A method to protect a high-moisture commodity during storage for later production of a product includes inserting the high-moisture commodity into a hermetic storage container having sufficiently low permeability, and storing the commodity in bag or in bulk for up to 9 months or more prior to producing the product. The method eliminates the need for drying prior to storage.
102. Provide commodity having high moisture content

104. Perform drying procedure to reduce moisture content

106. Store dried commodity in suitable storage container

108. Re-hydrate commodity

Product

FIG. 1
Provide commodity having high moisture content

Place commodity in hermetic storage container

Store moist commodity in hermetic storage container

Product

FIG. 2
FIG. 7
FIG. 8
FIG. 9
FIG. 10
METHOD FOR PROTECTING HIGH MOISTURE COMMODITIES DURING STORAGE

FIELD OF THE INVENTION

[0001] The present invention relates to storage of commodities and, more particularly to a method for protecting a high moisture agricultural commodity during storage.

BACKGROUND OF THE INVENTION

[0002] Under dry conditions, grains (paddy rice, maize, feed and any organic product), can be stored for extended periods provided that there is no insect infestation or microbial activity. Under humid storage conditions, however, the grains may deteriorate rapidly, resulting in qualitative and quantitative losses, and this deterioration is accelerated at higher temperatures.

[0003] Current methods for production of starch and ethanol from a commodity such as corn (maize) often require storage of the commodity for periods of up to 9 months or more. To ensure safe storage, the commodity is dried to its critical moisture content of 13-14% or below prior to the long storage period. Drying is often accomplished through the use of fossil fueled dryers (oil or gas), an expensive and time- and energy-consuming process. The commodity is then stored for a period of time, after which it is re-moisturized in order to extract the desired by-product.

[0004] Others have attempted to eliminate the drying step by treatment with chemical or biological substances. For example, U.S. Pat. No. 4,508,737 discloses a method for preserving and controlling fermentation of high moisture grains by adding an alkali metal sulfite, bisulfite or metabisulfite together with an alkali metal sulfate and amylolytic enzyme. U.S. Pat. No. 4,208,443 discloses a method for reducing spoilage of high moisture grain by treating with ethyl alcohol or an ethyl alcohol solution containing a microbial preservative. International publication number WO1999/045787 discloses a process for preservation of moist grain using a biocontrol agent such as Pichia anomala. It would be advantageous to have a method for chemical and biological free storage of high-moisture commodities.

[0005] U.S. Patent Publication Number 2003/0152671 discloses a method for preserving particulate plant material intended for human consumption or animal feed stock. The method includes providing a flexible walled container, filling the container with the plant material, pressing the material to express air therefrom, closing the container, and compressing the flexible walls of the container inwardly. However, the container is of unspecified permeability plastic film. In addition, this method is limited by space considerations and time constraints. That is, only relatively small containers may be used since the material must be tightly packed and the air reduced by pressing. In addition, this type of storage has not been shown to effectively protect stored goods over extended periods of time.

[0006] It would thus be advantageous to have a method of protecting high moisture commodities during storage such that the step of drying could be eliminated or significantly reduced without the use of biological or chemical substances and wherein the storage could be provided for large amounts of the commodity and over long periods of time.

SUMMARY OF THE INVENTION

[0007] According to one aspect of the invention, there is provided a method for protecting a high-moisture commodity during storage. The method includes providing a high-moisture commodity, placing the high-moisture commodity in a hermetic storage container having sufficiently low permeability without drying the commodity, and storing the moist commodity in the hermetic storage container wherein the stored moist commodity may later be removed from the hermetic storage container and used to produce a product. In some embodiments, the commodity is corn or soy beans. In other embodiments, the commodity is another organic feed stock. In some embodiments the product is ethanol or starch. In other embodiments, the product is animal feed. The specified period of time for storage is up to 9 months or more. The period of time may be greater than 2 months or even greater than 9 months. In some embodiments, the hermetic storage container is a Cocoon™. In other embodiments, the hermetic storage container is a SuperGrainBag™. In some embodiments, the commodity may be a frozen commodity which is allowed to defrost in the hermetic storage container.

[0008] According to another aspect of the invention, there is provided a method for using a hermetic storage container. The method includes introducing a high-moisture commodity into hermetic storage container having sufficiently low permeability, storing the high-moisture commodity in the hermetic storage container, wherein the storing includes depleting the level of oxygen in the hermetic storage container via internally-generated respiration, removing the high-moisture commodity from the hermetic storage container, and using the high-moisture commodity to produce a product from the high-moisture commodity.

