, fax: (+1) 687-566-7821</p> |
| Granaria NV<br>(Belgium)                                  | <p>A leading European broker in agricultural commodities and has a dedicated section for the bird food market. Imports millets, canary seed, Niger seed, maize and pulses from Australia, New Zealand, Argentina, Brazil, Hungary and South Africa.</p> <p>Address: Granaria NV, Meir 26, B2000 Antwerp, Belgium</p> <p>tel: (+32) 3 213 9380, fax: (+32) 3 2139394.</p>                      |
| Dalsace Frères<br>(France)                                | <p>Dalsace Frères is a general commodity broker with a specialist section for bird food ingredients.</p>  |

TABLE A2.2  
Major Packers and Wholesalers

| Packer/Wholesaler  | Details  |
|--|--|
| Harrison Bird Food<br>(United States of America)             | <p>Has a product line of organic bird food diets<sup>1</sup>. The company philosophy is that non-organic grains may contain pesticide residues that are detrimental to bird's health. Produces mainly extruded diets that contain ground cereals (maize, oats, barley, rice, proso), ground legumes (groundnuts, lentils, peas, soybeans), ground sunflower seed, ground sesame, and dried alfalfa supplemented with vitamins and minerals. Some mixes also contain exotic ingredients such as chia (<i>Salvia columbariae</i> Benth.), kelp seaweed, and algae (<i>Spirulina</i> spp.). Organic bird food is gaining popularity, and Harrison Bird Food's products are now available in several European countries.</p> <p>Address: 7108 Crossroads Blvd, Suite 325, Brentwood, TN 37027, United States of America.</p> <p>web site: <a href="http://www.harrisonbirdfood.com">www.harrisonbirdfood.com</a></p> |
| Kaytee (United States of America)                            | <p>Started the manufacturing of pigeon and other bird foods in 1923, and remains one of the most important bird food suppliers in the United States of America. It has locations in Wisconsin and Kansas and is active overseas in Singapore, Canada, Japan and the United Kingdom. Kaytee is part of the Central Garden and Pet Company.</p>  |
| Pennington Seed Inc.<br>(United States of America)           | <p>One of the largest bird food packers in the United States of America, is part of Central Garden and Pet Company. Operates three state-of-the-art packing plants under the name 'Penn Pak' in Georgia, Nebraska and Missouri. Penn Pak formulates and packs for third party brands, and has its own brand of wild bird food. Sells several grain mixtures for cover crops and is a major supplier of lawn and turf grasses.</p> <p>Address: P.O. Box 290, 1280 Atlanta Hwy, Madison, GA 30650, United States of America</p> <p>web site: <a href="http://www.penningtonseed.com">www.penningtonseed.com</a></p> <p>email: <a href="mailto:seeds@penningtonseed.com">seeds@penningtonseed.com</a></p>   |
| Wild Birds Unlimited<br>(United States of America)           | <p>A new type of enterprise, concentrating on the sale of bird food for outside feeding and accessories such as feeders, water fountains and binoculars. Operates through franchised shops of which it currently has 290 in the United States of America. At the same time it operates an internet ordering and information service.</p> <p>Address: 11711 N. College Ave, Carmel, IN 46032, United States of America.</p> <p>web site: <a href="http://www.wbu.com">www.wbu.com</a></p>   |
| Wild Bird Centers of America Inc. (United States of America) | <p>This is a similar organization to Wild Birds Unlimited, with 100 franchises in the United States of America.</p>  |
| Wagner Bros Feed Corporation (United States of America)      | <p>A family company that has been in the animal feed business since 1894. Sells a wide range of wild bird mixes.</p> <p>Address: Wagner Bros Feed Corp, Box 26, Farmingdale NY 11735, United States of America.</p> <p>web site: <a href="http://www.wagners.com">www.wagners.com</a></p>  |

<sup>1</sup> Organic production means production without the use of artificial fertilizers and pesticides. Organic producers and organic production are subject to inspections by competent authorities.

TABLE A2.2  
Major Packers and Wholesalers (Continued)

