



PAULOWNIA: The Tree of the future

Paulownia is a fast-growing, readily sustainable hardwood requiring minimal management and very little investment. The tree can be harvested within 8-10 years for timber and can continue under coppice management. There are several varieties of Paulownia for which breeding involves selecting trees based on canopy shape, branching pattern, drought tolerance and rate of growth.

History

At least six species of Paulownia are currently recognized: *P. Elongata*, *P. fargesii*, *P. Fortunei*, *P. Glabrata*, *P. Taiwaniana* and *P. Tomentosa*. Paulownia has been

Pines more than just timber

RESIN

When we see a pine tree, many people in this part of the world think of timber or good trees for windbreaks.

It may seem that not many see a pine tree and think of turpentine, rosins (for bowed string instruments, gymnasts, ballet dancers, baseball pitchers), varnish, oil-paint thinner, furniture wax, lamp oil, soap, tar, and pitch.

In modern times, many of these products are now made with synthetic chemical processes that can be highly polluting and typically unsustainable.

Many people are interested in learning more about traditional products, their collection, processing, and uses. This is an overview of the science, history, collection, and uses of resin.



Resins

Resin is a fluid (specifically, a hydrocarbon) that is secreted from certain plants (resinous

cultivated in China for at least 3000 years. There is evidence that it was being used to build coffins around 600 BCE and was being cultivated on a large scale by no later than 200 BCE. For many centuries, the

Chinese have been planting Paulownia around their homes in order to attract the phoenix and bring good luck.

Paulownia timber was exported

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UTG SACCO UPDATE

UTG-SACCO should grow into a Bank: Testimony of a grower

In 2015, I begun developing the Tembuzi Cultural Fun Park, a project that I have devoted most of my time and energies. It is being developed on 10 acres of land, about 4 kms from Namugongo Martyrs' Shrine in the neighborhood of Sonde. I felt that apart from the commercial forestry plantation in Mubende district, I also needed something closer to Kampala, where I could retire and also have some fun surrounded with nature, friends and family. A nature park was my best bet, where I could experience the cool forest breeze and life.

Funding

The development of a Fun Park requires a substantial amount of money to carry out the construction work, plant the gardens and pay for the labor, all not cheap. Apart from the weekly wages, one also needs to feed and house the workers, who have been permanent residents at the site for the past two years. Much as I had prayed to God that I should diligently develop the Fun Park without any



Tembuzi Cultural Fun Park

bank loans, two years down the road, I begun feeling the pinch of spending without earning. The urge to use other people's money was so great. The suppliers of sand, bricks, cement and planting materials were all sending demand notes for their monies. Everyone was singing the same song, on how badly the economy was performing.

Around April 2017, I approached the UTG-SACCO for a loan of 20 million shillings. With the usual efficiency of the SACCO Officer, Mr. Moses Kasirivu, the loan was processed within one day. No security, no complicated paper work, no valuation reports, no legal or insurance costs. The process was so simple, with few huddles even if accesible amount was still minimal.

A few months later in June, I needed more money in order to get the Fun Park operational. The pressure to get some clients to enable me earn some money in order to continue with the developments was so immense. I felt that I had no choice but to apply for a commercial loan from the mainstream banks. I needed the money to install amenities like toilets, water, electricity and also improve on the children's play area. My deadline to have this done was end of August. Thus I did not have a lot of time.

In the past I had gotten and paid back loans from Post Bank, Kenya Commercial Bank (KCB) and Housing Finance Bank. However, this time round while sharing my intention of borrowing with a priest friend, he advised me to borrow from Centenary Bank, a bank owned by the Catholic Church. Being a Catholic, I thought that was smart, since I would be supporting "My Bank." Paying interest on the loan over the next three years would be good business for the Catholic brethren. So I thought.