[0009] Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, suitable methods and materials are described below. In case of conflict, the patent specification, including definitions, will control. In addition, the materials, methods, and examples are illustrative only and not intended to be limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The above and further advantages of the present invention may be better understood by referring to the following description in conjunction with the accompanying drawings in which:

[0011] FIG. 1 is a flow-chart illustration of the steps of a method of storing a high-moisture commodity, in accordance with known methods;

[0012] FIG. 2 is a flow-chart illustration of the steps of a method of storing a high-moisture commodity, in accordance with the present invention;

[0013] FIG. 3 is a schematic illustration of a hermetic storage container suitable for long-term storage of commodities in accordance with embodiments of the present invention;

[0014] FIG. 4 is a graphical illustration of the change in atmospheric gas contents within sealed containers with maize at 14%.
FIG. 5 is a graphical illustration of the change in atmospheric gas contents within sealed containers with maize at 16%;

FIG. 6 is a graphical illustration of the change in atmospheric gas contents within sealed containers with maize at 18%;

FIG. 7 is a graphical illustration of the change in atmospheric gas contents within sealed containers with maize at 20%;

FIG. 8 is a graphical illustration of the change in atmospheric gas contents within sealed containers with maize at 22%;

FIG. 9 is a graphical illustration of CO₂ level over time for each of the moisture levels; and

FIG. 10 is a graphical illustration of O₂ level over time for each of the moisture levels.

It will be appreciated that for simplicity and clarity of illustration, elements shown in the drawings have not necessarily been drawn accurately or to scale. For example, the dimensions of some of the elements may be exaggerated relative to other elements for clarity or several physical components may be included in one functional block or element. Further, where considered appropriate, reference numerals may be repeated among the drawings to indicate corresponding or analogous elements. Moreover, some of the blocks depicted in the drawings may be combined into a single function.

DETAILED DESCRIPTION

In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be understood by those of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well-known methods, procedures, components and structures may not have been described in detail so as not to obscure the present invention.

The present invention is directed to a method for protecting a high-moisture commodity during storage without the need for an intermediate step of drying, wherein the commodity is later used to produce a product. The principles and operation of a method according to the present invention may be better understood with reference to the drawings and accompanying descriptions.

Before explaining at least one embodiment of the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments or of being practiced or carried out in various ways. Also, it is to be understood that the terminology employed herein are for the purpose of description and should not be regarded as limiting.

It is appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable sub-combination.

Reference is now made to FIG. 1, which is a flow-chart illustration of the steps of a method of storing a commodity, in accordance with known methods. A commodity having high moisture content (equal to or greater than 18%) is provided (step 102). Next, a drying procedure is performed (step 104) in order to reduce the moisture content to less than or equal to 14%. The dried commodity may then be stored (step 106) in any suitable storage container until needed. The commodity may then be re-hydrated (step 108) so that it can be used, for example, to produce a product 14 such as ethanol or starch. 20

Reference is now made to FIG. 2, which is a flow-chart illustration of the steps of a method of protecting a commodity during storage, in accordance with the present invention. A commodity having high moisture content (equal to or greater than 18%) is provided (step 202). The high moisture commodity is then placed (step 204) into a hermetic storage container 16 and is stored (step 206) in the hermetic storage container 16 until needed. Hermetic storage container 16 is any container with “sufficiently low permeability”. “Sufficiently low permeability” is defined as permeability to oxygen of 400 ml/m²/day or less, to allow oxygen levels to reach 2% or less within 30 days or less. Without the use of hermetic storage container 16, a high-moisture commodity in humid, warm environments, the commodity would generally begin to deteriorate at time periods of less than 2 days. Additionally, even with the hermetic storage container, taste and composition is affected after a period of long-term storage due to generation of ethanol, acetic acid and other volatiles so as not to be suitable for consumption of the commodity by humans or for the preservation of germination capability. However, for specific purposes, such as production of a product (such as ethanol or starch) or for use as animal feed, the storage methods of the present invention are sufficient. Thus, this method of using hermetic storage for high-moisture commodities has not previously been contemplated, because it fills a very specific need and does not address storage of commodities used for human consumption. Thus, in accordance with methods of the present invention, the commodity may be stored for up to 9 months or more, and more specifically, depending on the commodity’s moisture content, for a period of 2-9 months and in some embodiments for greater than 9 months. It should be readily apparent that the method illustrated in FIG. 2, the step of drying has been eliminated.

