manence and durability. However, the character of the final paper is largely predetermined when such materials are used. The only fiber that makes a traditional handmade paper is that selected and prepared by the papermaker himself, with water, equipment, and alkali known to him. Even then the artisan must remain constantly aware of slight changes in processing, which may have an affect on the permanence, durability, and/or character of the finished paper.

Cotton Rag, Cotton Linters, Wood Pulp, and Raw Flax Because of its lack of hemicelluloses and its springy contorted fiber structure, cotton fiber does not work well in the Japanese papermaking process. In order to produce strong papers, cotton must be beaten thoroughly, resulting in stock with a reduced freeness that, in combination with the viscous formation aid, does not drain efficiently. Abaca or kozo concentrations can be diluted with cotton rag or linter fiber that has been beaten only slightly and, perhaps, cleaned with a flat diaphragm screen to remove knots. The resulting paper, however, lacks strength, and at the present writing I do not believe nagashi-zuki papers of combined cotton fiber and bast prove attractive or viable beyond experimental usage. Please note, however, Winifred Lutz’s significant work with fermented and stamped Belgian flax for nagashi-zuki papermaking (see Appendix 1).

Wood pulps, most notably bleached and unbleached kraft pulps, are used commonly in Japan today to dilute the much more expensive native bast fibers. Wood pulps have the same disadvantages as the commercial long-fiber pulps mentioned above. Generally, papers made with wood-pulp additives turn out softer and weaker than their pure-bast counterparts. The use of wood pulps is not recommended for anything beyond experimentation or practice.

Cooking and Washing Fiber

Review Chapter 3 before reading this and the following section on fiber preparation.

Water Of all the materials required in making a superior paper perhaps none is as important, yet often neglected, as high-quality water. Because
even small amounts of unwanted constituents in a water supply actually accumulate in the paper during sheet forming, water quality plays a crucial role in the permanence of the finished sheet. Ideally, water should be checked for pH and calcium, magnesium, iron, and copper content. Businesses that sell water-softening equipment will usually test water for basic impurities at no charge. The services of a commercial testing lab, however, may be necessary to learn the actual parts-per-million for elements present. If your water has a neutral or slightly alkaline pH (higher than 7) and some magnesium or calcium content, but negligible amounts of pollution, particulate matter, microbes, chlorine, iron, and copper, the water is at least acceptable if not very good for high-quality papermaking. The finished paper should contain less than 300 parts per million of iron and 30 parts per million of copper if future foxing or premature aging is to be avoided. Some conservators prefer even lower figures. Excessive levels of iron and copper can usually be traced to the water, iron or copper equipment, or cooking chemicals. Remember that without quality water a lasting, superior-quality paper is not possible.

Preliminary Steps The major activity prior to the actual cooking of the fiber is soaking the dry bark in clear, cool water so that it will more readily react to the hot alkali solution at the cooking step. If you have access to a mountain stream or river, you may elect to soak and sun-bleach the fiber in the traditional manner. Wall off an area with rocks to make a pool of slightly moving water about 25 centimeters (10 inches) deep, and then submerge your raw bark so that all strands are well exposed to the water and sunlight for about two days. Natural bleaching techniques should be used where a quality paper of very light color is required.

The more water, and the fresher, cleaner, and colder the water you use during soaking, the better the final quality of the paper. However, if nothing more is available, tap water in a bathtub, sink, or bucket will suffice. Two hours are required for minimum soaking.

At some point during the soaking step, you may want to clean the bark of black flecks and other defects by repeating the black bark removal process (see Harvesting Kozo, above). With thorough cleaning at this stage, only limited final picking will be required to yield very clean fiber. Unless your work will be interrupted for several days, proceed directly to cooking without again drying your bleached and soaked fiber. If you must stop, dry the
fiber at this point by hanging it outdoors. Do not forget to soak it again before cooking.

**Cooking** The cooking step should be done only immediately prior to papermaking. The quicker the fiber is made into paper after cooking, the "fresher" the final paper—that is, the less chance of fiber spoilage, which can dull luster and crispness and leave an unpleasant odor in the paper. Plan to cook and beat on the day before you are ready to continue with the rest of the process.