I needed about 80 million shillings, which I knew I would comfortably pay back in three years. I also had the security to guarantee my loan application. I was offering one of my best securities that is not only close to Kampala but part of the developed land of the Fun Park. I had previously used the same security with KCB when it was un-

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SEEDLINGS FROM FERDSULT ENGINEERING SERVICES LTD

Quality seedlings are now available at very attractive prices:



Pine seedlings (Caribae-Brazil) @ 420/=



Clonal Eucalyptus seedlings @ 500/=



Seedlings of grafted oranges @ 1,800/=



Seedlings of grafted mangoes @ 2,000/=

The nurseries are located 8 kilometers off Jinja road in Luwombo-Lugazi Buikwe District. For more information and booking please visit our office: Plot 17/19 Kampala Road, 7th & 8th floors, Diamond Trust Building or contact: Project Manager on tel: 0772 474431/0701 474431



RESIN: Pines are more than just timber

plants), most commonly coniferous trees such as pine trees. Resins perform a number of functions in the plants that produce them. Resins seal over wounds, and this protects the plant from pests and infections. Resins contain antimicrobial properties that help prevent decay and fungal infections, and resins also seem to decrease water loss during droughts or plant injury.

Humans have gathered and used resins from plants for thousands of years. Resins have been used for waterproofing, varnishes, adhesives, art, incense, medicines, and many other purposes. It is only recently in human history that we have started using synthetic, as opposed to natural/plant-derived, resins.

Resins can be collected by tapping trees. This has traditionally been achieved by notching the bark in a parallel V-shaped pattern. At the lowest notching, a bucket collects the pooled resin. Trees can be tapped for well over 20 years, and are then used for other purposes including timber, since the wood is not damaged during the tapping process. Depending on the species of tree and the product desired, various processing techniques are used to refine the resin.

While all resinous plants produce resin, some species and hybrids produce higher quality resin than others. Trees also produce other fluids (e.g. sap, latex, gums, etc.), but these are chemically quite distinct from resin. Resins can be categorized as follows, with a fair amount of overlap between categories:

Hard Resins: These are hard resins and include:

Dammar

Obtained from the Dipterocarpaceae family of lowland, tropical rainforest trees from around the globe and the Agathis trees of southeast Asia and northern Australia. Dammar is used as a glaze for foods, crafts, incense, varnish, and more.

Mastic

Obtained from the Mediterranean Mastic Tree (*Pistacia lentiscus*). Mastic was commonly used as a natural chewing gum, but it is also used in ice creams, puddings, pastries, nougat, sauces, soups, fruit and vegetable preserves, soft drinks, coffee, liqueurs, and many other foods. It has a long history as a medicinal and incense, and is also used in perfumes and cosmetics and even in varnishes.

Sandarac



Loblolly Pine used for timber, poles, & paper is a high-terpene producing resin plant.

Obtained from the Sandarac Tree (*Tetraclinis articulata*) of North Africa in dry, Mediterranean climate. Sandarac is used for varnish and lacquer.

Oleoresins

These are resins that contain an oil component naturally made by the tree. They typically stay soft or gum-like. Examples of oleoresins include:

Balsams

Obtained from a variety of trees and shrubs. Balsams contain certain esters (e.g. benzoic or cinnamic acid) that are aromatic, and therefore, balsam is commonly used for as a fragrance and a traditional medicine.

Copaiba

Obtained from the *Copaifera* genus of leguminous trees of South America. Used in varnishes and lacquers.

Elemi

Obtained from the Elemi Tree (*Canarium luzonicum*) tree of the Philippines. Used in varnishes, lacquers, and traditional medicine.

Grow UTG-SACCO into a Bank: *Testimony of a grower*

developed about four years earlier. So I genuinely believed that with such security, any bank could tell that I was a serious business partner. It was not the case with Centenary Bank!

The loan officers at my local branch provided me with the bank's loan requirements and demanded that I get a valuation report of the security together with audited accounts for my other businesses for the past three years. This took me two weeks and cost me almost three million shillings. I presented these reports, filled the loan application forms and was told that I would get a response within a week. The security was valued at 520 million shillings and in an incident of a forced sell, it would fetch 300 million, more than the 80 million I wanted to borrow.

In the report, the valuer had indicated that when she inspected the property we had accessed the land through another piece of land, which I also owned. Despite informing the bank that the land I was presenting as security had its own access road, which the loan officers physically inspected, they told me that the bank would need both titles, literary meaning I would have to put up a security of over 3.5 billion shillings to get a loan of 80 million. This was impossible because it neither made economic nor security sense in a country where land titles go missing like needles.

A week after my loan application, I called the loan officer and he told me that unfortunately the loan approval committee at the Head Office wanted my personal audited accounts for the past three years and not the business accounts as earlier requested. To me this sounded more like a security investigation as opposed to a business transaction. A friend jokingly told me, "you may need to give the loan officer something small to get your paper work through," but I ignored the crappie advice.