In some embodiments, the commodity is corn. In other embodiments, the commodity is another organic feed stock such as soy beans or grasses. In some embodiments, product 14 is ethanol. In other embodiments, product 14 is starch, which is also a precursor to ethanol.

High moisture corn when stored under hermetic conditions ferments—and this affects the taste, but in the case of production of starch or ethanol, taste is irrelevant. Thus, the most expensive part may be eliminated: namely, the (non linear) drying cycle, which requires significantly more energy to obtain each 1% (“1 percentage point”) reduction as the corn approaches 13%. The same benefit applies to alternative feed stocks which may be substituted for corn in making ethanol.

Reference is now made to FIG. 3, which is an illustration of a hermetic storage container which may be used in the methods of the present application. The hermetic storage container 16 may be any hermatically sealed containers suitable for long-term storage of commodities. In one embodiment, hermetic storage container 16 is a Coconun™ storage container (formerly called a “Cube”) such as described in Israeli patent number 87301, U.S. Pat. No. 6,609,354 and in U.S. Pat. No. 6,941,727, all of which are incorporated herein by reference in their entireties. Briefly, a Coconun™ storage container may be formed of a polyvinyl chloride material having a typical thickness of at least 0.813 mm (0.032 inches). It is a low air and water vapor-permeable container which
deprives air and humidity to storage insects or microflora within the commodity, is slippery, and tough when intentionally kept taut.

[0031] In another embodiment, hermetic storage container 16 uses the same material as or is a SuperGrainBag™, such as disclosed in U.S. patent application No. 11/368,803 entitled, “Flexible Ultra-low Permeability Transport System and Method”, incorporated by reference herein in its entirety. Briefly, the SuperGrainBag disclosed therein includes a long-term storage container for containment and hermetic sealing of the commodity therein, the long-term storage container having at least one outer layer, at least one inner layer, and a middle layer comprised of an ultra-low permeability material. An outer container, when needed, is configured to protect the long-term storage container during transport or to provide mechanical and UV protection.

[0032] In yet another embodiment, hermetic storage container 16 is a container which is comprised of a material such as that used for a Cocoon™ or a SuperGrainbag™, but having a different geometry. The geometry in some embodiments is such that a large amount of commodity may be stored therein, up to 15,000 tons.

[0033] In some embodiments, the commodity 12 may be a frozen commodity which is placed in hermetic storage container 16 and allowed to defrost inside of hermetic storage container 16. The moisture accumulated during defrosting of commodity 12 will not significantly affect the output of commodity 12 or the formation of a product, since the high moisture commodity 12 is inside hermetic storage container 16. Hermetic storage container 16 may in some embodiments include a pressure relief valve 18 to relieve excess pressure buildup. In some embodiments, time to reduce O₂ may be accelerated by the initial injection of CO₂ or N₂.

[0034] The use of a hermetic storage container 16 is particularly advantageous in that internally generated respiration contributes to a rapid decrease of oxygen levels inside the container. Internally generated respiration may include respiration of the high-moisture commodity—a process which is further enhanced by the moisture. Additional respiration may occur via insects which are present within the container. This internally generated respiration causes a depletion of oxygen and an increase in CO₂ within hermetic storage container 16, resulting in the death of insects contained within and the inhibition of mold propagation.

[0035] While certain features of the present invention have been illustrated and described herein, many modifications, substitutions, changes, and equivalents may occur to those of ordinary skill in the art. It is, therefore, to be understood that the appended claims are intended to cover all such modifications and changes as fall within the true spirit of the present invention.

EXAMPLE

[0036] The purpose of the current example was to examine the effect of various moisture contents on the quality of maize grains in self-regulated modified atmospheres during hermetic storage.

Methods:

[0037] A. Preparation of the maize samples: Maize grains at about 14% moisture content were brought to the laboratory from a local feed center. After removing impurities and broken kernels by screening, the maize was divided into five batches, which were then moistened to the target moisture contents of 14, 16, 18, 20, and 22%, respectively. This was done by spraying calculated amounts of distilled water over the grains, which were spread in a thin layer in a 30x40 cm plastic tub. The grains were thoroughly hand mixed after wetting, taking care not to leave any water in the tub. The moistened maize samples were tightly wrapped in plastic bags (8 kg per bag) and stored for 4 weeks at 5±1 °C, for conditioning. During that time each bag was shaken for a few minutes every day.