The average cook in Japan requires 200 grams (7 ounces) of soda ash (Na₂CO₃) and 15 liters (4 gallons) of water for every 1000 grams (2 1/4 pounds) of dry bark. Cooks are described by stating the amount of chemical added as a percentage of the total fiber weight. Thus the recipe above is a "20 percent cook." A 15 percent cook would require 150 grams (about 5 ounces) of soda ash; a 12 percent cook, 120 grams (about 4 ounces) of soda ash; and so on. This system works fine until you begin cooking very small quantities of fiber, for the 15 liters/1000 grams (4 gallons/2 1/4 pounds) ratio of water to dry fiber does not provide enough liquid to cover the fiber and somewhat more water is required. This of course dilutes the concentration of the soda ash (or whatever other alkali you may be using) and means your small-scale cook will not necessarily give a proper indication of what will result if you cook larger amounts of fiber. However, this is a problem one has to live with. The total amount of alkali available to chemically react with the various constituents in a given amount of fiber is usually considered the primary relationship. Go ahead and add more water when and if you need it, but keep a close record of your work. (Note: Most barks, stiff at first, will loosen up considerably after 10 to 15 minutes of cooking and sink below the cooking solution's surface.) Typical volumes required with small amounts of fiber are 12 liters/750 grams, 10 liters/500 grams, 8 liters/250 grams, and 4 liters/100 grams (or 12 1/2 quarts/1 1/2 pounds, 10 1/2 quarts/1 pound, 8 quarts/1/2 pound, or 4 quarts/3 1/2 ounces). In all cases, add the water to the cooking vessel, and when the water is almost boiling stir the alkali in and then add the soaked fiber. Cover the pot and cook at a steady gentle boil for 2 hours, stirring and turning the fiber every 30 minutes. When the fiber is fully cooked, all strands, large and small, thick and thin, should part easily with and against the grain. See Figures 70 and 71.
Cooking is a very important step and should not be regarded lightly. Many subsequent problems with fiber beating, formation quality, hardness or softness of the paper, and the like can be traced to cooking. Keep a careful record of your cooking, assigning numbers to each batch of fiber and attaching correlated paper samples so that you eventually develop a sensitivity to the effects of cooking. Variations on the average nagashi-zuki cook for specific fibers follow:

1. Kozo. If a Japanese papermaker knows his kozo fiber has been harvested within the last year and is of very high quality, he will often cook it for about 1½ hours in only a 12 percent cook. This lighter treatment goes back to a hidden but pervading sense of duty in traditional Japanese papermaking that embodies great respect for the integrity and natural character of the fiber. Thus, the traditional papermaker cooks with the minimal amount of alkali and for the minimal time necessary to yield good fiber separation. As a result of this approach he ends up with a stronger, more reliable paper, possessed of natural color, warmth, and luster. Overprocessing would lessen these qualities and result in an inferior paper.

If kozo fiber is more than one year old or of rough quality, try a surer 18 to 20 percent soda ash cook. If any residual toughness in the fiber is detected after 2 hours of cooking, more time may be required.

2. Mitsumata and gampi. Both of these fibers are usually processed in 15 to 20 percent soda ash cooks with the same consideration for age and quality.
as that given kozo. To gain a pleasing darker color, gampi is sometimes cooked with the black bark adhering even though picking time will be greatly prolonged. Mitsumata is almost always cooked as white bark. Since both mitsumata and gampi trees change radically in diameter and bark thickness from trunk to outer branches, very often Japanese papermakers add the thicker bark strands from the lower third of the tree to the cooking vessel about 20 minutes before the rest of the bark. This tends to give the thicker sections the extra action they need to end up with treatment similar to that received by the thinner, smaller sections. Cooking time averages about 2 1/2 hours for both mitsumata and gampi.

3. Foreign and native bastis. Any inner bark fiber from Korea, Taiwan, China, Nepal, or Mexico, as well as any native North American type, is often more resistant to cooking than new Japanese kozo and should be treated initially with a 20 percent cook for at least 2 hours for the best chance of success.

4. Abaca (Manila hemp). Because of its resistance to a basic 20 percent soda ash cook, abaca, when used in Japan, is normally cooked in caustic soda, usually in a 20 to 25 percent solution. Even with the use of such a strong chemical, cooking usually takes 4 or 5 hours, and the cooked fiber is often left to sit covered but unwashed in a cool area for a week or two to let any residual chemicals continue to act on remaining unwanted constituents. CAUTION: Caustic soda is very dangerous to work with; the use of rubber gloves and a face shield is strongly advised.

