The Uganda Commercial Fish Farmers’ Inputs and Services Suppliers Guide

April 2009
DISCLAIMER

The suppliers listed below are known to have supplied or offered to supply aquaculture inputs. Their vetting has been based on the quality of service they have provided to other farmers and to USAID FISH. Farmers have recommended suppliers who have satisfactory service to themselves and other farmers. However, the F.I.S.H project cannot guarantee that you will receive the right input of the right quality at a fair price. It is up to the client to be vigilant. F.I.S.H manuals do contain guidelines on selecting the proper feeds, fingerlings and other inputs. Additional notes have also been included in this catalogue to help fish farmers and the input suppliers make a guided choice and offer better services.

This catalogue does not exhaust all the suppliers to the aquaculture sub-sector and is subject to regular review for updating.

This manual replaces the draft compiled and printed in December 2008.

Copies of this and other documents from FISH can be found at: www.ag.auburn.edu/fish/international/uganda/

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CATALOGUE SECTIONS

This catalogue has three parts:

Part I  List of inputs, their description and suppliers of the inputs.

Part II  List of service providers and suppliers of the services, organized by type of input or service.

Part III  Contacts of inputs and service suppliers and additional information about them.

The 2008 Fish Farmers’ Symposium included a trade show in which different suppliers could display their products. The Fish Farmers’ Symposium for 2009 may take place at the end of the year. Presentations from the first 2 symposia are posted on the web at: www.ag.auburn.edu/fish/international/uganda/
PART I

LIST OF AVAILABLE INPUTS AND SERVICES
EQUIPMENT AND TOOLS

A. Aeration

Aeration is the addition of air into water. The primary objective of aeration in fish farming is to increase the levels of dissolved oxygen in water. There are different ways of aerating water in aquaculture production units with the wide range of equipment available for aeration. However, the efficiency with which each of the aerating systems work differs. Aeration efficiency is a function of how much of the air actually dissolves in the water. This is largely governed by the size of air bubble incorporated into the water and the distance the air bubble travels within the water column and the difference in oxygen levels of the air and the receiving water. The smaller the air bubble and the longer the distance travelled, the higher the aeration efficiency will be.

When making a choice of what aeration equipment to buy, consider:
1. The total water volume you need to aerate if using tanks or the total water surface area if you intend to aerate if using ponds.
2. What total biomass of fish you intend to support within the production units you plan to aerate.
3. Your source of power; its cost and the reliability of power supply.
4. The type of power you have on the farm (single-phase, three-phase or access to power lines)
5. Whether or not you expect to run the aeration full-time or part-time.
6. Maintenance and running costs of the equipment you propose to purchase.
7. Access to technical support for installation and maintenance.
8. Whether or not your production system warrants and can afford (i) aeration (ii) the specific system of aeration you intend to purchase and install (i.e. value for money).

A.1. Sub-surface or submerged Aeration

Submerged aeration is done when air is pushed into the water from below the water surface. This is done by extracting air from the atmosphere using air pumps, blowers or compressors. The air extracted is then passed through a hose and then through a diffuser. Diffusers have small pores through which the air must pass to enter the water. As the air passes through the diffuser's pores, it is broken into tiny bubbles. The pore size varies among the various diffusers. Diffusers may require high pressure or low pressure depending on the amount of air resistance built within the diffuser.
Air Pumps

The 12V DC air pump can be run off a car battery, solar panel or electricity. These air pumps are recommended for areas with no access to electricity and as a stand-by option when power goes off. They can also be wired directly to a car battery during live fish transportation or when holding live fish at live fish markets. They have low maintenance costs.

They are of different capacities. Select the size and capacity based on the amount of water you need to aerate as well as how much fish biomass you are likely to be holding each time. The required power draw is usually written in amps. A 12-v battery has a certain amp-hour capacity. You can only draw down a car battery one-half of its capacity.

Aquarium Air Pumps

Aquarium pumps are more suited for use in aquaria or small tanks. Some run off electricity while others can be run off ordinary battery cells. More than one air pump is often required if one is using them in small production tanks such as hatching troughs. They can effectively be used for small units in areas with no power for intermittent use or as a stand-by measure in case of power failure. Best if you use a low-resistance airstone. Operates about 100 hours on 2 heavy duty D-cells.

Suppliers: 1. AquaConsult (U) Limited
2. Balton (U) Limited

A battery-operated aquarium pump in use in a hatchery with no power.
Blowers

Blowers provide large volumes of air under low pressure. Regenerative blowers are recommended in aquaculture because they are reliable, require low maintenance and last a long time. Only the filters require regular cleaning in soapy water.

In aquaculture, blowers are often used in conjunction with diffusers and airlifts. They come in various sizes and of different capacities. Blowers require electricity, either from the grid or a generator, to power them. They come wired to either work with single or three phase power. Their capacity is often stated in terms of horse power (Hp).

**Balton (U) Limited** supplies blowers of the following capacities:
- ½HP, 1Ph
- 1HP, 1Ph
- 2HP, 1Ph
- 3HP, 3Ph

Note to verify if you have 3-phase power or not. BELT-driven blowers can be obtained that can be hooked up to a petrol or diesel engine.

Work best in 1 m or less water depth.

Tyre Tube Air “Blower”

The tyre tube aerator is assembled from material easily available even in remote areas. An inflated tyre tube provides aeration in combination with low pressure diffuser tubing. Suitable for aeration tanks. Also suitable for aeration in small rural hatcheries with no access to power and during live fish transportation for emergency aeration. It is handy and economic option for providing temporary aeration in all hatcheries in case of power blackouts.

Requires no power source. The tyre tube can be inflated using a bicycle pump or an air-pump at any petrol station. We were able to get 3 hours of aeration using a tube and one meter of low-resistance diffuser tubing.
Diffusers
Diffusers have small pores through which air or oxygen has to pass to enter the water. In the process the air or oxygen is broken into small bubbles depending on the size of the diffusers’ pores. There are several types of diffusers - some require high pressure and others low pressure.

Air Stones
Air stones are more suitable for use in aquaria or small tanks. They are made out of various materials such as clay and porcelain. However, the key feature is the fine interconnecting pores through which air passes out into the water. They can be used to release either air or oxygen. The quality of the air stone is dependent upon how well the particles making the stone are bound and how small the pores are. Very cheap airstones often have high resistance.

Balton (U) Ltd supplies air stones complete with fittings for connection tubing in the following sizes:
- AS-1 (4cm x 1.3cm)
- AS-3 (5cm x 2.5cm)
- AS-5 (8cm x 2.5cm)

Low Pressure Diffuser Tubing
This is latest technology. This low pressure diffuser tubing allows for high aeration efficiency if hooked up correctly. The best aeration efficiency is obtained when the tubing is set at 80 cm below the water surface. Less energy is also required to push air through the diffuser. Low pressure diffuser tubing can be adapted for use in both tanks and ponds with blowers, 12V DC air pumps and air/oxygen compressors.

*You can distinguish between low and high pressure tubing by blowing air through it. If it is low pressure tubing you will be able to blow easily.
Micro-pore Diffusers

Micro-pore diffusers are an extremely efficient diffuser that allows ultra fine bubbles to pass through. Micro-pore diffusers are made of fine porcelain. The resistance to air flow through this diffuser is high. Micro-pore diffusers therefore, work best with equipment that supplies air or oxygen under high pressure (such as, air compressors or oxygen cylinders). Their use is recommended when pure gases, notably oxygen in this case is to used. Micro-pore diffusers are fragile and should be handled with care.

Due to their high resistance, the diffusers of 6 inches long (15cm) can only handle a maximum of 0.75 liters per minute. Maximum pressure they can receive is 3.4 bars (read it on the “back-pressure gauge” of the regulator).

Hoses should be heavy duty and all fittings clamped due to high pressures.

A.2. Surface Aeration

Surface aeration is done by throwing up water from the water surface into the air. As the water falls back down, air gets incorporated into it. The higher the water is thrown up and the smaller the drops of water become, the more air gets incorporated into the water. In aquaculture, surface aeration is more commonly done in ponds using the following aerators. Be careful: these types of aerators make waves and cause erosion to the pond levees.

Paddle Wheel Aerator
Paddle wheel aerators are operated by a motor to propel water into the air. The paddles lift and throw-up the water into the air as they rotate. As the water drops back down, air is incorporated into it. Because of the motors, they require much more power to drive them. The motor and gear system of the paddle wheel aerator also require maintenance.

Paddle wheel aerators come in different sizes and capacities. They are recommended for medium and large ponds where movement of oxygenated water away from the aerator is important. The smaller models are not suitable for aerating deep ponds of depths greater than 2 meters.

**Dual-Prop Aerators**

Dual-Prop aerators are fitted with a small submersible pump that draws up water and throws it up into the air. Because of the amount of power required to drive the motor, they need be connected to electricity or powered by a generator.

The motor and propeller require regular maintenance. In addition, one need to regularly check and ensure the propellers are free debris. These aerators will dig a deep hole in the pond bottom if operated in shallow water. They will also erode pond levees.

**Supplier:** Balton (U) Limited
Comparison Between Sub-Surface and Surface Aeration in Ponds

**SUB-SURFACE AERATION**

- **Pond** being Aerated with Submersible Pond Aerator

**SURFACE AERATION**

- **Pond** being Aerated with Dual Prop Aerator

Assembly and Installation by:
1. AEATREC, Namalere.
2. Balton (U) Ltd.

For:
- Regenerative blowers, see page 9
- Low pressure diffuser tubing, see page 10
- Dam lining, see page 51
- Piping and other plumbing requirements, see page 20

Set-up and Installation by: Balton (U) Ltd.

Requires a motor in every pond, or the aerators can be moved from one pond to the other as needed.
### Comparison Between Sub-Surface and Surface Aeration in Ponds

<table>
<thead>
<tr>
<th><strong>SUB-SURFACE AERATION</strong></th>
<th><strong>SURFACE AERATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Can be adapted to aerate ponds of any size by increasing or decreasing total amount of diffuser tubing used.</td>
<td>1. Best suited for medium to large ponds &gt;500 m².</td>
</tr>
<tr>
<td>2. One blower sufficient to run a single system supplying several ponds (size blower appropriately based on its horsepower).</td>
<td>2. Each unit requires a terminal (each aerator need to be hooked directly to an electrical point or generator.</td>
</tr>
<tr>
<td>3. No need to have power lines to points close to ponds. Can be set at a distance far away.</td>
<td>3. Electricity lines running across ponds near or across the water. This can be dangerous if poorly or carelessly wired.</td>
</tr>
<tr>
<td>4. When power goes off, will need alternative power only to supply one blower (one motor)</td>
<td>4. When power goes off, alternative power is required for several motors.</td>
</tr>
<tr>
<td>5. Regenerative blowers are low maintenance pieces of equipment. Only the filter requires regular cleaning swirling in warm water. Diffusing tubing requires cleaning with water occasionally.</td>
<td>5. Motors or submersible pumps (depending on whether a paddle wheel or dual prop aerator is used) of each aerator require regular maintenance. So do the gear systems or submersible pumps with subject to breakdown and parts need regular replacement.</td>
</tr>
<tr>
<td>6. When power goes off, a set of DC batteries system and 12V diaphragm pumps to push air can be adapted for use in rural areas (hatcheries) far away from the power grid.</td>
<td>6. Only grid or generator power suitable because of the amount of energy required to start and run the motors. Can not be used with 12V DC car batteries because of power required by motors</td>
</tr>
<tr>
<td>7. Energy efficient. Uses much less power to push air, rather than water.</td>
<td>7. Use much more energy because of the demand of the motors.</td>
</tr>
<tr>
<td>8. By themselves, do not assure good mixing. Must be used with a well-designed diffuser/pusher to get uniform oxygen across the depth and length of the pond.</td>
<td>8. Currents created that push and mix the water depending on the positioning of the aerator within the pond.</td>
</tr>
<tr>
<td>9. There is much less erosion caused to the pond banks because the force generated propelling the water is gentler.</td>
<td>9. Significant amounts of erosion of pond banks because greater force is created by the splashing water.</td>
</tr>
<tr>
<td>10. The diffuser tubing releasing much smaller air bubbles into the water which then travel over a longer distance.</td>
<td>10. Aeration efficiency dependant on air that is incorporated into the water column when water is thrown up into the air.</td>
</tr>
<tr>
<td>11. Once someone has the correct low pressure diffuser tubing and the blower; the aerator can be assembled locally using locally available materials.</td>
<td>11. All parts imported (entire functional unit) needs to be imported as a full unit.</td>
</tr>
</tbody>
</table>

**Note:**

Electricity in Uganda is very costly. At the current cost, aeration is not cost effective in grow-out ponds because the current price of table fish (3000/= per kilo) is too low to make aerated ponds profitable.
A.3. Oxygenation

Oxygenation is the addition of pure oxygen into water. Oxygen in aquaculture is used for live fish transportation, when holding live fish and in emergency situations in tanks when oxygen levels drop too low. It is essential that every hatchery and nursery has an oxygen cylinder and the associated accessories for effective oxygenation because their product is ‘live fish’.

Pure oxygen gas is available on the market bottled under pressure into cylinders. The accessories for use with oxygen cylinders include:

i. A regulator that enables one to estimate how much oxygen is left in the cylinder and regulates pressure of oxygen flowing out
ii. An oxygen flow meter for better regulating the flow of oxygen out of the cylinder, and
iii. An oxygen bottle spanner for attaching the regulator and opening the primary release valve on the cylinder.