I worked with my auditors to produce my personal accounts. Thinking about it now, I must have been crazy to even have gone that far for a mere 80 million shillings. The red flag was flying high. I could tell this was going to be a very bad business deal and nobody in their right senses would call that a deal. I opted for "Plan B". Get resources from elsewhere and still carry out my work at the Fun Park and beat the set deadline of end of August.

Two weeks after the presentation of my personal audited accounts, the query on the access road was raised again. This time the loan officers from my local branch together with another from Headquarters came again to inspect the access road. I thought they were satisfied since we walked the whole length of the road and they witnessed that the Park was being used even in its current state.

But I was totally wrong. Something was bound to come up again. I waited for another two weeks and this time the loan officer informed me that he had got communication that the loan was pending approval since management required me to attach a proforma invoice for the Bouncing Castle, I wanted to purchase and the UMEME (electricity) connection. This was the last stroke and I called off the deal. This was over two months of back and forth, in comparison with the one day of the UTG-SACCO. Wasted time and over three million shillings I should have used on my developments trashed down the drain.

To compound it all at the end of the day, much as I had applied for 80 million shillings I would possibly have received 76 million having deducted the fees for the loan processing, legal and insurance charges and also the huddles of mortgaging the land. I had been forewarned that

NOTICE

ANNUAL FEES

UTGA Members with unpaid subscription fees are reminded to send them by CASH/CHEQUE to the UTGA office, Mobile money to 0785343564 or 0703343565 or you if you can make a bank deposit - please call the office

RAINS, RAINS

The rains are here now!

Preparations for planting:-

- Clearing of land
 - Burning the rubbish
 - Booking for seedlings
- UTGA recommends the use of certified contractors (*List available on demand*).
UTGA has information on external suppliers for chemicals, herbicides and tools

FOR ANY FOREST

SERVICES REQUIRED

Please get in touch with the UTGA office by calling **0785-343564** or by sending an email to info@utga.ug or caroln@utga.ug or peterm@utga.ug

IMPROVED SEED

F2 Pine Seed from Brazil now available at UTGA @ UGX 3.2million per kg for Members and 3.5million per kg for Non-Members. Order while it lasts.

Clean South

African Eucalyptus Seed now available at UTGA @ UGX 20,000 per gm for Members and UGX 32,500 per gm for Non-Members.

RESIN: Pine more than just timber

Labdanum

Obtained from the Rockrose (Cistus species) from the Mediterranean. Used in traditional medicine and perfumes.

Gum Resins

Resins that are produced with a natural gum (sugars/polysaccharides) instead of oil. Here are some examples of gum resins:

Frankincense

Obtained from the Boswellia genus of trees from tropical Africa and Asia. Used as an incense, perfume, medicinal, and had many religious ties.

Guggal

Obtained from the Guggal Tree (Commiphora wightii) of North Africa and central Asia. Used as a traditional medicine.

Myrrh

Obtained from the Commiphora genus of tree of tropical Africa, Asia, and South America. Used as a fragrance and medicinal.

Fossilized Resins:

Amber – the color “amber” is named after this amber-colored plant resin that has fossilized, although there is a blue amber that is stunning. Amber sometime contains animals or insects and is used in paleontology. Amber is used in jewelry, traditional medicine, perfumes, incense, varnishes, and lacquers.

Copal – this is a resin that has not quite been fossilized yet, so it can be considered a resin that is on its way to become an amber. It has been used as incense and medicine and varnish.

Turpentine

Many of the oleoresins from pine



Amber



Frankincense



Rosin



Vanish

trees have high levels of terpenes. Terpenes are a class of organic compounds (hydrocarbons) that a tree produces to repel pests; however, terpenes are produced and/or used in almost all living creatures in the world. Some examples of natural products containing terpenes are steroids and beta-carotene. Once a terpene is altered, it is known as a terpenoid. Turpentine is a fluid obtained by distilling high-terpene oleoresins.