Much longer cooks (8 to 12 hours) in soda ash rather than caustic soda may leave more natural color and character in the fiber. Whatever the cooking method, sufficient treatment has been accomplished if a single strand of the abaca comes apart against the grain with little or no resistance.

Wood-Ash Lye  Traditional wood-ash alkali is a very promising alternative to soda ash because it is regarded as a gentle cooking agent. But, if it is not thoroughly rinsed out after cooking, wood-ash alkali can leave residual potassium in the fiber, which is just as likely to cause premature oxidation of the cellulose as the sodium residue remaining after a soda ash cook. The basic procedure for making 14 liters (about 15 quarts) of the alkali is as follows:

Set up the wood-ash lye maker and add 1200 grams (about 2 1/2 pounds)
ash as indicated in Figure 45. (One-hundred-percent hardwood ashes are recommended, but the Japanese have used rice straw, rice chaff, and/or various grasses to produce the required ash. Feel free to experiment, but avoid ash from high-resin woods—e.g., pine—or any ash containing iron scraps or coal or oil residue.) Use fresh ash for the most effective cooking.

Heat 15 liters (about 16 quarts) of water to near boiling, and pour it into the top bucket. Let all the drainable water pass through the ashes into the lower collection bucket. Do not worry about the change in water color. You should end up with about 14 liters (about 15 quarts) of wood-ash lye, sufficient for cooking 750 to 1000 grams (about 1 3/4–2 1/4 pounds) of kozo fiber.

Generally, in working with wood-ash lye you should use 100 grams (3 1/2 ounces) of ash to make each liter (quart) of cooking solution and plan on 1 to 2 more hours of cooking time than the 1 to 1 1/2 hours required with soda ash. Remember that roughly 15 liters (about 16 quarts) of cooking solution are required for each kilogram (2 1/4 pounds) of fiber.

Increase the ratio of ash to water if you do not obtain effective cooking action with the 100 grams/liter ratio. Wood-ash lye is harder to work with, less predictable, and more time-consuming, but more traditional and perhaps better for the paper’s luster and crispness. In addition, wood ash may yield more permanent papers than chemical cooks due to its more gentle action and possibly a tendency to rinse out more readily than soda ash.

Other Cooking Alkalis In addition to ash lyes, lime also has a reputation as a traditional alkali. Moreover, it is especially attractive from a standpoint of paper permanence since the calcium carbonate residue remaining in the paper acts as an alkaline reserve to counteract possible future environmental acidity. The proper material, commonly referred to as hydrated or slaked lime, Ca(OH)₂, can be obtained from suppliers of industrial chemicals and is usually used as a 25 percent cook (250 grams lime/1000 grams fiber/15 liters water, or 9 ounces lime/2 1/4 pounds fiber/4 gallons water). Total cooking time is usually about 5 hours. Make sure you use fresh lime, as lime readily carbonates in a humid atmosphere, which renders it less effective at cooking.

Sodium hydroxide, mentioned above, known also as lye or caustic soda (NaOH), is a very strong chemical that should be used only when necessary. Not only is it dangerous, but from a traditional standpoint, any fiber that is
really appropriate for making *nagashi-zuki* papers of quality and character will not require the stronger caustic action of NaOH.

Soda ash surfaces, in the end, as the best alkali for beginners, combining convenience, versatility, and reliability. Moreover, properly executed, a soda-ash cook followed by a lime-water wash (i.e., .75 grams lime/1 liter water, or $\frac{1}{4}$ teaspoon lime/1 quart water), which facilitates removal of the sodium, is likely to yield a very permanent finished paper.

Immediately following cooking, many papermakers add a little water to the pot to cover any strands that tend to stick up above the solution’s surface, and then they leave the fiber in the hot solution to stand until the next morning. Some Japanese papermakers believe there is an important advantage in this continued subtle treatment during the overnight steeping. However, if necessary, you can immediately proceed to the washing step.

*Washing* Dispense with the majority of the spent cooking solution by dumping the cooked strands into a drain basket (described in Chapter 5). To wash the fiber, add fresh water to the cooking vessel, and then add the bark strands. Slowly move the bark about in the water for a few moments; then dump the lot into the drain basket again and repeat the process two more times. Eventually the water passing through the mesh will become fairly clear. You may stop here or, if you are especially concerned about permanence, you may give your fiber a final lime-water rinse (made up as described above).