The regulator and spanner are made to fit specific cylinders. Therefore, purchase the regulator and spanner from the supplier from whom you obtain the cylinder, as these fittings are not always interchangeable.

Precaution!! Only use brass fittings and NO petroleum products with oxygen cylinder and regulators. Always seek advice from the supplier on the use and precautions one must take when using the cylinder and accessories. Keep cylinders chained upright or lying down so they do not fall and break off the main valve.

Oxygen Cylinder

Oxygen gas is compressed into cylinders under extremely high pressure. The cylinders should therefore be handled with extreme care, as any damage to the cylinder that causes small hole or leakage will result into an explosion. Therefore, strictly follow the advice given by the supplier on how best to handle and use the cylinder with its recommended accessories. In the event that there is any damage, report it immediately to the supplier.

The universal coding for cylinders with oxygen is black. If the cylinder is not black, then it may not contain oxygen gas.

Different sizes are available and rated in terms of total cubic meters oxygen held.

Suppliers: 1. Uganda Oxygen Ltd
           2. BOC (U) Ltd
Oxygen Flow Meter

Flow meters are used to regulate the flow of oxygen from the cylinder to diffusers. The oxygen flow meter come two forms: graduated from 0-15 ml and 0-3.5 ml of oxygen /min. The 0-3.5 ml oxygen/min flow meter is ONLY suitable for use with a micro-pore diffuser.

It is important to use an oxygen flow meter when using a low resistance diffuser as the natural tendency is for matter to flow from high to low pressure along the path of least resistance. Therefore if not controlled, much more oxygen than is required will pass through the diffuser. This will waste oxygen.

Note: Always check that you have purchased an oxygen flow meter and not any gas flow meter. This is because the different gases have different densities hence, their calibrations are different.

Oxygen flow meters can also be purchased as separate apparatus shown here.
Regulator

The regulator fits directly onto the cylinder (picture page 15). The regulator is used to tell what the gas pressure is, inside the cylinder. The reading of the amount of pressure in the cylinder gives an indication how much oxygen is contained within the cylinder. Most regulators will also have a gauge to read “back-pressure”. More explanation is given in the USAID FISH notes on transporting live fish.

The flow of oxygen out of the cylinder is also initially controlled by the valve attached to the gauge. This enables one to regulate the release of oxygen gas within a certain pressure range. It is especially important to control the pressure at which gas is being released from the cylinder when using micro-pore diffusers, otherwise if the pressure exceeds the maximum allowable, the micro-pore diffuser will explode. If too little, no oxygen will flow.

Some pressure gauges come fitted as a single unit with an oxygen flow meter.

Spanner

The spanner is specially designed to open up the valve on the cylinder, and to fasten the regulator onto the oxygen cylinder. Oxygen bottle spanners are specifically for use with oxygen cylinders. Use of other spanners like pipe spanners can result into damage of the fittings and this results in loss of oxygen, even when presumed closed.

Suppliers: 1. BOC (U) Ltd
2. Mech Tools Ltd
3. Uganda Oxygen Ltd
A.4. Aeration Fittings

Barbed fittings are preferable for air lines in aquaculture because one requires an airtight fit. Plastic, and stainless steel are recommended for fittings because items are always in contact with water, and sometimes salty water, on fish farms. The materials used should be non-reactive with water. Brass and galvanized fittings are rust-proof but should not be in constant contact with water because they can give off zinc and copper which can be toxic to fish. Short-term contact, like a few hours is usually OK.

**Hose Clamps**

Hose clamps are used to tighten the fitting of an attachment onto a terminal. The cheap ones rust and need to be replaced from time to time.

**Suppliers:**
1. Balton (U) Ltd
2. Mech Tools Ltd

**Manifolds and air outlets**

Manifolds are used as distributors to increase the number distribution points from a single source. Some come with valves already fitted.

**Suppliers:**
1. Balton (U) Ltd
2. Aquaculture Management Consultants Ltd
3. Mech Tools Ltd
Silicon Aquarium Tubing

Silicon tubing are used for air circulation and distribution in hatcheries and aquaria as they are easy to clean and non-reactive. The product is supplied in different diameters to fit particular needs.

Any PVC tubing can also do for airlines but constant use with pure oxygen makes it stiff and exposure to sunlight makes it brittle over time.

 Suppliers: 1. Local aquarium shops

Plumber’s Thread Tape

Plumber’s thread tape is used to improve the fit between connections so as to reduce air/water loss. It is safe to use plumbers thread tape with oxygen cylinders and their accessories.

 Suppliers: Any hardware shop dealing in plumbing materials.
B. Air and Water Reticulation

Pipes, Hosing and Other Plumbing Fittings

Plastic piping of either PVC or HDPE is the material of choice for channeling water and air around farms. This is because plastic is a relatively inexpensive, inert material. The specifications regarding type and sizing required depend on:

i. site topography,
ii. intended use (water or air)
iii. the pressure one would like to have, or is likely to have from the water or air source,
iv. the amount of water volume required to units,
v. where the pipes shall be set (exposed or not, are they likely to be stepped on, etc.), and
vi. the cost.

Likewise, the appropriate fittings should be selected.

HDPE pipe cannot be glued; it must be clamped, threaded or heat-set to make a junction. Therefore, fittings can be expensive. However, HDPE can come in a roll and long distances can easily be traversed. Often the long distance portion can be done with HDPE and the portion with multiple fittings can be done in PVC; with a threaded coupling to join the 2 types.

NOTE:

1. When plumbing for water or air distribution on fish farms, it is important to remember that we are usually dealing with low pressure distribution systems. Therefore, the fewer the number of joints, bends and constrictions, the better. In addition, the main supply lines should be looped to help maintain pressure. Otherwise the outlet points furthest from the source will have much less water or air flowing out, if all the other outlet points are open.
2. In hatcheries, the plumbing for both water and air distribution should preferably be fixed above or at ceiling level. This is for safety reasons as it reduces the likelihood of tripping over.
3. Many hatchery owners have used amateur plumbers who do not understand the friction losses in pipes and fittings. Poor design will greatly increase your installation costs and your operating costs.
4. Purchase the appropriate pressure rating for your needs.
**HDPE Pipes and Plumbing Fittings for Water and Air**

- Equal Tee
- Male threaded adapter
- Male threaded elbow
- Coupler
- Step over
- Reducing socket

- Equal Elbow
- Straight Tee
- Female threaded elbow
- Stop valve
- Female threaded elbow
- Socket

- 90 Elbow
- End cap
- Female threaded adapter
- Female threaded Tee

**PVC Pipes and Plumbing Fittings for Water and Air:**

- Flange Adapter
- Reducing saddle

Various PVC drainage fittings and pressure fittings

All items on this page are supplied by GENTEX LTD.
**Flexi-piping and Fittings**

Suppliers: 1. Balton (U) Limited  
2. Gentex (U) Ltd

**Water Pumps**

Water pumps are used to lift and push water. There are different kinds of water pumps, each suited to pumping water from different water source types.

The various pumps therefore have different operating principles. The basic kinds of water pump used in aquaculture establishments are:

1. Submersible; pumping water from under the water surface; these pumps remain under water.
2. Centrifugal pumps; usually require priming. They are outside the water and must suck up the water, then push it.

Water pumps also work with different power mechanisms, such as 220V electricity, solar energy, 12 V DC battery, diesel or petrol. However, this is influenced by their power requirements, which is a function of volume pumped and distance.

The choice and cost of a pump is dependent on the site’s features and intended use, notably:

1. Nature of water source,
2. Topography, which influences pump capacity in terms of head, pressure, flow rate, etc
3. Horizontal and vertical distance to pump
4. Type power available at the site
5. Amount of water required *vis-à-vis* the recharge rate of the water source.

NOTE: it is difficult to transmit DC power over a long distance so solar panels must be near a pump. Solar power is nice but cannot pump a lot of water.
Valves and Clamps

Valves and clamps are used to control the air/ water flowing through into the production unit. Some provide rough adjustment and are best for just on-off; others provide finer adjustment..

Suppliers: 1. Balton (U) Ltd
2. Mech Tools Ltd
3. Gentex

High pressure tubing

Both reinforced PVC and rubber tubing are available on the market for high pressure connections (air and water). Hose clamps (p.18) may be needed.

Suppliers: 1. MechTools Ltd.
2. Uganda Oxygen Ltd.
C. Water Quality Management

C.1. Water Quality Monitoring

There is an assortment of equipment to measure water quality parameters ranging from electronic meters, test strips, thermometers and field water analysis kits. Electronic meters require calibration to give accurate and reliable results. Have this demonstrated to you by the supplier. Also most of these meters have an inherent function of measuring measure water temperature.

**Oxygen meters**

Oxygen meters are used to measure the amount of dissolved oxygen in water. Most oxygen meters can at the same time measure water temperature. However, NEVER use an oxygen meter to check the temperature of very hot water otherwise you will permanently damage the probe. Avoid using in water >45°C.

Remember to also purchase spare membranes and electrolyte solution along with your oxygen meter to replace the membranes when needed.

There are 3 types of oxygen meters:
1. Polarographic (most models)
2. Galvanic
3. Optical or luminescent

**Thermometers**

Use alcohol-filled thermometers; not mercury as mercury is poisonous if the thermometer gets broken.

Suppliers: 1. Balton (U) Ltd.
2. Wagtech Ltd
3. School Laboratory Supply Stores.
**pH Meters**

*Suppliers:* 1. Balton (U) Ltd.  
2. Wagtech Ltd.

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**Secchi Discs**

*Locally fabricated by:* Junior staff at Aquaculture management Consultants Ltd, or Fisheries Training Institute students, Entebbe.

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**Test strips**

*A wide range of test strips are available capable of measuring a number of water quality parameters. Test strips provide a handy as well as reliable way for spot detection of water quality changes. Strips are available for measuring pH. Other parameters that can be measured with test-strips include nitrite, nitrate, ammonia, chlorine, etc.*

*Some strips provide several parameters at once; others only one. Test strips are generally less exact than water test kits using titration or color comparisons.*

*YOU CAN ONLY USE A TEST STRIP ONCE. EACH WATER SAMPLE MUST BE TESTED WITH ITS OWN STRIP.*
Aquaculture water quality test kits

These contain testing reagents and procedures for the most common water quality parameter that are necessary to monitor in fresh water fish farming.

A basic kit like the one shown on the upper left can be used to determine Ammonia, Nitrite, pH, Alkalinity, Carbon Dioxide and Hardness. This kit however does not determine pH, temperature, and dissolved oxygen.

A complete test kit like one shown on the left can be used to measure the following parameters within the respective ranges:

- Ammonia Nitrogen: 0.2-3.0 mg/l
- Nitrite: 0.05-0.8 mg/l
- pH: 5.0-10.0
- Alkalinity: 0-200 mg/l
- Carbon Dioxide: 0-50 mg/l
- Chloride: 0-200 mg/l
- Dissolved Oxygen: 0-10 mg/l
- Hardness: 0-200 mg/l
- Temperature: -5 to 45°C

*Refills can be acquired from the following individuals; Mr. John Walakira and Mr. Fred Nsimbi (see services list page 65).
C.2. Water Treatment

Alum

Alum is used to reduce turbidity from clay and algae suspended in water. It “clarifies” the water and is sometimes used to treat water for hatcheries. Alum is acid forming and can substantially reduce total alkalinity and pH. This makes alum unsuitable for use in ponds with low total alkalinity as it may lower pH to points where it is toxic to fish. Alum also reduces phosphorus in water. So prevent phytoplankton from developing.

Therefore, use of alum may necessitate liming if pH drops too low. Try alum in a small amount of water beforehand to determine how much total you will need.

Gypsum can also be used to reduce turbidity.

Zeolite

Zeolite is an effective means of reduces levels of ammonia dissolved in water. It is recommended for use in transportation tanks when undertaking distance live fish haulage.

Zeolite may be recharged several times by overnight immersion in a salt solution or oven drying. Zeolite is not effective in salt water.

Rock Salt (Magadi)

Rock salt is used like regular salt and is often cheaper. However, depending on the source, it can have different chemical makeup and possibly raise the pH too high. Know your rock salt before using it.

Suppliers: Both salts are available in the local markets

Salt

Salt is one the easiest and cheapest forms of medication available for freshwater fish. Salt (sodium chloride or NaCl) is safe for most species of fish. It can also be used in live fish transportation to reduce stress. It does not have to be iodized.
C.3. Pond Treatment

Agricultural lime

Agricultural lime is made of both a divalent base ($\text{CO}_3^{2-}$) and cation ($\text{Ca}^{2+}$), which increases both the alkalinity and hardness of the water. It also allows release of carbon (C) as a source of nutrients for phytoplankton and does not cause pH spikes so much as opposed to the builders and quick lime.

If pond waters or soils are located are either soft (< 20 ppm) and/or acidic (pH < 6), ponds should be limed with agricultural lime.

Suppliers: 1. Balton (U) limited
2. Some Agricultural Supply stores

Builders lime

Builders lime or “hydrated lime” is preferably used in the disinfection of ponds or other facilities. This is because when used, the pH level rise up sharply and after a while drop back down. When the objective of liming is to disinfect facilities, adequate amounts are added so as to raise the pH to 11. In so doing, wild fish, frogs, other potential disease agents and predators get destroyed.

*When liming empty ponds, ensure that the is spread uniformly over the entire pond bottom, paying extra attention to potential hiding places for predators.