Collected oleoresins are placed into a steam dis-

tiller, and the turpentine is evaporated off and collected in a condenser. Turpentine can also be extracted via a process known as destructive distillation which occurs during pyrolysis (this is the process that occurs with the proper use of rocket stove technology). Turpentine can be used as a solvent (a substance that dissolves other substances) and to produce varnish. It can also be mixed with beeswax to make a high quality furniture wax. Turpentine can be burned in oil lamps and can

be mixed with ethanol to make “burning fluid”, an illuminant. Turpentine is mainly used today, once it has been processed, as synthetic pine oil. Pine oil is used for fragrance, flavoring, and in cleaning agents to give the “pine” odor.

Trees that have traditionally been primary sources of terpenes:

- Aleppo Pine (Pinus halepensis)
- Loblolly Pine (Pinus taeda)
- Longleaf Pine (Pinus palustris)
- Maritime Pine (Pinus pinaster)
- Ponderosa Pin (Pinus ponderosa)
- Scots Pine (Pinus sylvestris)
- Slash Pine (Pinus elliotii)
- Sumatra Pine (Pinus merkusii)
- Balsam Fir (Abies balsamea) – produces Canada Balsam. Used as a glue for eyeglasses, a traditional medicine, and in soaps and perfumes.
- Terebinth or Turpentine Tree (Pistacia terebinthus) – a very-long lived tree from the Mediterranean and Middle East.
- Larch (Larix species) – produces Venetian Turpentine. Used in varnish, traditional medicine, and traditional chewing gum.
- Red Spruce (Picea rubens) – produces Spruce Gum. Used as a traditional chewing gum.

Other Resin Products

Rosin (aka Colophony) – Rosin is the substance left over after turpentine is distilled from resin. Rosin is a solid and ranges in color from yellow to black. It is used by violinists and other string instrument musicians, in sealing wax, varnishes, medications, foods, and in electronic soldering.

Pine Tar

Produced when heating Pine wood at high temperatures without catching fire (pyrolysis). Wa-

from China to Japan, where it was used to produce handicrafts such as kotos (harps) and tansa (wedding chests). It is a custom in parts of Japan to plant a Paulownia tree when a girl is born so that the wood may be used to fashion her wedding chest.

It was introduced into the United States in the 1800s when Paulownia seeds, which had been used as packing material for Chinese dinnerware, were released into the wild, where they flourished. These feral Paulownia growths were discovered by the Japanese in the 1970s and have since become the focus of a multi-billion dollar export project.

Morphology

Paulownia is a fast-growing deciduous hardwood with gray-brown lenticillate bark. The leaves have long petioles and an opposite arrangement; juvenile leaves can be as large as 80cm, with a serrate margin, while mature leaves are smaller and have a smooth, wavy margin. The undersurface of the leaves is covered with a dense layer of fine hairs. The inflorescence is a pedunculate or sessile cyme of 2-5 flowers; the fragrant, purplish white flowers have a large, two-lipped corolla, with two lobes on the upper lip and three on the lower. Paulownia is entomophilous and can be cross-pollinated to produce numerous small, ellipsoid, membranaceous seeds with striate wings. The Paulownia tree is extremely hardy; it has a broad range of temperature tolerance and has been known to grow at altitudes of up to 2,000m above sea level. Under optimal conditions, a 5-6m increase in height can be expected in the first growing season and an increment of 3-4cm in diameter at breast height annually. Trunk extension in Paulownia is



A plantation of mature paulownia

PAULOWNIA: The Tree of the future

sympodial; the rapid growth of the lateral branches, however, gives it the appearance of a monopodial growth pattern.

Paulownia is a deep rooted tree with a well developed root system. There are usually several large, dichotomously branched roots growing downwards (up to a length of 8 meters). The absorptive roots are 1-5mm thick and up to 60cm long.

In sandy soils, 76% of the absorptive root system is 40cm-100cm deep; only 12% of the root is in the first 40cm of the soil. The development of the root system is heavily influenced by the soil structure; a loose, well-drained sandy soil is ideal for Paulownia.

A Paulownia plantation requires only minimal inputs from the grower; it can also be readily intercropped.

A properly maintained tree will yield one cubic meter of hardwood in 8 to 10 years, after which a new stem will shoot. A single plantation can therefore be harvested several times, providing a sustainable, renewable source of timber.