| Packer/Wholesaler                                | Details   |
|--|---|
| Lebanon Seaboard Inc. (United States of America) | <p>A specialised lawn and garden product company. Markets the <i>Lyric</i> brand of bird food.</p> <p>Address: 1600 East Cumberland Street, Lebanon, PA 17042, United States of America.</p> <p>fax: (+1) 717-273 9466</p> <p>web site: www.lebsea.com</p>  |
| Versele-Laga (Belgium)                           | <p>One of Europe's largest animal feed manufacturers, has a substantial interest in the manufacturing of bird food. It is well known for its pigeon food but, in addition, has a complete product line for wild bird feeding and extruded diets for aviary birds. Produces between 220 000 and 250 000 tonnes of bird food per year, and sources bird food ingredients from Africa, China, eastern Europe and Latin America. Its main brands are <i>Prestige</i> and <i>Orlux</i>.</p> <p>Address: Versele-Laga, Kapellestraat 70, B9800 Deinze, Belgium.</p> <p>tel: (+32) 9 381 3200, fax: (+32) 9 386 8513</p> |
| Vitakraft (Germany)                              | <p>Has been manufacturing pet food for almost 100 years, operates factories in many European countries, and is active in the United States of America and Asia. Its main brand is <i>Vitakraft</i>.</p>   |
| Lenersane Poortman NV (The Netherlands)          | <p>This company has been in the feed business since 1803. Siber Hegner of Germany, a global manufacturer of chemicals/pharmaceuticals and food ingredients, currently owns Lenersane Poortman. Lenersane Poortman imports 40 000 to 60 000 tonnes of small grains from several countries and packs/formulates for private labels.</p> <p>Address: Lenersan Poortman NV, Vogelaarsweg 23, 3313 LL Dordrecht, The Netherlands.</p> <p>tel: (+31) 78 6220622, fax: (+31) 78 6210669</p> <p>web site: www.lenersanpoortman.nl</p>   |
| Beduco NV (Belgium)                              | <p>Created by the merger of Beyers and Dufky. Beyers had global recognition in pigeon food and pigeon breeding. Beduco has a large range of pigeon foods and wild bird foods.</p> <p>Address: Beduco NV, Wasserijstraat 25, B2900 Schoten, Belgium.</p> <p>tel: (+32) 3 3608526</p> <p>web site: www.beduco.be</p>  |
| Oxadis (France)                                  | <p>Part of the Limagrain Group of agricultural companies and specializes in garden supplies. They have a complete product line-up in bird food for indoor and outdoor feeding. The main brands are <i>Aime</i> and <i>Tyrol</i>.</p>  |
| Sluis (The Netherlands)                          | <p>Sluis is one of the oldest bird food brands in The Netherlands. Their product range is mainly aimed at companion birds and is sold under the <i>Sluis</i> brand name or packed for private labels. Sluis is part of Lenersane Poortman BV.</p> <p>Address: Sluis, P.O.Box 889, 3300 AW Dordrecht, The Netherlands.</p> <p>tel: (031) 78 621 5200, fax: (+31) 78 621 0669</p>   |

TABLE A2.2  
**Major Packers and Wholesalers (Conclusion)**

| Packer/Wholesaler                       | Details  |
|---|--|
| De Witte Molen (The Netherlands)        | A specialised pet food manufacturer owned by Alenheri, a global trader and processor of cereals, pulses and nuts. It has an extensive product range of bird foods and is active in several countries   |
| A Poortman Ltd (United Kingdom)         | An international distributor of pulses and bird food. Supplies a wide range of bird food ingredients to the industry.<br>Address: A. Poortman Ltd., Prescott House, Prescott Street, London E1 8BB, United Kingdom.<br>tel: (+44) 2074812110, fax: (+44) 2077021513<br>web address: <a href="http://www.poortman.com">www.poortman.com</a> email: <a href="mailto:trading@poortman.com">trading@poortman.com</a> |
| CJ Wild Bird Foods Ltd (United Kingdom) | Based in the United Kingdom and produces and markets wild bird food under the RSPB seal of approval. It has a large range of products including feeders. The company sells through mail order and retail outlets in the United Kingdom and Europe.   |