This is more powerful than agricultural lime so less is needed if just fertilizing.

It can also be used to reduce the dissolved carbon dioxide in borehole water.

Note: always check pH before stocking your pond; especially if you have applied lime. If you cannot check pH, put a small container of “sentinel fish” in the pond first to see if they survive.
**Pond Fertilisers**

Pond fertilization can increase fish yields three to four times. Also fish will be in better condition. Fertilizers used in ponds stimulate the growth of algae and later zooplankton. These are food for fish. Algae also makes the water turn green, which helps to shade the pond bottom, preventing growth of weeds and filamentous algae. Phosphorus is usually the first limiting nutrient, followed by nitrogen. Fertilizers like NPK contain various amounts necessary nutrients while other fertilizers contain only one or two of these elements. Common fertilizer sources are normal super phosphate (SSP), triple superphosphate (TSP), diammonium phosphate (DAP) and Urea. The latter fertilizers are preferable for use in aquaculture because they allow the farmer selectively manage the specific nutrients that may be limiting in tilapia grow-out ponds and often contain more of the required N and P per kg than do the NPK fertilizers. All chemical fertilizers should be dissolved in water before distributing them round the pond. Overdosing with N-containing fertilizers can cause high ammonia and fish death.

**Diammonium Phosphate (DAP)**

DAP is a major source of phosphorus. It also contains some ammonia which is a nitrogen source. It is usually labelled as 18-46-0 meaning it is 18% N; 46% P<sub>2</sub>O<sub>5</sub>, (meaning 20% P) and no potassium.

**Suppliers:**
1. Balton (U) Ltd
2. Twiga chemicals (U) Ltd
3. Most agricultural supply stores

**Urea**

Urea primarily a source of nitrogen to the pond; generally 46% N. Urea dissolves very easily.

**Suppliers:**
1. Balton (U) Ltd
2. Twiga chemicals (U) Ltd
3. Most agricultural supply stores
Water Treatment

Potassium Permanganate

Potassium permanganate) is a strong oxidizer that works by oxidizing organic and inorganic materials. It is used as a disinfectant to treat drinking water and as a first line of treatment for ectopic bacterial infections. If fish are exposed to this chemical, they should not be consumed in the next 3 days.

**Suppliers:** School laboratory Supply Stores.

Copper Sulphate

Copper sulphate is used as an algacide and parasite treatment. Do not apply it to water if the alkalinity levels are below 30 ppm.

**Suppliers:** 1. Desbro (U) Ltd.

**Note on Use of chemicals:**
Use of any chemicals or medications is "at your own risk."
- Fish should ALWAYS be properly examined and diagnosed for disease by a licensed veterinarian or fish lab.
- ALWAYS double-check your chemical calculations and dosage rates.
- ONLY dose at rates prescribed by a licensed veterinarian or the manufacturer.
- NEVER mix chemicals or medications with other chemicals.
D. Feeds

Best results are obtained from feeding when:
1. Fish are given the correct feed of the right nutritional for their stage of development.
2. Production units are stocked based on their carrying capacity.
3. Water quality parameters within the production units are maintained within optimal ranges.
4. Fish are fed based on feeding response using the feeding chart only as a guide.
5. The person feeding the fish has been properly trained and doesn't waste feed.
6. Production units are harvested before they get to their carrying capacity.

Whenever you purchase a feed, check the label to ensure:
1. it is the right feed you are buying.
2. The manufacturing date: buy the most recent feed you can get because the quality, starts slowly deteriorating after it has left the factory. Preferably purchase feeds that are less than a month old from the date of manufacture.

On the farm, feed should be stored in a dry well ventilated from off the floor and away from walls. Do not store feeds:
1. under direct sunlight
2. In wet or humid premises.
3. Where rodents and other pests have access to the feed.
4. In a room with poisonous chemicals such as pesticides.

D.1. Larval and Fry Diets

Artemia

Artemia is a “live” food for newly hatched catfish larvae. Artemia are animals, tiny shrimp that are a good source of highly digestible protein and other nutrients that the larvae require during their early stages of development.

The quality of artemia varies. When purchasing artemia check the label on the tin for:
1. Hatchability % on the tin. Knowing the hatchability helps you estimate how much you should prepare each time you feed the larvae, as it is a cyst with the artemia inside that is nutritious. Empty cysts are of poor nutritional value to the larvae.
2. The average size of the cyst. This is because you do not want to get a species that is too large for the larvae to ingest. This can be estimated from the number of cysts/g given on the label.

Suppliers: 1. AquaConsult (U) Ltd
2. Balton (U) Ltd
Extruded Complete Diets for Catfish Larvae and Fry

Extruded Starter Diets for Catfish

RANAAN catfish hatchery feed comes in the following sizes (codes)

- **Code CS0** – Size, 0.2 – 0.3mm (Artemia replacement diet).
- **Code CS1** – Size, 0.3 – 0.5mm
- **Code CS2** – Size, 0.5 – 0.8mm
- **Code CS3** – Size, 0.8 – 1.2mm
- **Code CS4** – Size, 1.2 – 1.5mm

**Typical analysis**
- Crude Protein, 55%
- Crude Fat, 14%
- Crude Fibre 0.6%
- Ash, 9.5%
- With vitamins A, E, D₃, C

Supplier: Balton (U) Limited

Extruded Starter Diets for Catfish Fry and Fingerlings

RAANAN Fish Feed
- **Code 8785** feed of Size, 3.0mm.
  - This is the Pellet size suitable for catfish juveniles up to 200g

**Typical analysis**
- Crude Protein, 42%
- Crude Fat, 13%
- Crude Fibre 2.3%
- Ash, 5.8%
- With vitamins A, E, D₃, C

Supplier: Balton (U) Limited
Complete Sinking Diets for Tilapia and Catfish Nursery Pond Production

Source of Nile Fish Feed

SON fish feed is available in the following categories:
1. 45% Crude protein
2. 35% Crude protein
3. 30% Crude protein

The crumble sizes available on market are:
1. 2 mm
2. 3 mm
3. 4 mm

*SON feed requires booking and payment before delivery. Please give at least 10 days advance notice. All orders are confirmed upon payment. Up-country farmers can deposit payments into SON farmers account (see page 81).

*When making orders please specify crude protein percentage you require and crumble size.

All feeds with complete vitamin/mineral pack; including Stabilised Vitamin C.

UGACHICK Fish Starter

Fish Starter 36% Crude Protein, 3mm pellet size. Suitable for catfish up to 200g.

Note, due to equipment repair, 3 mm may not be available. Check first.

All feeds with complete vitamin/mineral pack; including Stabilised Vitamin C.

* For upcountry farmers, please book with our agent nearest to you in advance. This allows ship your consignment to you via our agents in time.
D.2. Grow-Out Fish Feeds (Sinking Commercial Pellets)

Source Of Nile Fish Feed

30% crude protein, 4 mm. You may request for a smaller size. Most suitable for use in fertilized tilapia grow-out ponds.

*SON feed requires booking and payment before delivery. Please give at least 10 days advance notice. All orders are confirmed upon payment. Up-country farmers can deposit payments into SON farmers account (see page 81).

All feeds with complete vitamin/mineral pack; including Stabilised Vitamin C.

**UGACHICK Fish Grower**

Fish Grower 30% Crude Protein, 5mm pellet size. Suitable for catfish growout.

All feeds with complete vitamin/mineral pack; including Stabilised Vitamin C.

* For upcountry farmers, please book with our agent nearest to you in advance. This allows ship your consignment to you via our agents in time.
D.3. Feeding Equipment

Automatic Belt Feeder

These are non electric. Operated on a mechanism similar to that of a rewinding clock.

They are suitable for use in hatcheries to feed juvenile fish in small tanks. Also used to dose in hydrated lime in hatcheries.

Automatic belt feeders are available in 12 and 24 hr settings. They work with powder feeds and can be used to provide continuous or intermittent feeding.

Multiple units needed in large tanks.

Demand Feeders

Demand feeders reduce feed wastage because feed is only released to the fish when they want to eat, depending on their appetite. They are very useful for feeding fish in cages, especially when sinking pellets are used.

Demand feeders are available in all sizes and can be locally fabricated on order (plastic and metallic).

These feeders work best when feed pellets of UNIFORM SIZES are used. Tilapia tend to play with demand feeders, so the feeder must be only filled with one meal at a time.

Suppliers: 1. Imported by Balton (U) Ltd.
2. Locally fabricated by:
   i. Mr. Mugenziomu (Ask at Aquaculture Management Consultants)
   ii. SoN, Ltd
E. Fry and Fingerlings

When purchasing fingerlings for stocking production units, ensure that:

1. They are of the correct size. It is recommended that stock for grow-out ponds (both tilapia and catfish) be above 10 g. If fish are smaller than 10 g they should be stocked into a nursery pond first, then transferred into a grow-out ponds. The survival rates of fish smaller than 10 g is poor in grow-out ponds because the fish are too small to compete with the predators and it is hard to train them on feed in such large ponds. Cages should be stocked with stockers of about 30-50g.

2. The fish are of the good quality, i.e. uniform size. No signs of physical abnormality or of stress. Such fish are likely to die soon after stocking. For tilapia, they should be from selected stocks.

3. Fry and fingerlings are transported to nursery or grow-out farms in tanks with aeration or polythene bags with oxygen. If not, the fish will have no access to oxygen when enroute, and will subsequently be exhausted and weak at stocking and so within a few days of stocking will die. Note that most fish that die in the pond do not come up to the surface. Therefore, one might only realise at final harvests when pond are drained, or cages completely harvested.

4. Purchase your fry or fingerling from hatcheries that follow Best Management Practices. This will ensure good quality—hence survival with safeguards against the introduction of diseases into your farm. Many farms offer tilapia but these are often old fingerlings or small adults.

5. Always book fingerlings at least three days in advance. This is to allow the hatchery or nursery to condition the fish for at least 48 hours before collection and transportation. Never transport fish that have not been conditioned because they shall be extremely stressed and are more likely to die enroute or soon after stocking. Therefore, DO NOT transport fish that have been harvested from a rearing pond or tank on that very day. You will be in for a loss.

E.1. Catfish Bait and Fingerlings

Make sure you only purchase good quality fingerlings.

Good quality fingerlings

Catfish Hatcheries:

- Kabeihura Farmers Ltd, Bushenyi
- Mpigi Fish Farm, Ltd., Mpigi town
- MUSO4 Fish Farm, Iganga
- Namuyenje Mixed Farm, Mukono
- Sun Fish Farm, Ltd, Kajjansi
- Tende Farm and Training Center (Garuga)
- Umoja Mixed Farm, Kakiri, on Hoima road

Bad quality fingerlings

- Missing tail
- White patches on body
E.2. Tilapia

Monosex Tilapia Fry and Fingerlings

(97% or more of the fish are male)

Male tilapia begin to grow faster than females after the first 3 months or so. Having more males in the pond reduces the amount of fry produced and prevents overcrowding.

It is best to use Selectively-bred tilapia to produce the all-male fry.

Suppliers:
1. All stages—SoN Fish Farm: Selectively bred
   This farm sells fry to outgrower nursery farms

Monosex Tilapia Nurserys (for fingerlings 10g+)
1. Mpigi Fish Farm, Ltd.
2. Umaja Fish Farm, Ltd
3. Namuyenge Mixed Farm
4. MuSO4-Fish Farm

Mixed Sex Tilapia Fingerlings

Many farms just take left-over fry from their production ponds and sell as “fingerlings”. There is a high likelihood that these fingerlings are from the slower-growing parents. We recommend that you source “selectively-bred” tilapia from SoN farm or from their nursery outgrower farmers listed below:

Suppliers:
1. Mpigi Fish Farm, Ltd.
2. MUSO4 Fish Farm.
3. Umaja Fish Farm, Ltd.
4. Kabeihura Farmers
5. Numuyenge Mixed Farm

Products Available at SoN:

<table>
<thead>
<tr>
<th>Weight (g)</th>
<th>Ush/Fish (prices 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>1-5</td>
<td>25</td>
</tr>
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<td>5-10</td>
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<td>40-50</td>
<td>250</td>
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<tr>
<td>50-100</td>
<td>500</td>
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</tbody>
</table>

Sizes: 1—10g suitable for Phase 3 tilapia production in secondary nursery ponds.
Sizes: 10—100g suitable for stocking Phase 4 and 5 tilapia grow-out facilities.
Sizes: 30-50 g suitable for stocking grow-out cages
E. Live Fish Transportation and Holding

Oxygen Gas, Cylinders, Regulators and Flow Meter
(see under oxygenation, pages 15-19)

It is also recommended that hatcheries have a functional oxygen unit as a back-up for use in production tanks in the event of power failure or when there is extra oxygen demand, e.g. when grading fish, packing fingerlings in bags or transporting for live transportation to other farms or during hatching in catfish hatcheries.

Tanks and Tubs

Tanks and tubs with a wide open mouth are preferable for live fish transportation because:
1. It is easier to scoop out the fish at destination,
2. Allows for a large surface area to be exposed to air which is handy when transporting adult catfish live, as they can obtain oxygen from air.
3. In emergency’s when the aeration system breaks down. Allow a large surface area from which fish can access atmospheric air.

Tanks used to transport fish live must have a cover to prevent fish jumping out and excessive water loss.

If one is transporting large catfish aeration may not be needed but the water level should not come all the way to the cover, as the fish will not be able to gulp air.