[0038] B. Experimental: The maize from the same moisture treatment was removed from the bags and thoroughly mixed. Then maize of each moisture level was placed in 1-L glass jars, about 500 g per jar. The jars were sealed with a screw-cap gastight lid and special clamps. Twelve jars were prepared for each moisture treatment, three of which were sampled for analysis after 15, 35, 55, and 75 days. To enable gas sampling, a hole was drilled in the lid and fitted with a silicon-rubber septum. The exact volume of each jar was pre-determined by measuring the volume of distilled water that filled it. The sealed jars were stored at 30±1 °C.

[0039] C. Analytical Procedure: The germination percentages of the grains of the various moisture treatments were determined after storage on damp filter paper for 10 days at 18 °C. The moisture content of the maize samples was determined by forced-air oven drying at 105 °C for 24 h. Equilibrium relative humidity (ERH) was determined at 25 °C with a Novasina MS1 Hygro Measuring System (Detensor® Pfaffikon, Switzerland). The pH was measured in a 10-fold aqueous extraction of a 20-g sample, with a Delta 230 pH meter (Mettler, Schwenzebach, Switzerland). Ethanol and VFA were determined in aqueous extracts by means of a gas chromatograph equipped with a semi-capillary FFAP (nitroterephthalic acid-modified polyethylene glycol) column (Hewlett Packard, Waldbronn, Germany), over a temperature range of 40 to 230 °C. Losses were evaluated according to weight loss, and expressed as gas loss (g kg⁻¹). Ethanol in the headspace was determined with a gas chromatograph according to Davis and Chace (1969).

[0040] Atmospheric gas composition in the headspaces was determined by withdrawing gas samples with 3-ml gastight syringe. The concentrations of O₂, N₂, and CO₂ were determined with an SRI 8610c gas chromatograph (SRI Instruments, Inc., Las Vegas, Nev., USA) equipped with a thermal conductivity detector. The gas chromatograph had two columns, one packed with Poropak Q for CO₂ determination and the other with Molecular Sieve 5A for O₂ and N₂ determination. The columns were maintained at 40 °C, and the detector temperature was 200 °C. The percentages of the gases were computed with Peak-Simple software for Windows.

[0041] D. Microbiological Analysis: Microbiological evaluation included enumeration of total aerobic heterotrophic bacteria in plate count agar (Scharlab Microbiology, Barcelona, Spain), lactobacilli in Oxoid CM627 pour plate Rogosa agar (Oxoid, Basingstoke, UK), and yeasts and molds on spread-plate malt extract agar (Difco, Detroit, Mich., USA) acidified with lactic acid to pH 4.0. The plates were incubated for 3 days at 30 °C.

[0042] E. Statistical Analysis: The statistical analysis included analysis of variance and Duncan’s multiple range test, which were applied to the results by using the GLM procedure of SAS (1982).

Results:

[0043] At the beginning of the hermetic storage period the moisture contents of the maize in the 14, 16, 18, 20 and 22% moisture treatments were 13.7±0.1, 16.1±0.0, 18.4±0.1, 20.4±0.1, and 22.5±0.2%, respectively. The moisture content increased by 8 to 17 g kg⁻¹ during hermetic storage, because of respiration activity. The mean equilibrium relative humid-
ity over the experimental period, in the various treatments, which resulted in initial target moisture contents of 14, 16, 18, 20, and 22%, was 77.5±0.3, 85.2±0.3, 89.2±0.3, 91.5±0.4, and 92.5±1.2%, respectively.

[0044] FIGS. 4-8 show the change in atmospheric gas contents within the sealed containers of maize with the various moisture contents. The higher the moisture content, the shorter the time it took for the O₂ to be consumed and replaced with CO₂ during the aerobic respiration. Most of the O₂, in the containers with 14, 16, 18, 20 and 22% moisture was consumed after 600, 120, 48, 24, and 12 h, respectively. This indicates that the respiration rate increased with increasing maize moisture content. In the maize with 14 to 18% moisture CO₂ replaced only the O₂, and the N₂ concentration remained constant, whereas in the maize with 20 and 22% moisture the relative concentration of N₂ decreased in the sealed containers.

