

THE TOOLS WE USE: OUTFITTING YOUR OPERATION FOR EFFICACY AND EFFICIENCY

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Introduction

Outfitting your nutrition operation can feel a bit like building an arsenal with which you can draw from to fight the good fight that is feeding your animals. However, what you put in your arsenal will depend entirely on your goals as a department and the space and capacity you have available. Wherever your operation lands on the centralized/decentralized commissary continuum, it will be essential for your operation to have good quality equipment to help you provide the best diets for your collection in the most effective way possible. The intent of this paper is to help you and your institution make the right choices about what equipment will best suit your operation and your animals.

Assessing Your Needs

The following items need to be considered when purchasing equipment:

- 1) Institutional needs
 - Animal/Species Needs
 - Safety
 - Sanitation
 - Collection Size
 - Centralized/Decentralized Operation
- 2) Space/Resources Available
 - Do you have room in your kitchen or to store it?
 - Can it be easily installed?
- 3) Staffing Requirements
 - Will it take more time?
 - Will it make work more efficient?
- 4) Funding Available
 - Will it reduce waste/staff time, thus pay for itself?
 - What is the initial investment?

Outfitting Your Operation

The following is a list of equipment that institutions currently use and/or have found to be useful and, in many cases, necessary to their operation. For most products, there are several companies which you can choose from, and this paper is not meant as an endorsement of any one particular brand. We will, however, give some specific examples to help illustrate certain items on the list. Above all, when you choose a product, make sure that the product you choose is a good quality product that will withstand what you are about to put it through.

Kitchen - Food Prep

- *French fry cutter (manual)* - Simple use of a lever arm and a blade grid allows for the quick processing of long cut sweet potatoes, apples, and other produce. Made from metal, it is easily disassembled and hand-washed or sent through a dishwasher (watch your material, as not all types are dishwasher safe). The cutter can be wall mounted above a small table (allow for reach-across access, 18-24" wide) for placing the container/bin underneath the cutter itself. Because this is completely human-powered, ergonomics (height and reach) are crucial. Moving parts can be lubricated with a food grade oil. This is a relatively inexpensive item to purchase and install.
- *Vertical cutter/mixer* - A vertical cutter mixer (VCM) allows for a wide range of tasks to be performed with the same piece of equipment. In addition, attachments can be purchased to take greater advantage of the platform. The main bowl of the cutter mixer can be used for a variety of kitchen needs from processing biscuits and pellets into a powder to making meat mixes, formulas, and gruel-type diets. A side attached food processor performs all of the same functions as a stand-alone processor, but is powered by the core of the VCM. These can be expensive pieces of equipment, but used models are often available affordably. The VCM requires a dedicated floor footprint, and is quite heavy (most have wheels on one side for a tilt/move option).
- *Blender* - Blenders in the kitchen are used for a variety of tasks from powdering small amounts of biscuit or pellet to making gruel-type or gel-type diets. For zoos that tube feed often, it allows for mixing multiple ingredients such that they will readily flow through various gauge tubes. There are numerous models and designs available from industrial stainless steel (tend to be more expensive) to nearly disposable, small motor, and/or coffee grinder types. This is one of the most common equipment types found in many zoo commissaries.
- *Microwave* - Microwaves can allow for quick heating of water when a stove or other method is not available. A microwave also can allow for quickly steaming vegetables as needed. It should be noted that a microwave in the commissary is usually animal food only, and if this is the case, it needs to be labeled accordingly.
- *Stove* - A stove can be a useful addition in the commissary. It allows for all of the same tasks as the microwave, but can also provide for other non-microwavable tasks (i.e. hard boiling eggs, etc). In addition, if meat needs to be cooked (i.e. chicken), often the stove is a more thorough and efficient method.
- *Band saw* - A band saw designed for cutting meat, bone, and other food items can be an invaluable tool for reducing waste if you have the facilities to accommodate it. It can be used to cut frozen meat and fish to sizes that allows for more rapid, even thawing, and it enables the thawing of partial packages to prevent thawing of excessive product due to packaging size. This item can also be the most dangerous item in your facility. Commercial kitchen saws require not only floor space for the machine, but generally they are hardwired to an electrical box which requires a specific zone of safety clearance. The machines can be custom fitted with electrical plugs, but they require higher voltage than a normal outlet and the plug will need to be waterproof for cleaning. Further safety requirements include a secondary shut off on the electrical box that can be "locked-out" during cleaning and maintenance. The saw does not necessarily need to be located in the kitchen if size or electrical requirements are a hindering factor. However, cleaning the saw requires a lot of water, so access to a hose and proper floor drains are a must. When

working with this item, proper personal protective equipment (PPE) such as a face shield or other eye protection and gloves need to be worn.