Polythene Tubing 300-400 gauge

Polythene tubing is used to pack fish for live transportation. Use about 350 gauge. Double the bag.

However, NOTE the following when purchasing a roll of plastic for transporting live fish:
1. That it has not been stored standing upright, but lying down,
2. It is not dragged across the floor.

If the roll is mishandled as above, then there will be many tiny holes made in the tubing through which oxygen will escape. Consequently, the tubing becomes useless for packing and transporting live fish as it will not be able to hold oxygen.

* Please use a gauge range recommended otherwise the bag will be too thin and shall easily puncture or it will be too thick to tie an air-tight knot.
Collapsible tank material (Tarpaulin)

The collapsible tank is very useful in temporary holding of fish e.g. during live fish sales and treatment. The tank requires a holding frame to keep it in shape and the frames as seen below can be locally made by any welder.

Suppliers: TARPO Industries (U) Ltd

Stand-Alone System

The stand-alone system is ideal for use by persons, (e.g. restaurants, farmers live-fish market stalls) who would like to hold fair amounts of their fish alive for some days.

The fish should not be fed during the holding time because it will generate wastes and will foul the water.

Depending on if power is available, water can be recirculated and aerated, or, an oxygen cylinder can be used to help keep tilapia and carp alive.

Market-size catfish do not need any aeration but they MUST be able to reach the surface to gulp air.

If no aeration is used, water should be changed once a day.

Always cover tanks, if just with a net. Fish jump out when you are not looking.
F. Harvesting and Holding Tools and Equipment

F.1. Netting Materials

A wide range of netting materials of different thickness (ply) mesh sizes are available on the local market. Netting material is used to make the various nets and cages used in aquaculture to harvest, rear or temporarily hold fish as well as make screens for production units. Selection of the type of material to be used depends on:
1. the purpose for which one to use it,
2. the size of fish that will be held,
3. the quantity of fish that is likely to be held by the net, and
4. the duration for which it is to be used.

**Brown Mukene Netting**

Suitable for making fry nets, hapas and cages for fry and fingerlings.

**Suppliers:** Store selling fishing supplies at Nakivubo Mews, Kampala

**Pond Seine Netting**

For making pond seine nets.

**Suppliers:** 1. Uganda Fishnet Manufacturers
May be hand-woven, see pg ..., under services list.

**White Fry Netting**

There are 2 types: nylon (sturdy) and polyester, which is cheap but tears very easily.

**Suppliers:** Store selling fishing supplies at Nakivubo Mews, Kampala.

**Hapa Material**

For making hapas for small fry.

**Suppliers:** Ask Aquaculture Management Consultants
F.2. **Materials for Mounting and Mending Cages and Nets**

**Twine**

Nylon twine is available in different sizes, based on the ply. More ply is thicker and stronger. It is used to mount, mend and weave nets. Select the specific ply based on that of the net or cage you intend to mend. When mounting a seine the twine should be same or lesser ply number than the mesh.

NOTE: some cheap twine may not be real nylon and will be very weak. Also, when the ply is written, it doesn’t always mean the same thing. One 12ply twine may be much thinner than another 12 ply.

Shops that sell illegal fishing gear often sell very poor quality or fake products.

**Suppliers:**
1. Uganda Fishnet Manufacturers
2. Fishery Shops at Nakivubo Mews
3. General hardware shops.

**Needles**

Used when weaving, mounting or mending nets or cages.

**Suppliers:**
1. Uganda Fishnet Manufacturers
2. Fishery Shops at Nakivubo Mews
3. General hardware shops.

**Floats:** 2 types: hollow plastic (cheaper) and solid polyurethene, which are more expensive.

**Suppliers:**
1. Fishery Shops at Nakivubo Mews

**Sinkers**

**Mud-lines:** made from old or defective gill net pieces; can also use old seine or cage material. Should be attached to lead line.

**Suppliers:** Uganda Fishnet Manufacturers, fishing gear shops at landing sites.
F.3. Nets

The following are the kinds of nets commonly used for harvesting aquaculture production units:

1. Pond seines
2. Cast nets
3. Scoop nets
4. Dip nets

**The Commercial Pond Seine Net**

The commercial pond seine is used to harvest ponds. The key features of this net are the bag and evenly weighted mud-line. The bag allows temporarily hold fish within the pond water which is least stressful and allows one the flexibility to undertake other activities in between seining. The weighted mud-line allows the net to glide over the pond bottom rather than dig down in the mud; hence less mud is got within the net mixed with the fish at seining. In addition, only two people are required to pull the seine even in large commercial grow-out ponds.

**Suppliers:** Uganda Fishnet Manufacturers, Other private makers; ask Aquaculture Management Consultants

The key features of the pond seine are:

- **Bag** that is essentially a cage fixed into the net. The bag prevents the fish seined from escaping and at the same time provides a facility for temporarily holding the fish caught in the seine with minimum stress within the pond while sampling or for market.

- **Float Line** that keep the top of the net just above the water level during seining and provide a guide as to where the net is.

- **The mud-line** that is made of thick but loosely braided old gill netting and sinkers. The sinkers are made of elongated lead weights fixed into the bottom rope spaced at close but uniform intervals. If the sinkers are too large and widely placed, the mud-line will not balance and shall either dig down or allow large openings in the bottom for fish to escape.

  The seines are treated with bitumen to make them last longer.
Cast Nets

Cast Nets are commonly used when sampling or harvesting a portion of fish from cages or large dams that are too deep to seine. In cages they allow one to sample without having to lift up and crowd fish in a corner of the cage which is stressful to the fish.

Suppliers: Fishery Stores at Nakivubo Mews, Kampala.

Monofilament CASTNETS ARE ILLEGAL FISHING GEAR FOR THE LAKES.

Scoop Nets

Scoop nets are used to harvest and transfer small amounts of fish at a time from units. They come in various sizes. Select the appropriate size made of the appropriate material based in the size of production unit you intend to use it in, the size of fish and amount likely to be held in the net each time. They are also useful for removing floating debris; feed left over, or dead fish from production units.

A good scoop-net should be ONLY deep enough to allow fish be comfortably held. If too deep, fragile fish at the bottom will get squashed. Having a double lipped frame protects the netting at the edge from tear as this part of the net often abrades against the surface of the production unit during harvesting. A piece of plastic tubing can also protect the leading edge of the net. The frames and handle of the scoop net are often made of plastic-coated metal. The handles can additionally be made of wood.

Aquaria and Hatchery Scoop Nets

Come in assorted size ranges and materials depending on the size of fish you are handling.

Suppliers: 1. Balton (U) Ltd.  
2. Pet Shops dealing in Aquaria
The Industrial Scoop Net

An industrial scoop net is used to harvest up to 35 kg of table size fish from units.

Note the:
(i) double lip, to prevent damage to the net when pushed against concrete tank bottom
(ii) ‘lift’ attached to the edge of the handle that makes it easier to lift heavy weights, and
(iii) the knot and ring at the bottom that enables one to more easily tip the fish out of the net.

These scoop nets are most useful for removing fish from the bag of a seine, or from tanks. NOTE: Not to be used on fingerlings as the stiff mesh can damage the fishes skin and remove scales.

Suppliers: Mugoya Metal Works, Iganga

F.4. Holding and Rearing Facilities

Cages

Cages can be used as rearing facilities to produce fish in water bodies. They can also be used as holding fish temporarily in production units.

Stiff PVC Coated Net Cage

Stiff cages suitable for holding fish temporarily in ponds. They can be placed at the bottom of the pond. The PVC coating makes them non-abrasive to the fish and rust proof.

Similar material can be obtained from Roofings Ltd. on order basis. IF galvanized is possible, it is recommended. Coating with bitumen used for water tanks is also a good idea if PVC coating is not possible.

Suppliers: Material supplied by Roofings Ltd. For fabrication see pg 64, Services.
**Soft Net Cage**

These soft cages are popular for cage fish farming in lakes and reservoirs. They are made of nylon, 24-ply and heat-treated and stretched to set the knots. After assembly, they are dipped in bitumen to protect the nylon from degradation by sunlight. Attached to a frame, a cage of 1X1 m² is capable of holding up to 180kg of fish. Fish must be “conditioned” according to the directions in the cage culture manual; otherwise they will not survive in a cage. Covers and frames are a “MUST”.

**Suppliers:** Uganda Fishnet Manufacturers

Typical cage sizes are 1x1x1 and 2x2x2 meters. Order in advance.

**Collapsible Cages**

The collapsible cage is portable, can be easily disassembled. It has a cover that is easily opened and reclosed with a draw-string, sinker and float ring. Suitable for temporary holding of live fish in large water bodies, like lakes, water reservoirs. Remember to anchor it or tie it to something when you set it in a large water body, or the fish will swim it away.

**Suppliers:** Aquaculture Management Consultants, Ltd.
Mounted Cages for Fish Production in Lakes

When cages are placed in the lake or reservoir they need to be attached to a raft so that they remain suspended in water. The cage therefore is attached to a frame, to which frame there are both floats and sinkers. Several cages can then be rigged together.

Suppliers: 1. SoN (U) Ltd
• Aquaculture Management Consultants (David, Rashid)

Hapas

Hapas are small fine mesh net enclosures used in hatcheries to hold or rear juvenile fish.

Hapas are an efficient method of collecting and raising and dispatch of fry easy than in ponds.

Made by: SoN Fish Farm.

For information and contact on Cage Making, Mounting and Mending (services) Hapa Sewing (services) See under section II on services, page 64.

‘Dead-Men’

‘Dead-men’ are used to hold nets, hapas and cages in their functional position. They help save labour and make it possible for one person to do a job that would otherwise require up to three.

Made and Supplied by
: Mugoya Metal Works, Iganga

The picture shows the bag of the commercial pond seine being hooked up onto ‘dead-men’ in order to hold the fish seined within the bag.
G. Pond Construction Tools

Compactors

Hand compactors are made of heavy metal plate attached to a steel rod. They are the best alternative for manual compaction of small size ponds. They are also used to compact areas where other compactors cannot operate, like inside core trenches.

No maintenance costs required.

Supplier: Mugoya Metal Works, Iganga

Motorised Compactors

There are several kinds of motorised compactors on market for use. Most are diesel powered and require regular servicing and maintenance. These compactors are most efficient on flat surfaces that are not water logged. They help save time in compaction compared to hand compactors.

It is advised that an experienced person runs the motorised compactor; or first get basic training from the supplier on its proper use and maintenance.

Suppliers: 1. MANTRAC
           2. Terrain Plant (U) Limited
           3. Second hand sales, Katwe

'Sheeps Foot Packer

This sheep's foot packer is designed for compaction of pond levees. Works efficiently even on soils with a high clay content. It can be attached to walking tractor or oxen to pull it. Also has a seat for the operator. The compactor itself requires minimum maintenance.

Supplier: AEATREC, Namalere
Fabricated by AEATREC, Namalere. Produced on order.
Walking Tractor

The walking tractor is a pulling force for the sheep’s foot packer. It can additionally have fittings adapted, notably:

- cart for transportation of live fish and other farm materials
- in emergencies, to power DC blowers.

Supplier: Agro Sokoni

Surveying

It is important to have the levels taken on proposed fish farms before construction begins. This is because water must flow on fish farms, and preferably on gravity. Using pumps can be costly. There must be a smooth flow of water right from the water source, through to the production units, and out to the drainage. Taking one’s levels before starting pond construction, also helps reduce construction costs significantly because one knows before hand how far they should excavate and where to place earth.

Automatic Surveying Levels

Suppliers: 1. MechTools (U) Ltd
For hire a professional services in fish farm planning, see services...
**Line levels**

Line levels, or other hand levels are an essential and inexpensive tool during pond construction. When used correctly, the enable one obtain correct slopes of levees and pond bottom as well as the height of the levees. Works best with a string at 5-meter intervals.

**Suppliers:** Any General Hardware Store selling construction materials.

**Tape Measures**

An assortment of tape measures are available on the local market.

**Suppliers:** Any General Hardware Store selling construction materials.

**Other General Pond Construction Tools**

An assortment basic tools used in pond construction

**Suppliers:** General Hardware Stores
H. General Supplies

Chest Waders

Chest waders are water proof boots and overalls integrated into one outfit for getting into and working within fish ponds.

It is hygienic, avoids the inconvenience of getting in contact with water and mud and keeps workers safe from parasites such as leeches.

However, they can be very hot so should not be worn outside the water.

Supplier: 1. Balton (U) Ltd.
2. Locally made by TARPO (U) Ltd, on order.
Dam Liner Material

Dam liner material is a 1mm thick HDPE UV resistant sheet used in the construction of water holding tanks and reservoirs. It can be used to line earthen ponds whose soil sub-strata is porous so as to minimize water loss through seepage. This material also provides flexible and economical solution to hatchery tank construction.

It’s other attributes include its property of absorbing heat faster due to its black colour and taking longer to lose this heat due to its insulating characteristics. This helps maintain optimum water temperatures for fry and fingerlings longer into the night, thus, reducing energy costs of heating water.

It has a high resistance to wear and tear due to its chemical properties and thickness, including degradation by UV rays from sunlight.

Supplier: Balton (U) Ltd
Supplied in in rolls of 6.6m wide x 200m long = 1320 Sq.m. It can be sold in pieces less than a roll depending on the farmers needs.

* Balton also does installation for both tanks and ponds

Fish Baskets

Fish baskets are extremely useful for temporary holding of fish in water during sampling or transportation, as well as for carrying harvests.