TABLE A2.3  
**Other Brokers/Packers/Wholesalers**

| <b>Company</b>                                 | <b>Mailing Address/phone/fax/web site</b>   |
|--|---|
| D&D Commodities Ltd (United States of America) | P.O. Box 359, Stephen, MN 56757, United States of America <a href="http://www.ddcommodities.com">www.ddcommodities.com</a>  |
| Hall Grain Company (United States of America)  | P.O.Box 350, Akron, CO 80720, United States of America <a href="http://www.hgc.com">www.hgc.com</a>   |
| CAMEX Inc. (United States of America)          | P.O. Box 17370, Boulder, Colorado 80308, United States of America.<br>tel: 303-652-2000, fax: 303.652.2011.   |
| Sunbird Inc. (United States of America)        | P.O. Box 942, 702 3rd Street, Huron SD 57350, United States of America<br><a href="http://www.sunbird-inc.com">www.sunbird-inc.com</a>  |
| A&B Grains (Pty) Ltd. (Australia)              | <a href="http://www.abgrains.com.au">www.abgrains.com.au</a>  |
| Johnston & Jeff Ltd. (United Kingdom)          | 63 High Street, Hull, HU1 1QP, United Kingdom.<br>tel: (+44) 1482 224893, fax: (+44) 1482 223618<br><a href="http://www.squark.co.uk">www.squark.co.uk</a> <a href="mailto:jjbirdseed@aol.com">jjbirdseed@aol.com</a> |
| OXADIS (France)                                | St. Quentin Fallavier, 38291 France<br>tel: (+33) 474821010   |
| Natural Granen (Belgium)                       | Metropoolstraat 28-29, B2900 Schoten, Belgium.<br>tel: (+32) 3 6403550, fax: (+32) 3 6452016<br><a href="http://www.naturalgranen.be">www.naturalgranen.be</a>  |
| Harvest Sun Seed & Grain Co. Ltd. (Canada)     | 12 Hawthorne Crescent, Regina, SK S4S4Y2, Canada. <a href="http://www.harvestsun.sk.ca">www.harvestsun.sk.ca</a>  |
| Agri-Tel Grain Ltd. (Canada)                   | P.O.Box 808, Beausejour, Manitoba R0E 0CO, Canada<br><a href="http://www.agritelgrain.com">www.agritelgrain.com</a>   |
| Morrow Grain Co. Ltd. (Canada)                 | Suite 770-789 West Pender Street, Vancouver, BC V6C1H2, Canada.<br>tel: (+1) 604-688-2755,<br>fax: (+1) 604-688-1649.   |
| AgrofÉ (Argentina)                             | <a href="http://www.agrofe.com.ar">www.agrofe.com.ar</a>  |

## Appendix 3

# Genetic resources

Following is a list of institutions that hold germplasm accessions or have developed improved varieties. Note that this list, with one exception, includes only public or semi public-institutions.

### Canary seed

Crop Development Centre  
University of Saskatoon  
51 Campus Drive  
Saskatchewan  
Canada S7N5AB

Faculty of Agricultural Sciences  
Pannon University of Agriculture  
Vas utca 2  
H9200 Mosonmagyaróvár  
Hungary.

### Niger seed

All India Coordinated Research Project on Oilseeds  
J.N. Krishna Vishwa Vidyalyaya  
Jabalpur  
482004 MP  
India

Biodiversity Institute  
P.O. Box 2003  
Addis Ababa  
Ethiopia

Jawaharal Neru Agricultural University  
Zonal Agricultural Research Station  
Chhindwara  
480001 MP  
India

Mahatma Phule Krishi Vidyapeeth  
Western Ghat Zonla Agricultural Research  
Station Itapuri  
Nasik  
422403 Maharashtra  
India

National Bureau of Plant Genetic Resources  
Regional Research Station  
Akola  
444 104 Maharashtra  
India

Birsa Agricultural University  
Kanke  
834 006 Ranchi  
Bihar  
India

Western Regional Plant Introduction Station  
(USDA-ARS)  
Washington State University  
56 Johnson Hall  
Pullman, WA 99164-6402  
United States of America

Central Plant Breeding and Biotechnology  
Division  
P.O. Box 135  
Khumaltar  
Nepal

**Sunflower seed**

North Dakota State University  
 Foundation Seed Stocks  
 P.O. Box 5051  
 Fargo, North Dakota 58150  
 United States of America  
 tel: 701.231.8140  
[www.ag.ndsu.nodak.edu/aginfo/seedstock/fss/index.htm](http://www.ag.ndsu.nodak.edu/aginfo/seedstock/fss/index.htm)

**Proso millet**

ICRISAT  
 Patancheru  
 502324 Andhra Pradesh  
 India

Indian Council of Agricultural Research  
 Krishi Bhavan  
 110001 Delhi  
 India  
 tel: (+91) 11 3382534  
 fax: (+91) 11 3384773

Central Arid Zone Research Institute  
 Light Industrial Area near ITI  
 324003 Jodhpur  
 India

University of Queensland  
 R.J. Fletcher  
 Gatton College  
 Lawes  
 Queensland 4343  
 Australia

University of Nebraska  
 Nebraska Millet Improvement Programme  
 Scottsbluff, Nebraska 69361-4939  
 United States of America  
 tel: (+1) 308-632-1261  
 fax: (+1) 308-632-1365

Cereal Breeding Research Darzau  
 Darzau Hof  
 29490 Neu Darchau  
 Germany  
 tel: (+49) 5853 1397  
 fax: (+49) 5853 1394

North Dakota State University  
 (contact information listed above)

**Other millets**

ICRISAT  
 (contact information listed above)

University of Queensland  
 (contact information listed above)

North Dakota State University  
 (contact information same as above)

**Quinoa**

Instituto Nacional Autonomo de Investigaciones  
 Agropecuarias (INIAP)  
 Avenida Eloy Alfaro y Amazonas s/n  
 Quito  
 Ecuador  
[iniap@iniap-ecuador.gov.ec](mailto:iniap@iniap-ecuador.gov.ec)