[0045] After the aerobic respiration phase the anerobic respiration continued to produce CO₂. The levels of anaerobic respiration were measured after a stability of CO₂ level was reached and up to 1776 h (74 days) (FIG. 9). During the same period, the levels of O₂ were monitored to ensure that anaerobic conditions were maintained (FIG. 10).

[0046] The pH of the maize in the various moisture treatments was around 6.0 and it did not change much during the hermetic storage, except for that with 22% moisture, in which it decreased from 5.8 on day 0 to 5.5 on day 75.

[0047] Table 1 summarizes the dry matter losses and germination percentages of the maize stored in the self-regulated atmospheres in the sealed containers. The germination percentage decreased during the storage period, and decreased as the moisture increased. With moisture contents of 18% and above the germination percentage decreased to zero after 35 days of storage. Dry matter losses increased with increasing moisture content of the maize.

### Table 1

<table>
<thead>
<tr>
<th>Moisture %</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (days)</td>
<td>G</td>
<td>DML</td>
<td>G</td>
<td>DML</td>
<td>G</td>
</tr>
<tr>
<td>0</td>
<td>84.3</td>
<td>82.8</td>
<td>76.0</td>
<td>75.0</td>
<td>28.6</td>
</tr>
<tr>
<td>15</td>
<td>79.9</td>
<td>0.02</td>
<td>78.1</td>
<td>0.03</td>
<td>68.3</td>
</tr>
<tr>
<td>35</td>
<td>81.7</td>
<td>0.01</td>
<td>79.7</td>
<td>0.05</td>
<td>3.9</td>
</tr>
<tr>
<td>55</td>
<td>72.3</td>
<td>0.03</td>
<td>61.0</td>
<td>0.11</td>
<td>0.0</td>
</tr>
<tr>
<td>75</td>
<td>58.3</td>
<td>0.02</td>
<td>21.0</td>
<td>0.15</td>
<td>0.0</td>
</tr>
</tbody>
</table>

For each measured parameter, within a row, means followed by different letters are significantly different (P < 0.05).

[0048] The major volatile products found in the maize were ethanol and acetic acid (Table 2). The highest concentrations were found in the maize with the highest moisture contents (20, 22%). Ethanol concentrations increased during storage, whereas those of acetic acid remained constant or decreased slightly. It should be noted that although ethanol is a volatile by-product of maize, this ethanol production should not be confused with later use of maize to produce ethanol as a product. Propionic and butyric acids were detected at low concentrations (<0.3 g kg⁻¹ DM).

### Table 2

<table>
<thead>
<tr>
<th>Moisture %</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (days)</td>
<td>Et</td>
<td>HAc</td>
<td>Et</td>
<td>HAc</td>
<td>Et</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>0.2</td>
<td>0.3</td>
<td>0.1</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>35</td>
<td>0.2</td>
<td>0.3</td>
<td>0.1</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>55</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>75</td>
<td>0.1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

For ethanol, within a row, means followed by different letters are significantly different (P < 0.05).
Propionic and butyric acids were detected at low concentrations (<0.3 g kg⁻¹ DM) in some samples, with no consistent pattern.
Ethanol was also detected in the headspace of the sealed containers, and its concentration followed the same trend as its content in the maize (Table 3). These findings might indicate yeast activity.

### Table 3

<table>
<thead>
<tr>
<th>Ethanol content (mg kg(^{-1})) in the headspace of moist maize in hermetic storage.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time (days)</strong></td>
</tr>
<tr>
<td>14</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>75</td>
</tr>
</tbody>
</table>

Tables 4-6 summarize the results of the microbiological analyses. No visible molds could be detected in any of the treatments. At 14 to 18% moisture the numbers of molds, yeasts and bacteria in the various treatments were similar and tended to decrease during storage. The populations of these microorganisms were within the safe limits regarding freedom from substantial spoilage (<log\(_{10}\)CFU g\(^{-1}\) < 4.0). At 20 and 22% moisture the numbers of yeasts and bacteria were higher, tended to increase during storage, and reached population levels (>log\(_{10}\)CFU g\(^{-1}\) = 6.0) usually associated with spoilage of vegetable food commodities as distinct from the production of starch, ethanol or feedstock.

### Table 4

<table>
<thead>
<tr>
<th>Mold numbers (log(_{10}) CFU g(^{-1})) in maize under hermetic storage.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time (days)</strong></td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0.2</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>35.2</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>75</td>
</tr>
</tbody>
</table>

Within a row, means followed by different letters are significantly different (P < 0.05). (For day 0 there was one sample only). NF = not found (below the detectable level, log\(_{10}\) CFU g\(^{-1}\) < 2.0).