- *Knives, Sharpeners, Gloves, and Accessories* – These are likely the most used tools in the kitchen. It is very important to make sure the right knife is being used for the right job. Even more important is that these knives need to be kept sharp at all times for safety. A good combination of knives to keep in the commissary include, but are not limited to, 8-10” Chef’s Knife, 4-6” Utility Blade, Boning Knife, Kitchen Shears, Paring Knife, etc. Select knives that are NOT serrated as they are harder to sharpen and serrations are used for sawing, not cutting. Other items to include in the kitchen are: a steel, which does not sharpen the blade only straighten or hone the edge, and a sharpening stone. The option is also available to employ and outside company which will sharpen knives on a regular basis. Storing knives is best done in a working kitchen with a magnetic knife strip attached to a wall. This prevents the blades from getting dulled in drawers or counters, and it keeps anyone from accidentally getting injured by misplaced knives. Cut resistant gloves can help reduce cuts in the kitchen. For working in the kitchen, lighter weight gloves composed of materials such as Spectra®, Kevlar®, etc. allow for greater dexterity and flexibility with decreased hand fatigue. Some gloves come color-coded by size, and are made with microbial resistant material. All gloves need to be washable to prevent cross-contamination and bacterial growth. All cut-resistant gloves are rated by the amount of weight required to cut through the material, so make sure that the glove rating is sufficient for the level of protection you may need.
- *Anti-fatigue mats* - Mats are designed to relieve foot pressure and reduce the strain on the lower back and legs of those who have to stand and work in one place for extended periods of times. For the kitchen environment, mats made with anti-microbial rubber prevent slippage on wet floors and can be cleaned and sanitized on a daily basis. Perforated mats provide drainage of liquid and debris. Solid mats have the disadvantage of holding in moisture if the mat is placed on a wet floor; therefore perforated mats are preferred for the wet environment of the kitchen.
- *Scales* - The needs of an institution will vary when it comes to the size and number of scales an operation requires. Although the initial cost of a quality scale is higher than food scales found at the grocery store, the capabilities and life span of these products are well worth the price. The important things to look for in a scale are sensitivity (how precise is the scale), durability, and size. Scales can measure within a range from less than a mg up to many kg. The main workhorse of many kitchens is a gram scale with a range from 0.1 g to 2 kg. Generally, as scale weight capacity increases, sensitivity decreases. Having different sized scales for different tasks may be necessary. “Wash-down” scales are made for wet environments and can handle a wide array of temperatures if they need to be used in the cooler or freezer. Smaller scales may require a separate cover to help keep them dry, clean, and functional (based on sensitivity). A useful addition to scales used in the kitchen is an Infrared Tare Function that will zero the scale by just holding a finger over the sensor. This helps prevent cross-contamination by keeping dirty hands from touching the device. The size of the platform is also important. If a container is too large for the platform, it can cause the scale to be unbalanced, leading to inaccurate weights. When purchasing scales, also find an external company that is able to provide annual calibration and regular maintenance. These companies can also recommend scales that are better quality and more cost effective to repair when broken.

- *Feed Mill Grinder* - Also known as size reduction equipment. These range from large hammer mills all the way down to coffee grinders. They can be useful for both making diets and preparing samples to send for analysis. The ability to grind a dried feed product expands the feeds available to specialized feeders that do not have the ability, mouth size, or dentition to eat larger pellets. Powdered commercial diets can be easily mixed into chopped fruit and vegetable diets or gelatins to allow for uniform distribution in the diet. Things that need to be considered when looking for a grinder include 1) Material to be processed (size, coarseness, moisture content) 2) Desired particle size 3) Throughput. These will determine the size and style of grinder needed along with the screen size, RPMs, and power requirements.