Asociation Nacional de Productores de  
 Quinoa (ANAPQUI)  
 La Paz  
 Bolivia  
[anapqui@ceibo.entelnet.bo](mailto:anapqui@ceibo.entelnet.bo)



**Safflower**

Institute of Agricultural Research  
Melkawerer Research Centre  
P.O. Box 2003  
Addis Ababa  
Ethiopia

Seedtec International  
P.O. Box 2210  
Woodland, California 95696  
United States of America  
tel: (+1) 916-666-7871  
fax: (+1) 916-662-9125

Program de Oleaginosa (CIANO/SARH)  
Calle Norman Borlaug km 12  
Apdo Postal 515  
Obregon  
Sonora State  
Mexico 8500

Agri-Food Canada  
Research Centre  
P.O. Box 300  
Main, Lethbridge  
Alberta  
Canada  
tel: (+1)403-327-4591 fax: (+1) 403-387-3156

Directorate of Oilseed Research  
Indian Council for Agricultural Research (ICAR)  
Rajendranagar  
Hyderabad 500030 AP  
India  
tel & fax: (+91) 40245222

Montana State University  
Eastern Agricultural Research Centre  
1501 North Central  
Sidney, MT 59270  
United States of America  
tel: (+1) 406-433-2208  
fax: (+1) 406-433-7336  
info@sidney.ars.usda.gov

North Dakota State University  
(contact information same as above)

**Japanese millet**

University of Queensland  
(contact information listed above)

## Appendix 4

# Typical composition of some bird foods

TABLE A4.1

### Wild bird food

---

#### Simple mixtures

- Black and striped sunflower seed.
- Peanuts (whole, shelled)

#### Custom mixes

- Finches mix : white millet (Proso), red millet (Dari), canary seed, rapeseed, linseed, oats, Niger seed.
  - Wild bird mix : wheat, flaked maize, canary seed, red millet (dari), white millet (proso), Niger seed, small black or striped sunflower, flaked rice, peanuts.
- 

TABLE A4.2

### Caged bird food

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#### Budgeriars

- Canary seed / white millet (50:50)

#### Parrots

- Parrot mix: small sunflower, large sunflower, white millet, safflower, flaked peas, peanuts.
  - Parrot mix extra: small sunflower, large sunflower, red millet, white millet, peanuts, wheat, sunflower hearts, pine nuts, hempseed, banana flakes, pineapple flakes, papaya flakes, coconut shreds, sultanas, apricots.
-

## Appendix 5

# Typical retail prices for selected bird food (ingredients)

Prices will typically vary depending on pack size. The ranges indicated below are for 1 kg (highest price) to 25 kg (lowest price) packages.

TABLE A5.1  
Typical retail prices for small grains sold for bird food

| Species                  | Small pack (1 kg)<br>(US\$) | Large pack (25 kg)<br>(US\$/kg) |
|--------------------------|-----------------------------|---------------------------------|
| Sorghum                  | 1.50                        | 0.95                            |
| White millet             | 2.00                        | 0.95                            |
| Peanuts                  | 3.20                        | 1.83                            |
| Peanuts (broken)         | 3.08                        | 1.75                            |
| Black sunflower          | 2.35                        | 1.43                            |
| Niger Seed               | 4.00                        | 2.09                            |
| Canadian canary seed     | 1.70                        | 1.75                            |
| Japanese millet          | 3.06                        | 1.41                            |
| Quinoa                   | 6.46                        |                                 |
| Spray Millet (500 g)     | 4.00                        |                                 |
| Striped sunflower        | 3.06                        | 1.75                            |
| Egyptian white sunflower | 3.34                        | 1.91                            |
| Safflower                | 2.35                        |                                 |

TABLE A5.2  
Typical prices for bird food mixes

| Type               | Typical content   | Average price (US\$/kg) |
|--------------------|---|-------------------------|
| Budgeriar          | canary seed/white millet  | 1.50                    |
| Canary             | canary seed /rape/linseed/Nigerseed                               | 1.75                    |
| Parrot standard    | striped sunflower / peanuts                                       | 1.35                    |
| Parrot elite       | striped sunflower /dried fruits and nuts                          | 1.55                    |
| Parakeet           | canary seed /small sunflower /millet / dari/<br>buckwheat         | 1.55                    |
| Pigeon maintenance | tick beans / wheat / whole maize                                  | 0.75                    |
| Cockatiel          | millet / canary seed /small sunflower /dari /hemp<br>seed /groats | 1.30                    |
| Native finches     | canary seed / linseed /rape seed                                  | 1.65                    |

TABLE A5.3  
Typical prices for other ingredients used in bird food

| Ingredient    | Price (US\$/kg) |
|---------------|-----------------|
| Banana chips  | 3.85            |
| Papaya chunks | 4.25            |