### Table 5

<table>
<thead>
<tr>
<th>Yeast numbers (log(_{10}) CFU g(^{-1})) in maize under hermetic storage.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time (days)</strong></td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0.2</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>35</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>75</td>
</tr>
</tbody>
</table>

Within a row, means followed by different letters are significantly different (P < 0.05). (For day 0 there was one sample only). NF = not found (below the detectable level, log\(_{10}\) CFU g\(^{-1}\) < 2.0).

In summary, in the laboratory experiments described above, intermediate--and high moisture maize at 16 to 22% was stored without spoilage in hermetically sealed jars. The good quality of the maize under such conditions is apparently due to the self-regulated anaerobic atmospheres generated under sealed conditions, since the volatile fatty acids were present at very low levels. The good quality of maize may make this technology suitable for storing this crop at least for ethanol source and starch extraction.

1. A method for protecting a high-moisture commodity during storage, the method comprising: providing a high-moisture commodity; placing the high-moisture commodity in a hermetic storage container having sufficiently low permeability without drying the high-moisture commodity; and storing the moist commodity in said hermetic storage container wherein said stored moist commodity may later be removed from said hermetic storage container and used to produce a product.

2. The method of claim 1, wherein said providing a commodity comprises at least one of: providing corn; providing soy beans, and providing another organic feed stock.

3. The method of claim 1, wherein the product is at least one of: ethanol; and starch.

4. The method of claim 1, wherein the product is animal feed.

5. The method of claim 1, wherein said storing comprises storing for up to 9 months.

6. The method of claim 1, wherein said storing comprises storing for more than 9 months.

7. The method of claim 1, wherein said storing comprises storing for more than 9 months.

8. The method of claim 1, wherein said placing comprises placing the commodity in one of: a Cocoon\textsuperscript{TM}; and a Super-Grainbag\textsuperscript{TM}.

9. The method of claim 1, wherein said placing comprises placing the commodity in a container comprised of a material used for a Cocoon\textsuperscript{TM} or a SuperGrainbag\textsuperscript{TM}, wherein said container is for storage of large bulks of said commodity.

10. The method of claim 9, wherein said container is for storage of up to 15,000 tons.

11. The method of claim 1, further comprising providing a frozen commodity and wherein said placing the commodity in a hermetic storage container comprises placing the frozen commodity in a hermetic storage container, and wherein said providing a commodity comprises allowing said frozen commodity to defrost while in the hermetic storage container.
12. The method of claim 1, wherein said storing further comprises reducing an amount of oxygen in said hermetic storage container.

13. The method of claim 12, wherein said reducing is done at least partially via respiration of said high-moisture commodity.

14. The method of claim 13, wherein said reducing is initially accelerated by injection of CO$_2$ or N$_2$.

15. A method for using a hermetic storage container having sufficiently low permeability, the method comprising:
   introducing a high-moisture commodity into said hermetic storage container;
   storing said high-moisture commodity in said hermetic storage container, wherein said storing further comprises depleting a level of oxygen in said hermetic storage container via internally-generated respiration;
   removing said high-moisture commodity from said hermetic storage container; and
   using said high-moisture commodity to produce a product from said high-moisture commodity.

16. The method of claim 15, wherein said introducing comprises introducing said high-moisture commodity into at least one of: a Cocoon$^\text{TM}$, and a SuperGrainbag.

17. The method of claim 15, wherein said storing is done for up to 9 months.

18. The method of claim 15, wherein said storing is done for more than 2 months.

19. The method of claim 15, wherein said storing is done for more than 9 months.

20. The method of claim 15, wherein said reducing an amount of oxygen is done via respiration of said high-moisture commodity.

21. The method of claim 15, wherein said using comprises using said high-moisture commodity to produce at least one of: ethanol; and starch.

22. The method of claim 15, wherein said using comprises using said high-moisture commodity to produce animal feed.

23. The method of claim 15, wherein said introducing comprises introducing a frozen high-moisture commodity, and further comprising allowing said frozen commodity to defrost while in the hermetic storage container.

24. The method of claim 23, wherein said depleting a level of oxygen is accelerated by initially injecting CO$_2$ or N$_2$.  

* * * * *