Supplier: 1. God is Able Shop
2. Some vendors that carry plastics made in Kenya.
Green House Plastic

Green House Plastic enhances the inside hatchery microclimate by accelerating temperature gain by day and retarding temperature loss by night. Consequently, it greatly helps reduce temperature shocks caused by the drastic day time–night time temperature fluctuations.

It is available in rolls of:
- 4m wide x 83m long
- 5.5m wide x 83m long
- 6.9m wide x 83m long
- 8m wide x 83m long

A Catfish Hatchery Built out of Green House Plastic

Supplied and Installed by: Balton (U) Ltd.

Mulch Film

An opaque plastic film that cuts off light from the outside, providing the dark environment preferred by catfish fry.

It may be black on both sides or black on one side and silver on the other side, in which case the black side is put facing the outside (to attract heat) and the silver side facing inside (to reflect back into the hatchery any heat that tries to escape). So when used in combination with green house plastic, it boosts the hatchery microclimate.

Supplier: Balton (U) Ltd.

NB: It is important to first measure the surface area to be covered (the sides, the roof and any other components as per hatchery design) so as to establish which roll would be the most economical to buy.

Good plastic is treated to resist UV rays.
Shade cloth

Black netting material that comes in different shade percentages i.e. mesh sizes that can be used as ventilator mesh in hatcheries or as cage tops in cage farming. This material also takes advantage of its black colour to favour catfish’s preference for dark environments.

The advantage of shading production units, notably tanks and cages, is that once fish are kept under diffuse light, it helps keeps them calm. This reduces the stress levels in the unit. In addition, for cages, it keeps off birds that may scare the fish, thus stressing them or even predate upon the fish.

**Supplied by:** Balton (U) Ltd

Comes in rolls of 6m wide x 100m long = 600 square meters. Sometimes sold at Game, in Lugogo.

Can be sold in length pieces less than a roll. Different shade percentages cost different prices at Balton (U) Ltd.

- 50% 1.69 USD/m²
- 70% 2.13 USD/m²
- 90% 2.48 USD/m²

Water Proofing mix for Cement

Concrete is by nature porous. Therefore, for surfaces that are exposed to water, it is important to make the exposed surface water tight. Hence water-proof cement is recommended when constructing concrete tanks, raceways, etc.; especially in the plastering.

It is a white powder that is mixed in with the cement.

This is also known as “hydrofuge” in francophone countries.
Weighing Balances

Flat Bed Weigh Balances

Supplier: 1. Magric (U) Ltd, 2. JOSI Engineering Ltd.

Spring Balances

Supplier: 1. Magric (U) Ltd, 2. JOSI Engineering Ltd. 3. General hardware Shops

A variety of weigh balances are available for use on the local market. Select based on your intended load, reason for use—within hatchery or grow-out. Consideration should also be given as to whether it intend to use the weigh balance indoors or outdoors.

Kitchen Scales

Suppliers: Most supermarkets

Laboratory Weigh Balances

Maximum 200g, 0.00 sensitivity for hatchery

Supplier: BDH laboratories
Laboratory glassware

Graduated cylinders, beakers, pipettes, mortar and pestle, petri-dishes, reagent bottles, etc for hatchery use. These are used in breeding and treatment, for collecting, measuring and storage of samples.

Supplier: Most School laboratory supply shops

Powering Fish Farm Equipment

12V Batteries for DC Supply Units and Systems

Uganda Batteries ltd supplies lead acid batteries for power backup and solar systems. 12 V DC batteries can be used in remote areas either individually or in combination with solar installations to power pumping, heating, lighting and aeration systems.

12V DC batteries from Uganda Batteries come with a 12 month warranty.

Regular auto batteries can only be discharged to 50%. Deep cycle batteries can discharge to 80%. Batteries are rated by the total power they can store in terms of amp-hours.

Supplier: 1. Uganda Battery Ltd
2. UltraTec, and many other solar energy suppliers

Solar systems and equipment

Solar power is a one time cost solution for sourcing power in areas with no access to the grid or as a standby option. Solar power can be used to heat water, power small pumps, to power blowers, etc.

I. Other Hatchery Inputs

Aquaria and their Accessories

Air Stones
(see under aeration on page 10)

Aquarium Filters

Easy to clean submersible aquarium filters suitable for small aquaria. They can be mounted vertically or horizontally.

Aquarium Pumps

These are designed for extremely quiet operation. High-quality air pumps can be used in small tanks or aquaria. They work with a range of diffusers and can be used in a hatchery for intermittent use.

Automatic Back up Air pump

Some air pump is for emergency backup air in hatcheries, aquariums, small tanks and even for transporting fish, as it has its own battery. When the power shuts off, the pump automatically switches over to its battery backup and continues to run for several hours or until power is restored. It utilizes a 6V rechargeable battery that is easily accessible.

Aquarium Heaters

Heaters are helpful during on cold days for maintaining water temperature aquaria and hatchery tanks. Typical temperature settings controlled by a dial range from 18-34 ºC. The heater should be mounted in water in vertical position only.

*Care should be taken when handling electric equipment under water.

Suppliers of Aquarium Pumps and Heaters: Pets Alley Ltd., other Pet Stores.
Aquarium Tanks and Ornamental Fish

Suppliers Ornamental fish and Aquaria:
1. African Bulldozers (Kenya)
2. Pets Alley Ltd.
3. Umoja Fish Farm Ltd

Ornamental Fish Feed

Suppliers: 1. Pets Alley Ltd.

Ornamental aquaria require monthly servicing to ensure air pumps, air filters are in good condition. These pieces of equipment help maintain good water quality within the tank.

For aquaria servicing, see page...
For other accessories can be ordered using information on page 42.
Bio-filter material

The bio-filter media is a surface-providing media for attachment of micro-organisms that convert toxic soluble metabolic wastes (mainly ammonia) into less toxic forms. The material is used in bio-filters in catfish hatcheries that re-circulate their water. True biofiltration is extremely difficult to manage. It requires constant power for recirculation AND continuous production with no stopping and restarting during the year. A solids-removal system is highly recommended to be installed before the biofilter.

Frequent water quality checks are a necessity for systems based upon biofiltration.

Both sinking and floating media are available. Biofilters can be made with either or a combination of both depending on water dynamics within the biofilter.

The more bumps and nooks and crannies on the surface, the more surface area is created.

**Suppliers:** Plastic Recycling Industries Ltd.
**Hatching Jars**

Hatching jars are used to hatch eggs. A good hatching jar allows for effective water exchange, air distribution as well as having the ability to keep the eggs uniformly distributed within the water column. These attributes are influenced by features such as their shape, the size and location of entry and exit points for water and air. Water flow rate and pressure from distributor points also matter. The advantage of hatching jars is that they take up minimum space. Because they have a smaller surface area, heat loss where one is attempting to regulate temperature is lower compared to a hatching eggs from a hatching trough.

**Artemia Hatching Jars**

Conical shaped jar. The hatching process takes place under vigorous aeration and intensive lighting. An large empty mineral water bottle can be improvised.

Do not use diffusers or fine airstones for hatching artemia as the small bubbles will harm them. Big bubbles are preferred.

**Suppliers:** Balton (U) Ltd.

**McDonald Jars**

McDonald jars are used for hatching eggs. In the catfish hatcheries they can be set up in a tank or trough of warm water. The warm water is then re-circulated through the jar. In this way much less water needs to be heated and it is easier to maintain water temperature during incubation.

The catfish eggs though have to remain in suspension within the jar during hatching. Therefore, they must be treated after fertilisation to stop them sticking to each other and surfaces and water flow must be constant.

**Suppliers:** Balton (U) Ltd.

**Hatching Trays**

Can easily be made by wrapping hapa material around a frame.
Fish Graders
Fish graders work like a sieve and are used to separate out fish according to size. Commonly, a set comprises a frame, the grader box to which grader bars of different sizes can be attached. The size of the grader bar reflects the distance in between the individual bars. The spacing in between bars by most manufacturers is given in millimetres or fractions of an inch and it should be equidistant otherwise it won't work properly. Grading fish is extremely important as it enables one maintain uniform fish sizes in production units to control cannibalism and for quality control.

Adjustable Fish Grader

Supplier: Balton (U) Ltd.

Convertible Fish Graders

Supplier: Balton (U) Ltd.

Improvised Graders

Suppliers: Any supermarket or grocery
This one was found at Quality Supermarket

Very convenient. Only one grader is required to sort all sizes of fish. The spacing between the bars is adjusted with a lever.

Convertible graders require one to have the different sizes of grader bars. These can be removed and fitted within the frame depending on the size of fish required. They may be made of steel or fibreglass.

Simple household plastic containers can be used. However, make sure that the spacing all around is equidistant. To make it functional, one will have to make a float on which to mount the grader. Easiest is to use PVC pipe; filled with broken polystyrene

Float ring
**Graph Paper, laminated** (for measuring very small fish)

Useful for making larvae, fry and egg counts as well as for estimating their dimensions.

Use a plastic petri dish, over the paper, to hold your sample to measure or count.

The paper shown at left is graduated in 2 mm squares; each large square being 1 cm (10 mm).

**Supplier:** 1. Any bookshop selling school supplies
   *Laminate the paper yourself at commercial establishments or enclose the graph paper in transparent plastic sheet.
   2. Tony/Moses/David
      (Aquaculture Management Consultants)

**Fish Measuring Board**

Fibre glass coated wooden fish measuring boards. Made to customers specifications. For measuring fingerlings and larger fish. When a scale is not on hand, and you wish to know the weight of a fish, you can measure the total length and refer to a chart to estimate its weight.

FISH training manuals will have some weight-length relationships for catfish and for tilapia.

**Fabricated by:** David, Moses, Tony
(Aquaculture Management Consultants)
Sorting and Grading Table

Made locally from timber and dam-liner sheet. Any smooth water proof sheeting can be used to line the wooden surface. The two front holes help in separating the desired and undesired sizes whilst draining the table.

A grading table should always be wet when in use and non abrasive to the fish.

Supplier: Any carpenter

Siphon Screens

A siphon screen allows one to siphon out debris from tanks containing young larvae without removing the larvae in the process, if the debris is SMALLER than the larvae.

However, if the debris is the same size as the larvae, you have a problem. A well-trained hatchery manager knows how to resolve this problem.

The screen also allows a person to drain down a tank by siphoning without sucking up small fish.

Fabricated by: Umoja Fish Farm, FTI, David, Moses,

Fish Packaging Material

Proper packaging of fish products improves their shelf life, marketability and value. Different materials are available on the market ranging from paper bags, plastic bags and Styrofoam boxes. There is always need for labelling and branding of fish products and this can be achieved by custom made packaging material.

Labels may be printed by supplier or a printer.

*Remember to pay attention to hygiene when packing fish because it is a highly perishable commodity.

Suppliers: Medipoint Group

Polybag

Styrofoam pack
PART II

LIST OF SERVICE PROVIDERS

Indoors catfish rearing tanks at Sunfish Farms, Kajjansi.

NaFIRRI (Jinja) research officers analyze water chemistry, phytoplankton and zooplankton, and benthos.

Home-made degassing tower reduces the dissolved CO₂ in spring water that feeds the hatchery.

A well-stocked cabinet in the hatchery at Kabei-hura Farmers.
## A. FARMS AND INFRASTRUCTURE DEVELOPMENT