During washing, you can monitor the progress of chemical removal by testing the wash water with pH strips until it drops close to or equal to the pH of your source water. In any case, remember that thorough washing after cooking is crucial to the permanence of the finished paper. See Appendix 1 (p. 252) for more on washing.

Larger vessels are required for washing quantities of fiber larger than 1 to 2 kilograms (about 2–5 pounds). Note the Japanese washing pool described in Chapter 5. To use this piece of equipment, or any very large wash vessel, after the fiber has been washed, drain off the discolored water through a strainer, refill the tank, and repeat the process two or three more times. Whatever the equipment and procedure, treat the bark strands with care during washing. After cooking they have lost their binding materials and will easily shed precious fibers with rough treatment. Remember, too, that
limited washing yields darker, crisper paper, while continued or extended washing yields softer, lighter-colored papers.

**Speck Removal** Very high quality traditionally-made Japanese paper is completely free of foreign matter. Left in, specks may add a certain visual interest, but they seriously harm the paper’s respectability as a finely made sheet.

Foreign matter can also cause problems for the user, particularly the fine-art or letterpress printer, and can affect the permanence and durability of the paper as well.

There are two methods of locating specks while picking by hand. The first, and more common in Japan, is to gently pass the individual strands through the hands in a large bowl or pan of water—carefully inspecting the strip for any attached foreign matter. (See Fig. 119.) The backlit glass bowl suggested in Chapter 5 can be of tremendous help here. In addition to black flecks, watch for discolored areas (usually brownish or reddish), which, if they seem tough and stringy compared to the rest of the strand, indicate a diseased or wounded area that did not respond to cooking. Remove these and any additional defects that could interfere with consistent quality in the finished sheets, but leave any soft greenish matter (the cooked green middle layer). Change the water in the bowl periodically during picking. (In Japan this work is often done in fine mesh baskets partially submerged in gently flowing water.)

The second technique for speck removal allows you to work “dry” and avoid having your hands in water constantly. Working on a water-resistant surface, remove one strand at a time from the group of cooked and washed bark strips, and pull it apart several times along its full length, thereby exposing any defects or foreign particles. As strands are picked clean, keep them damp by packing them into a pile or ball or, if necessary, cover them with plastic.

Working alone, picking all specks from 1000 grams (about 2 1/4 pounds)—roughly 500 grams (about 1 pound) after cooking—will take about 5 hours depending on the quality of the original fiber and your work rate. Invite curious friends, stray neighborhood children, or anyone else available to help. (Explain that this is a unique learning experience.) Persevere and do not be disheartened.

Foreign matter may also be removed with a flat diaphragm screen.
Beating Fiber

Careful beating can make the difference between a permanent but stringy sheet and a sheet that is not only long-lasting but extremely well formed with very pleasing, uniform fiber distribution.

Absolute minimal beating necessary for good formation is the overriding rule of thumb in beating for Japanese papermaking due to the easily shortened fiber and rapidly lowered freeness.

Hand Beating Hand beating has at least the one definite advantage of rarely resulting in overly shortened slow-draining fiber. Because of this, the low cost of the hardware required, and the traditional respect for the fiber inherent in hand beating, it is the recommended procedure to follow when attempting the best-quality papers. See Figure 121, which shows hand beating in Japan. It is important to note here, however, that superb fiber distribution is very difficult to obtain with hand beating. Fiber selection and cooking must be very carefully executed. If the fiber is of only fair quality, or if the degree of cooking was not adequate, no amount of hand beating will properly disperse the fibers. Often, the papermaker has to accept a slightly stringier quality in the hand-beaten sheet, although some strength characteristics may be superior to those of a paper made with machine-beaten fibers.

Kozo, mitsumata, gampi, and any foreign or native bast fibers that respond readily to cooking can be hand beaten effectively. Two approaches to hand beating, simplified and traditional, are outlined below.

Simplified hand beating is a basic procedure for beating approximately 250 grams (9 ounces) of kozo (125 grams, or 4.5 ounces, after cooking). Be sure your beating surface has been washed clean with water.