Kitchen - Organization

- *Flip books* - There are a variety of ways to organize “recipes” within the kitchen from the modern tablet/touch screen options (discussed below) to the more basic folders and flip books. Flip books are set up much like three-ring binders on a stand, but are specific in design and can hold many pages (some come in expandable “sets” of 20, and can be combined up to 100 or more pages). Flip books allow for easy access to diet or recipe cards, can be easily edited and cleaned, and are a simple approach to organizing diet preparation activities in a variety of conditions.
- *Color coded cutting boards* - Cleaning and sanitizing cutting boards and utensils between jobs is imperative. Another precaution that can be taken is the use of color coded cutting boards (and other utensils), based on the job. Meat and fish handling utensils can be color coded differently than those used for produce or other purposes. If this additional failsafe is used, it is important that the color code is communicated and understood across the staff using the items.
- *Labels* - Keeping items properly labeled is an essential part of any food service operation. Labels in the kitchen need to be able to handle both wet and cold environments, but also be able to be removed easily for cleaning. Although there are food service labels available that will dissolve in 30 seconds of running water and are environmentally friendly, if they are used for delivering diets in a rainy environment (say for example Portland, OR), the difficulty becomes that they will dissolve before they ever reach the delivery area. Thermal printed labels will not dissolve and the lack of ink means no smearing and no purchasing ink cartridges. However, these labels require a special printer and the labels themselves can be more expensive than sheet labels.
- *Tablets* - Tablets are becoming more cost effective by the day. Having a tablet in the kitchen can replace paper diet books. A tablet connected to a wireless network will allow diet changes and ordering to be more automated, thus reducing the amount of time needed to implement changes and reducing the likelihood of mistakes occurring, such as labels not getting corrected or diet cards not getting changed. It would allow a nutritionist across the zoo to update diet cards in real time. Further, most tablets have cases to protect them in wet and rugged environments while also providing a built in stand. Ordering can be done on a tablet while doing inventory, and if needed, they can be attached to a keyboard or docking station to provide an extra computer for interns or staff.

Food Service Sanitation

- *Dishwashers* - There are multiple types of dishwashers available, based on the size of the operation and the numbers of dishes to be handled daily. For most operations, due to daily use, an industrial model of some type is most prudent. For smaller operations, a single compartment, short-cycle, one-rack-at-a-time could work just fine. For zoos with centralized operations where many dishes are returned to the commissary at once, a conveyor type dishwasher may be more useful. This allows for dishes to be loaded into racks and fed into the machine at one end, as clean/sanitized dishes are pushed out the other end. More space is needed for these conveyor type dishwashers, but they allow greater throughput for dish-intensive systems. Regardless of dishwasher set up, it is important to consider not only space (places for dish racks to run out of a conveyor, or places to store clean dishes, etc), but also humidity control. Dishwashers create a lot of humidity (steam, moisture), and appropriate ventilation is required for employee safety and sanitation. In cases where heat sanitizing is preferred over chemical sanitizing, the dishwasher may need to be affixed with a booster heater to increase the water temperature from the standard hot water heater in the operation to sanitizing temperature.
- *Sinks* - When a dishwasher isn't an option, it is best to invest in a three or four bottom system. This system works by having a three compartment sink plumbed together in series with the first compartment closest to the drain being the wash sink, the second sink being a rinse, and the third sink being a sanitizer. Each sink is filled at the start of each day and used throughout the day. Water is changed out in each compartment as needed throughout the day. The design allows for each sink to be emptied in succession starting with the wash sink, this will then wash, rinse, and sanitize the plumbing daily. Another consideration is whether to add a fourth compartment as a pre-wash sink. If possible, having a sprayer wand along with a garbage disposal on a sink prior to the wash prevents the need to continuously change out the wash water due to debris build-up.
- *Hoses* - A water wand sprayer attachment on a sink can do a great deal to help pre-wash any dishes. Most industrial sinks can be fitted to accommodate a sprayer. A reel hose installed in the kitchen can help with cleaning on a daily basis. This requires proper drainage in the kitchen to allow for large volumes of water, and the kitchen and any equipment must be able to handle being hosed down. This prevents the use of any wood shelves. Generally walls need to be concrete or covered in fiberglass reinforced plastic (FRP) panels. For this to be effective, the hoses need to have hot water lines run to them, and the facility must have a proper air handling system to remove any excess humidity.