<table>
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<tr>
<th>Service</th>
<th>Provider</th>
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</thead>
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<tr>
<td><strong>Fish Farm Site Assessment and Development</strong></td>
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</tr>
<tr>
<td>Surveying and Mapping</td>
<td>• Aquaculture Management Consultants</td>
</tr>
<tr>
<td></td>
<td>• NARO, AEATREC (Namalere)</td>
</tr>
<tr>
<td>Land Based Fish Farm Planning and Design</td>
<td>• Aquaculture Management Consultants</td>
</tr>
<tr>
<td></td>
<td>• NARO, AEATREC (Namalere)</td>
</tr>
<tr>
<td>Assessment of Water Availability and Harnessing Water for Land-Based Fish Farms</td>
<td>• Aquaculture Management Consultants</td>
</tr>
<tr>
<td></td>
<td>• NARO, AEATREC (Namalere)</td>
</tr>
<tr>
<td>Fish Hatchery Design, Installations and Set-Up</td>
<td>• Aquaculture Management Consultants</td>
</tr>
<tr>
<td></td>
<td>• Balton (U) Ltd</td>
</tr>
<tr>
<td><strong>Cage Farms</strong></td>
<td></td>
</tr>
<tr>
<td>Cage Farm Siting and Set-Up</td>
<td>• Aquaculture Management Consultants</td>
</tr>
<tr>
<td></td>
<td>Also see part C: water testing services</td>
</tr>
<tr>
<td><strong>Watch for the next fish farming manual on cage culture, to come out in mid-2009.</strong></td>
<td></td>
</tr>
<tr>
<td>Cage Mending</td>
<td>• Aquaculture Management Consultants (will give current names of menders)</td>
</tr>
<tr>
<td>Fabrication of Cage frames</td>
<td>• SoN Fish Farm</td>
</tr>
<tr>
<td></td>
<td>• Aquaculture Management Consultants</td>
</tr>
<tr>
<td><strong>Pond Construction and Rehabilitation</strong></td>
<td></td>
</tr>
<tr>
<td>Pond construction and rehabilitation</td>
<td>• Aquaculture Management Consultants</td>
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<tr>
<td></td>
<td>• Blessed Investments, Ltd</td>
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<tr>
<td></td>
<td>• Emma Mbulameri (Iganga Fish Farmers)</td>
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<tr>
<td></td>
<td>• WAFICOS (via Mpigi Fish Farm)</td>
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<tr>
<td></td>
<td>• African Bulldozers</td>
</tr>
<tr>
<td>Water Reservoirs</td>
<td>• AEATREC, Namalere</td>
</tr>
<tr>
<td></td>
<td>• Balton (U) Ltd</td>
</tr>
<tr>
<td></td>
<td>• Blessed Investments, Ltd</td>
</tr>
<tr>
<td>Advisory services on pond repair</td>
<td>• Aquaculture Management Consultants</td>
</tr>
<tr>
<td></td>
<td>• Emma Mbulameri (Iganga Fish Farmers)</td>
</tr>
<tr>
<td></td>
<td>• WAFICOS (thru Mpigi Fish Farm)</td>
</tr>
<tr>
<td>Hire of hand compactors</td>
<td>• Iganga Fish Farmers Association</td>
</tr>
<tr>
<td></td>
<td>• WAFICOS</td>
</tr>
<tr>
<td>Hire of motorised compactors</td>
<td>• WAFICOS</td>
</tr>
<tr>
<td></td>
<td>• Business hiring out construction equipment</td>
</tr>
<tr>
<td><strong>Other, Production Units</strong></td>
<td></td>
</tr>
<tr>
<td>Dam lining tanks, ponds, reservoirs</td>
<td>• Balton (U) Ltd</td>
</tr>
<tr>
<td></td>
<td>• African Bulldozers</td>
</tr>
<tr>
<td>Hapa making and mending</td>
<td>• Ask Aquaculture Management Consultants</td>
</tr>
<tr>
<td><strong>Green House Hatchery Design and Installation</strong></td>
<td>• Balton (U) Ltd</td>
</tr>
</tbody>
</table>
### B. SAMPLING, HARVESTING AND MARKETING SERVICES

**Grow-out Sampling and Harvesting Services**

<table>
<thead>
<tr>
<th>Service</th>
<th>Provider</th>
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</thead>
<tbody>
<tr>
<td>Hire of pond seine and cast nets</td>
<td>Iganga Fish Farmers Association, WAFICOS, ARDC Kajjansi</td>
</tr>
<tr>
<td>Hire of weigh balances</td>
<td>WAFICOS, Iganga Fish Farmers Association</td>
</tr>
<tr>
<td>Hire of fish Baskets</td>
<td>WAFICOS</td>
</tr>
<tr>
<td>Hire of seining crews</td>
<td>WAFICOS</td>
</tr>
<tr>
<td>Hire of pond holding cages</td>
<td>Iganga Fish Farmer Association, WAFICOS</td>
</tr>
</tbody>
</table>

**Live Fish Transportation**

<table>
<thead>
<tr>
<th>Service</th>
<th>Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hire of transport tanks, with or without oxygen or other aeration</td>
<td>WAFICOS (tanks based at 4 locations), Iganga Fish Farmers Association</td>
</tr>
<tr>
<td>Hire of pick-up for transportation and delivery of farmed fish to markets</td>
<td>WAFICOS</td>
</tr>
<tr>
<td>Assembly of tank sets for live fish transportation</td>
<td>WAFICOS, Aquaculture Management Consultants (junior staff)</td>
</tr>
</tbody>
</table>

**Table Fish Products: suppliers**

**Catfish**

- *Whole catfish*  
  - WAFICOS*  
  *for bulk orders and live fish sales*

- *Fresh catfish fillets*  
  - Edhron Fish Farm

- *Frozen catfish fillets*  
  - Edhron Fish Farm  
  - Ugachick

- *Smoked whole catfish*  
  - Edhron Fish Farm  
  - Samarieza Fish Farm

- *Smoked catfish fillets*  
  - Edhron Fish Farm

**Tilapia**

**Whole tilapia**  
- WAFICOS—for bulk orders and live fish sales  
- SoN (U) Ltd, Jinja - bulk and retail  
- Namuyenge Mixed Farm

**NB:** Whole fresh catfish and tilapia can also be purchased directly from individual fish farmers

**Other Marketing Services**

- Aquaculture Management Consultants (Rashid)  
- WAFICOS
### C. WATER QUALITY MANAGEMENT

#### Water Quality Testing

**Analysis of Water Quality for New Sites**
- Directorate of Water Development, Main Chemistry Laboratory, Entebbe.
- NAFIRRI, Jinja
- National Water and Sewerage Corporation.

**Hire of Aquaculture test kits**
- Iganga Fish Farmers Association
- WAFICOS

**Hire of oxygen meters**
- Iganga Fish Farmers Association
- WAFICOS

#### Aeration

**Installation of blowers**
- Aquaculture Management Consultants
- Balton (U) Ltd

**Fabrication and Installation of Bubble Jet Pond Aerator**
- Aquaculture Management Consultants
- AEATRIC, Namalere
- Balton (U) Ltd

**Aeration plumbing for hatcheries**
- Aquaculture Management Consultants
- Umoja Mixed Farm (Patrick)

#### Servicing of Water Quality Equipment and Tools

**Aquaculture test kit refills**
- Fred Musimbi, John Walakira, ARDC Kajjansi
- Wagtech

**Servicing oxygen meters**
- Aquaculture Management Consultants
- Balton (U) Ltd.
- Mpigi Fish Far

**Servicing and Re-calibration of pH Meters**
- Aquaculture Management Consultants
- Fred Musimbi, ARDC Kajjansi

**Servicing regenerative air blower—(filters)**
- Aquaculture Management Consultants
- Balton (U) Ltd.
- Mpigi Fish Farm; Paul Ssebinyansi

### D. SERVICING AND REPAIRS OF OTHER FARM EQUIPMENT AND TOOLS

**Automatic belt feeders**
- Aquaculture Management Consultants

**Weigh balances**
1. MAGRIC (U) Ltd.
2. JOSI Engineering, Ltd.
<table>
<thead>
<tr>
<th>SERVICE</th>
<th>PROVIDER</th>
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</thead>
<tbody>
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<td><strong>E. FISH HEALTH MANAGEMENT</strong></td>
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<tr>
<td>Clinical Services</td>
<td>• Aquaculture Management Consultants</td>
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<tr>
<td></td>
<td>• ARDC-Kajjansi (Walakira, Fred, Martin)</td>
</tr>
<tr>
<td></td>
<td>• Faculty of Veterinary Medicine, WARM</td>
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<tr>
<td>Fish Disease Laboratory Diagnostic Services</td>
<td>• Faculty of Veterinary Medicine, WARM/</td>
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<tr>
<td></td>
<td>Microbiology Dept</td>
</tr>
<tr>
<td></td>
<td>• Animal Diagnostic Lab, Entebbe</td>
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<td><strong>F. OTHER ADVISORY AND TRAINING SERVICES</strong></td>
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<tr>
<td>Enterprise Development and Business Advisory</td>
<td>• Aquaculture Management Consultants</td>
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<tr>
<td>Services</td>
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<tr>
<td>On-Farm Catfish Hatchery Production and</td>
<td>• SunFish Farm Ltd</td>
</tr>
<tr>
<td>Management (live-in training)</td>
<td>• .</td>
</tr>
<tr>
<td></td>
<td>• Mpigi Fish Farm, Ltd.</td>
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<tr>
<td></td>
<td>• MUSO4 Ltd.</td>
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<tr>
<td></td>
<td>• Umoja Fish Farm, Limited</td>
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<tr>
<td>On-Farm tilapia Nursery Production and</td>
<td>• SoN Ltd.</td>
</tr>
<tr>
<td>management</td>
<td></td>
</tr>
<tr>
<td>On-Farm Commercial Grow-out Fish Farm</td>
<td>• Blessed Investments, Ltd. (ponds and</td>
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<tr>
<td>Management</td>
<td>cages, tilapia and catfish)</td>
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<tr>
<td></td>
<td>• Aquaculture Management Consultants</td>
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<tr>
<td>Practical Pond Construction Training</td>
<td>• Mpigi Fish Farm</td>
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<td></td>
<td>• Aquaculture Management Consultants</td>
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<tr>
<td>Handling and packaging fish products for</td>
<td>• Aquaculture Management Consultants</td>
</tr>
<tr>
<td>market</td>
<td>• Faculty of Food Technology, Makerere</td>
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<td></td>
<td>University.</td>
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<tr>
<td>Fish Smoking Training</td>
<td>• Edhron Fish Farm</td>
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<td></td>
<td>• Fisheries Training Institute, Entebbe</td>
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<td>• Aquaculture Management Consultants</td>
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<td></td>
<td>• Faculty of Food Technology, Makerere</td>
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<td></td>
<td>University.</td>
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### H. GOVERNMENT SERVICES

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<tbody>
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<td>Animal Health and Pharmaceuticals</td>
<td>Ministry of Agriculture Animal Industry and Fisheries and National Drug Authority</td>
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<tr>
<td><strong>Aquaculture Permits:</strong></td>
<td>Ministry of Agriculture Animal Industry and Fisheries, Fisheries Resources Department, Entebbe.</td>
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<tr>
<td>• Aquaculture Establishment Certificate</td>
<td>Consult: Local District Fisheries Officers</td>
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<td>• Seed Production Certificate</td>
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<td>• Fish transfer Permits</td>
<td></td>
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<td>• Fish import/export permits</td>
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<td>• Permission to conduct cage culture</td>
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<tr>
<td>Aquaculture Research</td>
<td>National Agricultural Research Organisation, Aquaculture Research and Development Center, Kajanshi</td>
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<td>Environmental Impact Assessments</td>
<td>NEMA</td>
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<td>• Certificate of approval of EIA's</td>
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<tr>
<td>Handling Problem Wild Animals and Vermin control</td>
<td>Uganda Wildlife Authority</td>
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<tr>
<td>• translocation of problem wild animals</td>
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</tr>
<tr>
<td>Introduction of Genetic Material</td>
<td>Uganda National Council of Science and Technology</td>
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<tr>
<td>• certificate</td>
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<tr>
<td>Water Harnessing and Use, Permits</td>
<td>Directorate of Water Development</td>
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<td>• Borehole drilling permits</td>
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<tr>
<td>• Surface water permits</td>
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<tr>
<td>• Water discharge permits</td>
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</tbody>
</table>
PART III

CONTACTS OF AVAILABLE SUPPLIERS AND SERVICE PROVIDERS

Special thanks to: Maurice Ssebisubi, David Edadu, Moses Mukembo and Tony Omara for their field work to collect supplier addresses and other information.

For changes or additions to be included in the next edition, contact Dr Nelly at AMC or send an e-mail to: ugandafish@gmail.com

Note that consultants will be vetted by farmers groups before being listed.

The WRONG way to screen a standpipe. The total surface area that allows water to pass is small and this screen risks getting blocked, thus causing the pond to overflow.

Inlets screened this way (above, left) are also likely to be blocked quickly. A “filter sock” as shown below is better.