Squeeze most of the excess water from the fiber with your hands. Arrange the fiber strands along roughly the same axis and perpendicular to the line of your beating-stick strike, filling a rectangle approximately 10 by 30 centimeters (4 by 12 inches). Use the beating stick as pictured in Figure 121. Strike the pile three times in the same location (smartly on the last blow) before moving half a beating stick’s width across the pile. Continue beating, passing back and forth across the pile until the fiber has spread out considerably; then stop and fold the fiber mass in on top of itself from the front and back to the center. Fold the ends in about 8 centimeters (3 inches). Turn the folded wad upside down on the beating surface, and begin the
routine again. Repeat until approximately 25 minutes have elapsed, add the fiber to 3 liters (3 quarts) of cold water, mix well, and refrigerate no more than a few days if sheet forming does not begin immediately.

Traditional hand beating is a slightly more serious approach to hand beating starting with 750 grams (1 3/4 pounds) of dry kozo white bark that has been cooked 3 to 4 hours in wood-ash lye.

Squeeze the fiber very “dry” with your hands until little or no more water can be expelled. Arrange the fiber for beating as outlined under the simplified procedure above, noting, however, that your starting pile will be larger, perhaps 10 by 45 centimeters (4 by 18 inches). Beat the fiber, with periodic folding, for 45 minutes. Stop with the fiber well spread out on the beating surface just before you are about to fold in again. Sprinkle 300 milliliters (1 cup) of cool water over the fiber, fold in, and continue beating. After 15 minutes, stop, add another 300 milliliters (cup) of water, fold in, and continue. Repeat again, adding a total of 900 milliliters (3 cups) of water and beating an additional 45 minutes for a total of 1 hour and 45 minutes. When finished, add the fiber to 12 liters (3 gallons) of cold water, mix well with one hand, and store in a cold location until papermaking the next day.

Note: This procedure constitutes more prolonged treatment than that usually employed by Japanese papermakers, but as noted earlier, hand beating is no longer routinely practiced in Japan today and well-developed technique was not encountered during my research. When used today, hand beating is often followed by brief naginata treatment. In the author’s experience, the described procedure and longer times are necessary when beating by hand only and when seeking excellent formation quality.

*Evaluating Beating Degree* During hand or stamper beating some indication of the fibers’ beaten state may be obtained through use of a water-filled glass jar. Add several pinches of the beaten fiber to the jar, and shake it. If large strands or clumps remain, continue beating. Very well distributed fiber should be in evidence before you stop beating, although thorough mixing with a mazè at the vat in the presence of tororo-aoi will help improve final fiber separation.

*Stamper Beating* In Japan, most papermakers use a stamper as a substitute for hand beating for anywhere from 30 to 60 minutes and then follow with
brief hollander or naginata treatment to separate remaining attached fibers. Follow the same guidelines for adding water during stamper beating as for traditional hand beating. Use a stick to keep the fiber down inside the cement pot as stamping continues. Be sure to keep your head clear of the falling shaft weight. If strands or clumps persist in a glass-jar sample after an hour of treatment, they are likely to remain regardless of continued stamping. Additional treatment of the fiber in a naginata or hollander may help, however.

**Naginata Beating** As mentioned earlier, naginata usage generally follows fairly thorough hand or stamper beating. The naginata’s job is only to tease the fibers apart, and it is much more successful at this than the hollander, particularly with kozo. If the fiber is high in quality, and if cooking and preliminary hand or stamper beating are properly undertaken, then the action required in the naginata will be very minimal, usually between 2 and 7 minutes. Again, use the glass jar to judge, but stop as soon as possible.

To start a load, fill the oblong tub with water to within 10 centimeters (3 inches) of the shaft. Without turning the power on, add all the stamped or hand-beaten fiber and disperse it in the tub by hand. Turn the power on, and use a clean dowel to keep fiber moving through any noncirculating areas. When treatment is finished, turn the motor off and dump the load into the drain basket or a wooden drain box. Be sure to collect any stray clumps of fiber from the tub after it has drained; then rinse it clean with a hose.

Note: Naginata or hollander beating constitutes an additional washing step that leaves the finished paper lighter in color and somewhat softer than hand beating does. Because of this, wash your fiber less after cooking if you plan on the additional “wash” from a naginata or hollander.