Materials Handling

- *Hand trucks* - Often, when dealing with individual bags of feed or larger bales of hay (or multiple types of one-offs), it is easier to move product with a hand truck (or dolly). These can have a straight platform, or can have forks held on a spring release (to move into small plastic pallets). The small plastic pallets are made to hold 10 bags of feed, stacked vertically, and be used to maximize space, if a standard 4x4 wooden pallet is not practical for the space or operation.
- *Pallet jacks* - A manual (non-motorized) pallet jack is worth its weight in gold. It is inexpensive and can be easily moved with a forklift onto delivery trucks to move items loaded near the cab to the back for easier offloading. When selecting a motorized pallet jack, the load weight that needs to be moved and the grade of the building both need to be

considered. If a pallet jack is underpowered to go up a grade with a full load, it is a waste of money and a hazard in the operation.

- *Reach trucks* - Reach trucks (stand up pallet stackers or walkie stackers) are extremely useful when you have stackable racks that hold 4x4 pallets (wooden or plastic). These machines have an extremely tight turning radius and can fit down narrow aisles and alleys. Because the operator is standing up inside the machine, it also allows for better clearance and safety. Attention should be paid to the lift capacity of the truck itself, the forks down clearance (ensure access through your doorways), and ease of operation. If a building has the capacity for shelf storage of pallets, a walkie stacker can lift up to three levels and will be a space and back saving tool. If possible, invest the additional funds to opt for a side-shift model. This makes moving pallets into tight spaces much easier.
- *Tractors* - Based on the operation, tractors can be very useful pieces of equipment. If fitted with hydraulic arms, a set of forks can be used, similar to a standard forklift. Rear attachments allow for various mowers to be attached, for use in trimming or maintaining browse stands, harvesting fresh cut hay, moving hay (described below), etc.
- *Forklifts* - These vehicles can be essential to an operation if dock access is unavailable. If horizontal space is limited, vertical space may be a better option. When selecting a forklift, ensure that the model chosen is counterweighted properly to maintain stability when lifting heavy materials, especially when extending the full height of the mast. Forklift operation also requires proper operation and safety training, and many facilities require licensing or certification.
- *Forklift/Tractor Hay Handling Attachments* - If an institution houses elephants or a lot of hoofstock, handling hay can be a large part of the job requiring several people to check it, stack it, and deliver it. The amount of people required for such a task can be decreased to one if the proper equipment is used. If your institution uses round bales, a hay spear attachment is a necessity. Although these are available for forklifts, this attachment on a tractor allows you to move hay to different areas of a pasture or paddock with relative ease. When dealing with square bales, a hay grapple attachment on a forklift not only allows one well trained operator to unload and stack multiple tons of hay quickly. If floor space is at a premium and head-space is not, then this is an option. The drawback to this system is that this cannot be done with a light-duty forklift, and the counterweight on the forklift must be enough to handle the weight of the hay at the intended height of the stack.
- *Chain saws, loppers, and hand saws* - There are a variety of methods used for harvesting browse and bamboo. Hand saws and loppers are common manual-type harvest tools. Gear-driven loppers reduce the felt force needed to cut larger diameter branches and bamboo. Hand saws that can also be attached at the end of pole pruners allow for the dual use of the saw itself. For larger woody browse and thicker bamboo, there are automated options that increase the efficiency of the process, but also increase the risk. Electric (battery powered) pruning saws (saws-all type) are very useful for these operations. Risk is somewhat minimized with an electric, fixed blade saw, but appropriate PPE is still necessary. Chain saws (whether gas or electric) are potentially the most dangerous tools we can use (in addition to a band saw). Appropriate training for operation and safety is required. That said, when in the hands of a competent operator, a chain saw can quickly and efficiently handle bamboo and browse of all sizes.

- *Dock leveler/Above grade dock access* - Many of the items we use are shipped in bulk and arrive in the back of a trailer. Ensuring there is adequate space for the trailer to access the receiving location is imperative, but once in place, it is important to have a way to get the items safely and efficiently from the trailer to your commissary. Having above grade (trailer height) receiving space benefits not only the operation, but also the delivery drivers. Associated with that dock access is having a dock leveler to ensure ease of unloading once the trailer is in place. This links the dock to the trailer in a safe way to allow on- and off-loading. If a dock leveler is not available, a specifically-designed steel plate system can allow access between the dock and trailer (although is not ideal).