A much better way to screen a standpipe is shown at right. The total surface area that allows water to pass is much greater, and this screen is much less likely to get clogged. When you clean debris from a screen: DO NOT throw it back into the pond.
<table>
<thead>
<tr>
<th>COMPANY</th>
<th>ADDRESS</th>
<th>ABOUT US</th>
</tr>
</thead>
</table>
| **Aquaculture Management Consultants Ltd.** | Plot 2D Nakasero Hill Road. P.O. Box 20044 Kampala Telephone: +256 312 279911 +256 782 728028 +256 782 728027 +256 783 185981 Email: a.m.consult.ltd@gmail.com | A group of senior and junior fish farming specialists  
  • Farm planning, design and construction supervision  
  • Water quality advising  
  • Fish health management  
  • Training programs for farmers, students,  
  • Fish farming supplies and gear |
| **African bulldozers** | P.O Box 218 Sagana, Central Province, Kenya. Tel: +254 772-899904 Email: afridozers@yahoo.com | Pond construction contractors  
  Installation of pond liners  
  Aquarium-making  
  Ornamental fish suppliers |
| **Agro Sokoni Ltd.** | Plot 15/17, Nasser Rd. P.O.Box 22793, Kampala Tel: +256 414-257445 +256 772-496222 Fax: +256 414-344703 | Dealers in Diesel engines, Rice hullers, Maize mills and machinery repairs, generators. Also Distributors of known brands like Vee Belt Lister Petter, spares, Water pumps, and motors and starters plus many more agricultural handy tools and machinery. |
| **Balton Uganda Ltd.** | Plot 47/51 Mulwana Road Industrial Area P.O Box 852, Kampala, Uganda Tel: + 256 312-502300 Fax: + 256 414-255 853 Email: balton@balton.co.ug http://www.baltoncp.com | • Agricultural technical services and backstopping.  
  • Agricultural inputs,  
  • Irrigation equipment and services,  
  • Horticultural inputs and services.  
  • Public health services  
  • Aquaculture planning services. |
| **BDH Laboratory Supplies Ltd** | Plot 7 Bombo Road Opposite Kobil Petrol Station P.O. Box 2716 Kampala (U) Tel: + 256 414-344730 Tel: + 256 414-344730 /348695 Fax: + 256 414-349293 E-mail: bdhlab@utlonline.co.ug | • Laboratory supplies  
  • Lab scales  
  • Chemicals |
<table>
<thead>
<tr>
<th>COMPANY</th>
<th>ADDRESS</th>
<th>ABOUT US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blessed Investments Ltd.</td>
<td>P.O Box 26002, Kampala</td>
<td>In addition to fish farming, Blessed Investments Ltd is also involved in both agriculture and engineering.</td>
</tr>
<tr>
<td></td>
<td>Head Office: Plot 755, Gabiri Close; Kulambiro hill; Ntinda; Kampala</td>
<td>- <strong>The Farm Supplies:</strong> Milk, goats, pineapples, farmed fish.</td>
</tr>
<tr>
<td></td>
<td>TEL: 0392948747.</td>
<td>- <strong>Engineering Services:</strong> Civil works and Contractors</td>
</tr>
<tr>
<td>BOC GASES</td>
<td>Plot 73, 7th Street Industrial Area</td>
<td>Supply industrial and medical gases plus their accessories.</td>
</tr>
<tr>
<td></td>
<td>P.O Box 28088 Kampala</td>
<td>Website: <a href="http://www.boc.co.ug">http://www.boc.co.ug</a></td>
</tr>
<tr>
<td></td>
<td>Tel: +256 414-231875 /231876</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fax: +256 414-231794</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:bocinfo@boc.co.ug">bocinfo@boc.co.ug</a></td>
<td></td>
</tr>
<tr>
<td>The BUILDING Centre</td>
<td>Kitgum House, 52 Station road, P.O Box 7436, Kampala, Uganda.</td>
<td>The <strong>BUILDING Centre</strong> supplies a range of inputs for construction. These include:</td>
</tr>
<tr>
<td></td>
<td>Tel: +256 414-234567 /259754 /312-262443</td>
<td>- Construction chemicals (Water proofing, Epoxy flooring, grouts, joint sealants).</td>
</tr>
<tr>
<td></td>
<td>Fax: +256 414-236413</td>
<td>- Supply and install portable and large size generators up to 2000KVA.</td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:tbc@africaonline.co.ug">tbc@africaonline.co.ug</a></td>
<td>Basic construction tools like hoes, axes, and slashers</td>
</tr>
<tr>
<td>CRESTANKS Uganda</td>
<td>Plot 106/108 7th Street Industrial area.</td>
<td>Plastic water tanks, Plastic tubs Septic tanks</td>
</tr>
<tr>
<td></td>
<td>P.O Box 11381 Kampala Uganda</td>
<td>Email: <a href="mailto:scs@crestanks.co.ug">scs@crestanks.co.ug</a></td>
</tr>
<tr>
<td></td>
<td>Tel: +256 414-235470 /348973</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fax: +256 414-234184</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mobile: +256 772-766574</td>
<td></td>
</tr>
<tr>
<td>Davis &amp; Shirtliff</td>
<td>Kitgum House, Jinja Rd</td>
<td>Water pumps. Technical assistance in selecting pumps and their installation.</td>
</tr>
<tr>
<td>International Ltd.</td>
<td>P.O Box 22824, Kampala</td>
<td>After sales service.</td>
</tr>
<tr>
<td></td>
<td>Tel: +256 414-346337/8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: d&amp;<a href="mailto:s@ug.dayliff.com">s@ug.dayliff.com</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Website: <a href="http://www.dayliff.com">www.dayliff.com</a></td>
<td></td>
</tr>
<tr>
<td>COMPANY</td>
<td>ADDRESS</td>
<td>ABOUT US</td>
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</tr>
<tr>
<td>Desbro Uganda Ltd.</td>
<td>Plot 93, Jinja Rd. Opposite Club Silk, Industrial Area P.O Box 22615 Kampala Tel: +256 414 254557 +256 414 347565 Fax: +256 414 254557</td>
<td>Dealers in industrial chemicals. hydrated lime, alum formalin, copper sulphate, acids, and more.</td>
</tr>
<tr>
<td>Edrhon Fish Farm</td>
<td>Tel: +256 772-882006 +256 702-882006 Email: <a href="mailto:edwinaulb@yahoo.co.uk">edwinaulb@yahoo.co.uk</a></td>
<td>In addition to farmed fish products, smoked catfish; also supply fresh eggs.</td>
</tr>
<tr>
<td>Gentex Enterprises Ltd.</td>
<td>Plot No. M513, Ntinda P.O. Box 1494, Kampala, Uganda Tel: +256 414-286981 /4286080 Sales: +256 414-286980 Fax: +256 414-285186 Email: <a href="mailto:gentex@utlonline.co.ug">gentex@utlonline.co.ug</a> Web: <a href="http://www.gentexenterprises.com">www.gentexenterprises.com</a></td>
<td>GENTEX Company has a broad range of water pipes and pipe fittings supplies. Both HDPE and PVC. These come in different sizes and can be customised according to the farm’s needs.</td>
</tr>
<tr>
<td>GOD IS ABLE LTD.</td>
<td>Najjanankumbi: Entebbe Road P.O Box 4282 Kampala Phone: +256-772-850879</td>
<td>Fish baskets General household supplies</td>
</tr>
<tr>
<td>Iganga zone fish farmers association (IZFFA)</td>
<td>P.O Box 191, Iganga Tel: +256 712 197155 +256 392 813489 Email: <a href="mailto:mmusomerwa@yahoo.com">mmusomerwa@yahoo.com</a></td>
<td>Fish Farmers and Breeders Member services: Commercial fish farm seine Transport gear Marketing coordination Technical advising &amp; training</td>
</tr>
<tr>
<td>JOSI ENGINEERING COMPANY</td>
<td>Premier Complex, Plot 1/2 Ntinda Industrial Area P.O Box 9793, Kampala Tel: +256 312-283133 Mob: +256 712-415892 Email: <a href="mailto:josien_co@yahoo.com">josien_co@yahoo.com</a></td>
<td>Sales and Service of weighing scales.</td>
</tr>
<tr>
<td>COMPANY</td>
<td>ADDRESS</td>
<td>ABOUT US</td>
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</tr>
<tr>
<td><strong>Kabeihura Farmers Limited</strong></td>
<td>Mashonga, Kyamuhunga P.O.Box 47 Bushenyi</td>
<td>We supply fry and fingerlings of tilapia and catfish; all sizes.</td>
</tr>
<tr>
<td></td>
<td>Tel: +256 485 43456 +256 772 496989 +256 772 430201</td>
<td>Suppliers of Tea, Dairy,</td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:igara@infocom.co.ug">igara@infocom.co.ug</a></td>
<td></td>
</tr>
<tr>
<td><strong>Kigezi Fish Farm</strong></td>
<td>c/o Camera House P.O Box 777 Kabale, Kazingizi industrial area 4km Kabala-Katuna road Tel: +256 772 480 448</td>
<td>Fingerlings of catfish and carp Food fish</td>
</tr>
<tr>
<td><strong>KITANGALA GARDENS AND FISH PONDS</strong></td>
<td>Kitangala gardens and fish ponds Ltd. Kasenge 5km off Seguku-Kasenge road or 1 km from Kasenge trading centre. Tel: +256 772-604454 +256 701-604454 +256 752-604454</td>
<td>Recreation center. Smoked farmed catfish is our speciality. For fish, please book in advance. Contact person - Abdul Mutebi Email: <a href="mailto:kitangala@juno.com.ug">kitangala@juno.com.ug</a></td>
</tr>
<tr>
<td><strong>MAGRIC Ltd.</strong></td>
<td>MAGRIC is also an agent to these British companies:</td>
<td></td>
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<tr>
<td></td>
<td>Braithwaite engineering - for sectional steel water tanks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BP solar for solar power</td>
<td></td>
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<td></td>
<td>Avery berkel - weighing equipment,</td>
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<td></td>
<td>Salter weightronix - weighing equipment,</td>
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<td></td>
<td>Sinar - moisture analysers</td>
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<td>Braintree exports - procurement services,</td>
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<td></td>
<td>ELE international - material testing and environmental monitoring.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:magric@imul.com">magric@imul.com</a></td>
<td></td>
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<tr>
<td></td>
<td>Website: <a href="http://www.magric.com">www.magric.com</a></td>
<td></td>
</tr>
<tr>
<td><strong>MANTRAC</strong></td>
<td>Plot 17/41, 7th Street Industrial Area P.O. Box 7126, Kampala (U) Ltd.</td>
<td>Earth moving and construction equipment, tractors. Sales and Service.</td>
</tr>
<tr>
<td></td>
<td>Tel: +256 414-304000 +256 312-260526/7/8/9</td>
<td>Email: <a href="mailto:Ebuhweire@mantracuganda.com">Ebuhweire@mantracuganda.com</a></td>
</tr>
<tr>
<td></td>
<td>Fax: +256 414-235425</td>
<td>Website: <a href="http://www.mantrac.com">www.mantrac.com</a></td>
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<td>ADDRESS</td>
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</tr>
<tr>
<td>Mech Tools</td>
<td>Plot 32B Jinja Rd. P.O Box 40394, Kampala Uganda. Tel: +256 414-234373 Mob: +256 772-722730 Fax: +256 414-234413 Email: <a href="mailto:mechtools@infocom.co.ug">mechtools@infocom.co.ug</a></td>
<td>A wide assortment of quality construction and mechanical equipment and tools.</td>
</tr>
<tr>
<td>Medipoint Industries</td>
<td>Plot 47 / 49 Portbell Road Luzira P.O. Box 3099, Kampala-Uganda Tel: +256 414-259442 / 345034 Fax: +256 414-251196 Email: <a href="mailto:info@medipointuganda.com">info@medipointuganda.com</a> Web: <a href="http://www.medipointuganda.com">www.medipointuganda.com</a></td>
<td>We produce various packaging products - bags, Rolls, Tubings, sheets. Our packaging products are custom made products based on customer's specifications meet customers needs.</td>
</tr>
<tr>
<td>Mpigi Fish Farm and Water Supply</td>
<td>Paul Ssebinyansi, MD P.O. Box 65, Mpigi (Mpigi town. Butambala Rd) 0772-405-460</td>
<td>Pond construction contracting Pond renovation advising Farmer training Tilapia fingerlings, mixed sex and monosex Catfish fingerlings Air pump repair</td>
</tr>
<tr>
<td>Mugoya Metal Works Ltd</td>
<td>Mugoya Metal Works Ltd, Iganga District Mutukula/ Nakavule (Iganga town council) Tel: +256 752-529821 +256 751-529821</td>
<td>Metal Fabricators. • Panel beating • doors, windows, • Heavy duty harvest scoop nets, dead-men and pond hand compactors, and other metal works.</td>
</tr>
<tr>
<td>Muso4 F Enterprises</td>
<td>Musomerwa BuyunzaMutalib, MD PO Box 1412 Busalaamu, Iganga 0712-197-155 0702-197-155 <a href="mailto:mmusomerwa@yahoo.com">mmusomerwa@yahoo.com</a></td>
<td>Tilapia fingerlings, mixed sex and monosex Catfish fingerlings Hatchery design and management advising Pond construction, renovation training and extension services</td>
</tr>
<tr>
<td>Namuyenge Mixed Farmers Ltd</td>
<td>BMK Omar Waada, MD Located at Namuyenje village, Nakisuba subcountry Mukono District; tel:041-576-28 Mobile: 0772-372-797</td>
<td>Tilapia fingerlings, mixed sex and monosex Catfish fingerlings Food fish Poultry Email:<a href="mailto:bnkowadda2000@yahoo.com">bnkowadda2000@yahoo.com</a></td>
</tr>
<tr>
<td>COMPANY</td>
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<tr>
<td>PETS ALLEY LTD.</td>
<td>Yusuf Lule Road, Garden City Shopping Mall 2nd Floor, Kampala. P.O. Box 1741 Kampala Tel: +256 712-515100. Mob: +256 714-344977. <a href="mailto:petsalleyuganda@operamail.com">petsalleyuganda@operamail.com</a></td>
<td>Pet Store. Pet supplies— toys, speciality feeds. Information on sales of indoor pets, ornamental fish, aquaria.</td>
</tr>
<tr>
<td>PLASTIC RECYCLING INDUSTRIES UGANDA LTD. (PRUIL) P.O Box 8166, Kampala (U) Ltd. Plot M463 Mukabya Close, Kinawataka, Nakawa, Kampala, Uganda Tel: +256 414-288225 Fax: +256 414-288226</td>
<td>We buy use mineral water bottles for recycling. Will sell various plastic pieces and chips for use in biofilters. Email: <a href="mailto:pruil@utlonline.co.ug">pruil@utlonline.co.ug</a></td>
<td></td>
</tr>
<tr>
<td>PREMIER MILLERS FISH &amp; GENERAL FEEDS ENTERPRISES</td>
<td>P.O. Box 1412 Iganga, Uganda Tel: +256 392 813489</td>
<td>Distributors of Fish feeds from SoN and Ugachick, General fish farming inputs</td>
</tr>
<tr>
<td>Roofings Limited</td>
<td>P.O.Box 7169; Kampala Uganda Plot: 126, Lubowa Estates Entebbe Road Tel: +256-041-200952 +256-031-340100 Fax: +256-041-200953</td>
<td>Construction steel materials—bars, galvanised iron sheets, fencing. Email: <a href="mailto:roofings@roofings.co.ug">roofings@roofings.co.ug</a></td>
</tr>
<tr>
<td>Samarieza Mixed Farm Limited</td>
<td>Lukalu-Katogo, Mukono District P.O Box 825, Kampala (U) Tel: +256 414-349497 +256 772-431166 Email: <a href="mailto:zarambasam@yahoo.co.uk">zarambasam@yahoo.co.uk</a></td>
<td>Catfish: fresh and smoked Piggery: poultry Dairy Vegetables</td>
</tr>
<tr>
<td>Solar Construct Ltd.</td>
<td>Plot 15 Mulwana Road Opposite Uganda Baati P.O. Box 26216 Kampala, Uganda Tel: +256 31-264264 Mob: +256 772-732690 E-Mail: <a href="mailto:info@solarconstruct.com">info@solarconstruct.com</a></td>
<td>Sole fabricator and distributor of European quality solar systems in Uganda. Offer free site inspection and help in making any necessary adjustments to the plumbing system. Payment is in cash and instalments.</td>
</tr>
<tr>
<td>COMPANY</td>
<td>ADDRESS</td>
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<tr>
<td><strong>SON</strong></td>
<td><strong>source of the nile</strong></td>
<td>Fish feed, fingerlings and table size fish. Table fish sold fresh, smoked or filleted. Supply on order mounted cages and demand feeders. Upcountry orders can be made by making advance payments through our farmers account, Stanbic Bank, Jinja branch. Acct Name: SoN Fish Farm Account No.: 0140017401501</td>
</tr>
<tr>
<td><strong>Abudala Napuru Hatchery Manager</strong></td>
<td><strong>SON fish farm</strong> Bugungu, Njeru District P.O Box 322 Jinja Tel: +256 332-276348 Mob: +256 753-240989 Email: <a href="mailto:abudala@lakeharvest.com">abudala@lakeharvest.com</a></td>
<td><strong>SUNFISH Farms Ltd.</strong> Kajjansi (1.5km) from Kampala-Entebbe highway after fisheries research station. P.O. Box 12053 Kampala Tel: +256 772-462776 +256 782-768213 <strong>Catfish bait and fingerlings. Training in catfish hatchery management.</strong> Email: <a href="mailto:sunfishfarms@yahoo.com">sunfishfarms@yahoo.com</a></td>
</tr>
<tr>
<td><strong>SUNFISH Farms Ltd.</strong></td>
<td><strong>Farm at Kajjansi</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Bernard Digo Tugumisirize</strong></td>
<td><strong>Executive Director</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TARPO</strong></td>
<td><strong>Plot 37/41 Portbell Road, Luzira Opposite Nile Breweries Depot P.O Box 21672, Kampala, Uganda. Tel: +256 772 442292, +256 752 442292 Fax: +256 414 505982 Email: <a href="mailto:liz@tarpo.com">liz@tarpo.com</a> <a href="mailto:tarpoug@tarpo.com">tarpoug@tarpo.com</a></strong> Dealers in tarpaulin materials. Make tents. Will make portable holding tanks and wading boots to order. Website: <a href="http://www.tarpo.com">www.tarpo.com</a></td>
<td>Products for sale: Fish: catfish fingerlings, catfish brood stock, ornamental fish Poultry: Chicken eggs and chicken off-layers Misc: chicken manure Services: facilities for on farm training</td>
</tr>
<tr>
<td><strong>Tende Innovation Farm and Training Center</strong></td>
<td><strong>Located at Garuga; operated by Industrial Inputs Ltd PO BOX 866, ENTEBBE Contact person: Justine Wakabi: 0752 692 519 also Philip Borel: 0752 764 764 E mail: <a href="mailto:iil@infocom.co.ug">iil@infocom.co.ug</a></strong></td>
<td></td>
</tr>
<tr>
<td><strong>TIC Plastic Co., Ltd.</strong></td>
<td><strong>Add: 077 Block 17, Nalukolongo, Masaka Road, Kampala, Uganda. P.O Box 29858, Kampala, Uganda. Tel: +256 414-270408 / 271450 Mob: +256 712-688688 Fax: +256 414-270509</strong></td>
<td>Plastic rolls of different gauges for home and industrial use. Email: <a href="mailto:chenchiteng@yahoo.com.tw">chenchiteng@yahoo.com.tw</a></td>
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<tr>
<td><strong>Terrain Plant Ltd</strong></td>
<td>Plot 4786-8, Tank Hill Road, Muyenga P. O. Box 23132 Kampala</td>
<td>Earth moving and construction equipment. Sales, service and hire.</td>
</tr>
<tr>
<td></td>
<td>Tel: +256 0312 260086</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fax: +256 0312 260087</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:terrain_plant@bushnet.net">terrain_plant@bushnet.net</a></td>
<td></td>
</tr>
<tr>
<td>Twiga Chemical Industries (U) Ltd.</td>
<td>Plot 71 7th street industrial area. P.O. Box 4800 Kampala (U) Ltd</td>
<td>Agricultural chemicals, fertilisers, lime</td>
</tr>
<tr>
<td></td>
<td>Tel:  +256 414-257050</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:twiga@africaonline.co.ug">twiga@africaonline.co.ug</a></td>
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</tr>
<tr>
<td><strong>Uganda Batteries, Ltd</strong></td>
<td>Plot 6/8 Kalitunsi road Industrial area. P.O. Box 7049, Kampala.</td>
<td>Uganda batteries ltd supplies lead acid batteries for power backup and solar systems. The batteries can be used in remote farm solar water pumping systems and also lighting systems. The batteries come with a 12 month warranty.</td>
</tr>
<tr>
<td></td>
<td>Tel: +256 414-343150 /230734</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fax: +256 414-343292.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email, <a href="mailto:ublbatteries@utlonline.co.ug">ublbatteries@utlonline.co.ug</a></td>
<td></td>
</tr>
<tr>
<td><strong>Ugachick Poultry Breeders Ltd.</strong></td>
<td>Magigye Farm, Namulonge Rd. Magiye Farm, Namulonge Rd.</td>
<td>Fish feed and also supplies</td>
</tr>
<tr>
<td></td>
<td>Plot 1 Old Kampala Rd</td>
<td>• Poultry feed</td>
</tr>
<tr>
<td></td>
<td>P.O. Box 12337, Kampala-Uganda</td>
<td>• Pig feed</td>
</tr>
<tr>
<td></td>
<td>Tel: +256 414-251958 /343682</td>
<td>• Catfish fingerlings</td>
</tr>
<tr>
<td></td>
<td>Fax: +256 414-251958 /343682</td>
<td>• Catfish fillets and steaks</td>
</tr>
<tr>
<td></td>
<td>Mob: +256 772-936007</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:ugachickfarm@infocom.co.ug">ugachickfarm@infocom.co.ug</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Web: <a href="http://www.uganda.co.ug/ugachick/">www.uganda.co.ug/ugachick/</a></td>
<td></td>
</tr>
<tr>
<td><strong>Uganda Fishnet Manufacturers Ltd.</strong></td>
<td>5th Street Industrial Area</td>
<td>Manufacturers of fishing nets and other gear, twine, net needles. Seines and cages. Boat engine sales.</td>
</tr>
<tr>
<td></td>
<td>P.O. Box 3025 Kampala, Uganda</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tel: +256 414-258194/ 230288</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fax: +256 414-254261</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:ufmltd@ipsuganda.com">ufmltd@ipsuganda.com</a></td>
<td></td>
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</table>
UgaChick Outlets