**Hollander Beating** Generally, hollanders can be used effectively with mitsumata, gampi, abaca, or any foreign or native bast on the short end of the fiber-length scale, i.e., 3 to 6 millimeters (about $\frac{1}{6}$–$\frac{1}{4}$ inch) long. However, longer fiber types, such as kozo or anything resembling kozo in length (12 millimeters, or $\frac{1}{2}$ inch), tend to knot or lose freeness before dispersing when treated in a hollander.

When using a hollander with bast, remember to avoid any cutting or pounding action. The idea is only to loosen the fibers from one another. If any direct action takes place on the fiber, it should be light and occur only
for 60 seconds or so as the strands are added to the beater, to help break up the long lengths. Adjust the beater shortly thereafter so a clearance of about 5 to 10 millimeters (\(\frac{3}{8}-\frac{1}{2}\) inch) exists between the roll and bed plate. Beating time for mitsumata, gampi, and similar fibers is roughly 20 minutes, but use the glass jar to help evaluate beating degree.

Proper beating has been attained as soon as all fibers are well separated from each other. If even fiber distribution is slow in coming, remember that continued beating aimed at eliminating strands or clumps can quickly push the fiber below the minimum allowable freeness. You will know you have overdone the hollander beating if the fiber drains too slowly even when mixed with small quantities of formation aid at the vat. Problems at parting and drying can also be traced to overbeating. Be very cautious and gentle when using a hollander with bast fiber.

When finished, dump the load into the drain basket. Thoroughly clean the inside of the beater of any remaining usable fiber, and then rinse the machine with clear water.

Abaca, because of its slightly higher resistance to cooking and larger amounts of encrusting matter, usually requires slightly more aggressive beating action and time than do Japanese fibers (perhaps 30 minutes). Again, however, be conservative. Getting abaca started in the beater can be a problem due to its very stringy nature, even after thorough cooking. One solution to this problem is cutting the abaca before cooking or before it is added to the beater. More extended cooking will also facilitate ready fiber separation.

Any fiber will yield denser, crisper paper the longer beating is continued. Usually, in an effort to maintain maximum freeness and fiber length, this effect is not sought in working with fibers for nagashi-zuki. Abaca fiber, however, can be altered during beating to yield very different papers. Very light, minimal beating will yield a paper similar to kozo, while slightly extended beating will yield a paper more like mitsumata, and a bit more again (assuming proper cooking and fiber quality) will yield a crisp, translucent paper similar to gampi. Do not forget that, much as it is an important control factor, such extended beating can again easily result in overly lowered freeness and shortened fiber. Prolong beating of abaca with great reservation.²

Storing Beaten Pulps Although the Japanese did not recommend it, I have
frozen cooked-and-beaten kozo fiber, as well as fiber mixed with formation aids left over from draining vats, and later thawed the fiber for papermaking with no apparent deleterious effects. This procedure is not recommended, however, unless the fiber must be kept well beyond the allowable several weeks in a refrigerator. Freezing is not recommended during the production of archival papers.

Formation Aids

My first choice for a formation aid in the West is tororo-aoi grown at your own location and stored without the agricultural disinfectants commonly used in Japan. Tororo works exceptionally well in Japanese papermaking, appears to yield a permanent sheet, and enhances the naturally occurring luster in many bast fibers. See Figure 123, which shows Japanese tororo-aoi in bales.

Tororo-aoi Cultivation Tororo can be successfully cultivated in most areas of the United States. The following suggestions incorporate my personal experience with growing tororo in Michigan, the advice of Japanese tororo farmers, and data from Winifred Lutz. (See Figure 122.)

Quality root development requires an even temperature of 25°C (77°F) for at least three months with little fluctuation during the day and night. The soil should be fertilized prior to planting and again two months after growth has begun. Any of the three following commercial fertilizers is acceptable: 5–6–6, 5–8–5, or 5–10–5 (nitrogen, phosphate, and potash). I have obtained good results using green sheep manure as a substitute fertilizer.

Planting should be done immediately following the last frost. Set the seeds in groups of three, staggered 10 centimeters (4 inches) apart in rows roughly 50 centimeters (20 inches) apart. After the first leaves appear, thin the weakest of the three plants; then after each plant has developed three leaves, remove the weakest of the remaining two plants. (If only a small amount of seed is on hand you can eliminate these thinning steps and try for all possible plants by planting single seeds only.) The soil should be kept moist until the seeds sprout. Thereafter, only sufficient rainfall or watering to keep the plants healthy is required. Overwatering can harm tororo.