A Final Word

“An elephant for a quarter is only a deal if you need the elephant and have the quarter.” There are many options available to make commissary operations efficient. Selecting the best options for each operation is based on needs (current and future), existing infrastructure, staffing, and resource availability. Ensuring a good fit between the tools or equipment and the nuances of the existing operation is imperative so that resources (especially financial) are utilized to their greatest benefit. Perhaps more useful than the tools and equipment described herein, is the application of a creative approach to their efficient and effective use within each individual and unique operation.

Examples of different operation set-ups

Oregon Zoo (Centralized) - 1.5 FTE Kitchen Staff & 2,000 Collection Animals

- Bale Grab attachment for forklift - With our limited staffing we could not handle hay unloads without it.
- Hobart Meat Band-Saw - Our model has been running for decades. Used for sawing meat chunks, fish, calf carcasses, etc.
- Hammer Mill - Our model is donated from an old feed mill. Used to grind up whole bags of feed for use in diet mixes (bat chop diet).
- Hyster Forklift - Our model has extra counter-weighting to lift bales 3 stories in our hay barn.
- Pallet Jack - Manual and Motorized. We use the manual one to unload truckfulls of baled bedding and motorized for everything else.
- Hobart Chopper - We only have a smaller version that we use for chop.
- Ohaus Scales - Our diet scales have the infrared zeroing capability so you don't have to touch the scale to zero it, just hold your finger over it. Keeps the scale cleaner. We have other scales of different capacities 2.1 kg - 50 kg. Sensitivity is not as great as the scale capacity increases. We have a local scale company calibrate all the scales yearly
- Flip Books/Tablets - We currently use flip books, but we just purchased Microsoft Surface 3 Tablets for diet books. Got the Urban Armor covers for heavy duty use.

Busch Gardens - Tampa (Centralized) - 5 FTE Kitchen Staff & 3,000+ Collection Animals

- Robot-Coupe Blixer 60 – grinds feed (insectivore powder, primate biscuits, etc.). Probably could replace the Hobart if we didn't object to mixing meat and dry goods in the same equipment.
- Robotcoupe CL60: This is a food processor that slices and chops produce into different size squares or slices (disc slices or coleslaw type stuff). We use it every day to make the

different salads, fruit mixes, and fruit bat mixes. We spend about 2hrs/day with this machine. Could not function without this (or, would need another 2 employees).

- Hobart floor model mixer: This we use every day to make our meat mix (meat, fish, and flamingo powder). We also use this machine to mix our gels. It works great and we have been using it close to 40yrs.
- Label maker - Brother P Touch: Use this all the time. They stick well to items in the cooler, fairly well to ones in the freezer.
- Sartorius Scales: use these every day, all day. Couldn't live without these. Seems like a really good name brand that we have had very few problems with.
- CAT Pallet jack: This is used several times a week and has been old reliable for the last 30 years
- Chef's choice knife sharpener: works great
- The most used machine in the kitchen is the BOSE Radio: Used every day, all day. Can't stress the importance of having a good sound system. Just do it!

National Zoo & SCBI (Centralized) - 9 FTE Kitchen Staff & 2,000 Collection Animals

- Meat saw
- Microwave
- Multiple blenders
- Multiple scales
- Knives
- Food processors of multiple types (NOT a VCM, though)
- Stand up reach truck, Stand-on, Walk behind electric, & manual pallet jacks
- Chain saws, electric fixed blade saws, hand saws, pole pruners, weed eaters with brush blades
- Flip books

Cincinnati Zoo & Botanical Gardens - 4 FTE & 2500 Collection Animals

- Fork lift, Electric, & Manual pallet jack
- Scales
- Steamer
- Meat Refrigerator that we term "The Thawer" – I have not seen this piece of equipment anywhere else

Taronga Zoo

- We're really fond of the Robot Coupe products, particularly the attached Workstation. We have a smaller model but this workstation is ideal. The only thing I would suggest is rather than getting all the different discs, get multiples of the ones you would use most. The company is really good at mixing and matching to meet your needs.
- The bale grab has been very useful at our safari zoo, too.