Eastern Region:
Oboja Street,
JINJA.
Tel: 0434-120 801

Contact Persons:
1. Mr. David Chepp 0712-922 158
2. Ms. Betty Nanduddu 0782-593 727

Farmers in Eastern Region, please contact the Jinja Office

Central Region:
Katwadde Investments Ltd.
Tel: 0772-319 521
MASAKA

Western Region:
Mbarara Agent
Tel: 0772-445 191
MBARARA

Kampala:
Chicken House,

UgaChick Agents

1. Akonykori
   Tel: 0772-455 468
   LIRA

2. Mr Mbabazi
   Tel: 0782-448 551
   KABALE

3. Magem & Sons
   Tel: 0772-573 113
   NANSANA, KAMPALA

4. Musinguzi E
   FORT PORTAL

5. Munyagwa L.
   Tel: 0782-465 022
   MATTE
   (on Hoima Road, past Wakiso District headquarters).

6. Mrs. Ntege
   Tel: 0712-977 990
   BWAISE, KAMPALA

7. Sekajja Farmer’s Center
   Tel: 0752-665 282
   KAWEMPE, KAMPALA

8. Vincent Sakku,
   KALANGALA

9. Kiggundu Salongo
   Tel: 0772-998 710
   MUUKONO

10. Lutaya Deo
    Tel: 0752-365 711
    BOMBO
<table>
<thead>
<tr>
<th>COMPANY</th>
<th>ADDRESS</th>
<th>ABOUT US</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UOGLA Oxygen Limited</strong></td>
<td>Plot No. 43/59 7th street, Industrial Area P.O. Box 3002 Kampala Uganda. Tel: +256 414-257717/ 4257727 Fax: +256 414-256919 Email: <a href="mailto:uol@ugandaoxygen.com">uol@ugandaoxygen.com</a></td>
<td>Industrial and medical gases plus their accessories, such as: • Regulators, sales and repair • flow meters • high pressure tubing • brass fittings • spanners</td>
</tr>
<tr>
<td><strong>UMOJA FISH FARM</strong></td>
<td>P.O Box 558 Kampala Uganda. Tel: +256 712 429922 +256 772 702773 Email: <a href="mailto:jrugunda@yahoo.com">jrugunda@yahoo.com</a></td>
<td>• Dairy, • Catfish hatchery for bait and fingerlings. • Ornamental fish • Training in catfish hatchery management</td>
</tr>
<tr>
<td><strong>UltraTec (U) Ltd</strong></td>
<td>Plot 4520 Kabalagala Close P O Box 6832 Kampala, Uganda. Tel:    +256 414-501620 +256 712-200007 Mob: +256 712-200007 +256 752-200007 +256 772-200007 Fax:    +256 414-501619</td>
<td>Solar back-up power systems and system design; inverters, other 12-V systems. E-mail: <a href="mailto:ultratecug@usa.net">ultratecug@usa.net</a> Web: <a href="http://www.ultratecworld.com">www.ultratecworld.com</a></td>
</tr>
<tr>
<td><strong>Walimi House</strong></td>
<td>Plot 1073, Kayemba road, Mubarak zone, Makindye Division P.O Box 6213, Kampala Tel: +256 312-265896 +256 772-496745 Fax: +256 414-530412/ 348739 Email: <a href="mailto:waficos08@yahoo.co.uk">waficos08@yahoo.co.uk</a></td>
<td>WAGTECH supplies water testing kits, General scientific laboratory instruments, equipments, apparatus, consumables, chemicals and reagents.</td>
</tr>
</tbody>
</table>

**Member services include:**
- Hiring of compactors, fish transport tanks, oxygen cylinders, water quality test kits.
- Advisory services and fish marketing assistance

**Wagtech Uganda Ltd.**
4B Burton Street
P.O. Box 28457 Kampala (Uganda)
Tel: +256 414-235508
Mob: +256 772-410024/ 701-410024
Email: wagtech.uganda@spacenet.co.ug
Aquaculture Regulations and Permits

The Commissioner,
Fisheries Resources Department (FRD),
P.O. Box 4 Plot 29, Lugard Avenue,
Entebbe Tel. 322026
Ministry of Agriculture, Animal Industry and
Fisheries (MAAIF),
P. O. Box 102. Entebbe.
Tel: 320004
E-mail: fishery@imul.com

Water Use Permits

The Director, Directorate of Water Develop-
ment (DWD),
P. O. Box 20026 Kampala/ 19 Entebbe
Tel: 041-321342, 077- 721200
Fax : 041-321368
E-mail: wrmd@dwd.co.ug

Environmental Issues

The Executive Director,
National Environment Management Authority
(NEMA),
NEMA House,
Plot 17/19/21 Jinja Road,
P. O. Box 22255 Kampala Uganda.
Tel: +256-41-251064/5/8
Fax: +256-41-257521
Website: www.nemaug.org

Wildlife Issues and Animal Control

Uganda Wildlife Authority
Plot 7 Kira Rd; Kamwokya.
P. O. Box 3530 Kampala
Tel: +256 414-355000
Fax:+256 414-346291
Email: uwa@uwa.or.ug
Website: www.uwa.or.ug

NARO Offices:

AEATREC
Agricultural Engineering and App-
propriate technology Research Cen-
ter (AEATREC) - Namalere
P.O Box 7144, Kampala Uganda
Tel: +256 414 566161
Fax:+256 414 566161
Email: aeatri@starcom.co.ug

Aquaculture Research and Develop-
ment Center (ARDC) -Kajjansi
Part of NaFIRRI
P.O.Box 530, Kampala, Uganda
Tel: +256 414 375668
Fax: +256 414 200745
aqua@africaonline.co.ug

AEATREC (NARO) is an institution for agricul-
tural engineering innovations. Offers a wide
range of inputs and services;
• Water harvesting and Irrigation equipment
  and services,
• Agricultural machinery,
• Survey and Mapping.
• Tailor made practical training various as-
  pects of agricultural engineering

ARDC (NARO) government station provides the
following inputs and services:
• Fingerlings production.
• Development and management of
  aquaculture research information.
• Provision of literature on recent develop-
  ments in fish farming.
• Planning, monitoring and evaluation of
  aquaculture research programs.
• Library open to public and students for
  aquaculture information.
• Main office, Jinja has a complete water
testing laboratory