Tissue Culture

The use of in vitro propagation

techniques provides a supply of healthy, homogenous planting material for Paulownia. Trees planted from seed often show an altered growth habit and may be more susceptible to pests and diseases. We use only primary and axillary shoot meristems as explants for our in vitro cultured Paulownia plants in order to ensure true clonal propagation. Our research has shown that the best growth is achieved when the composition of the growth medium is adjusted for both the variety and the stage of growth.

Climate

Paulownia can survive between latitudes 40°N and 40°S and at altitudes of up to 2,000m. Although the tree can withstand temperatures between -20°C and +40°C, optimal conditions for growth are between 24°C and 29°C. In regions where there is a significant seasonal variation in temperature, it is advisable to wrap young trees in grass during the winter (to protect the bark from freeze-damage) and to paint them during the summer (to protect the bark from sunscald). Young Paulownia trees are very tall but may not have yet developed an extensive root system



Members appreciate the processing facility at Richard Bakojja's plantation

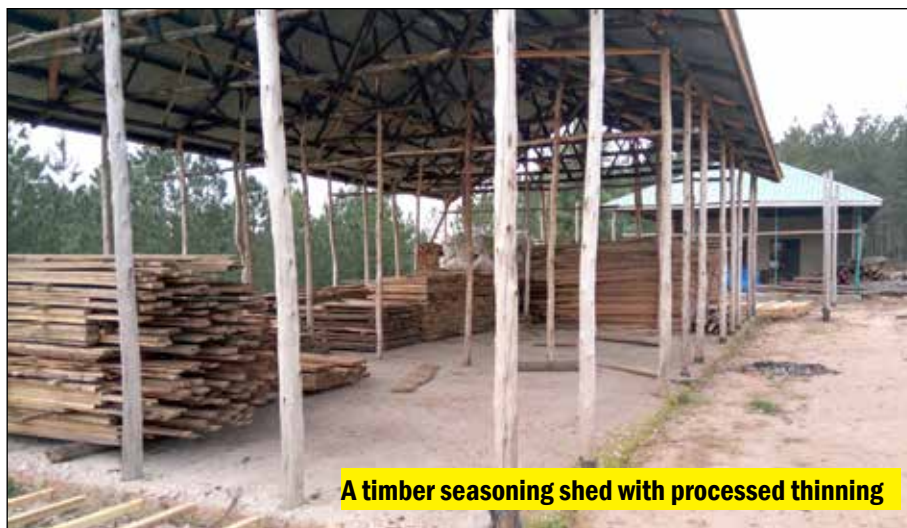
UTGA Board visits veteran tree grower's plantation

On Tuesday 3rd October 2017, a group from UTGA led by the Board Chairman, Dr. Sam Zaramba made an impromptu visit to the plantation of Mr Richard Bakojja, a UTGA founder member and one of the veteran commercial tree growers in Uganda. Mr Bakojja's plantation is in Mubende district.

Findings

Seed source

Members appreciated what Richard was doing on the ground and noted that the tree stand for which he had used pine seed from Australia was looking very nice. The trees had straight stem form, with little or no branching and uniform in size and height. This again lays credence to the fact that improved seed that is sourced from Australia performs very well in Uganda and with it, a grower is assured of a high quality resource.



A timber seasoning shed with processed thinning

Processing

Richard has also purchased a wood mizer and a circular sawmill powered by a fuel engine. Most of what he is processing is thinning that are also comprised of trees that would not produce good timber at final felling.

Taugya

Without compromising on the quality of the trees, Richard has

cultivated a system of working with the community to grow crops among the mature trees. This has created synergy with the forest adjacent people because the collective benefits enjoyed by all involved result in a win win situation. The plantation becomes jointly managed and incidences of encroachment and forest fires are reduced or eliminated.

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A plantation of mature paulownia

to provide anchorage; strong winds can cause breakage or inclined stems, which should be straightened out, propped and mounded.

Preparation and planting

No special site treatment is necessary before plantation. A southern facing exposure with some protection from wind is preferred. Young trees should be protected from grazing animals which may feed on the bark, damaging the tree and limiting growth.

The site should be pre-irrigated to moisten the soil and reduce the amount of labour required. Holes should be dug at 5m x 4m or 5m x 3m, providing 500-700 trees per hectare (if the site will be used for intercropping, planting density should be no more than 500 trees per hectare and may be as low as 300 trees per hectare, at 3m x 6m); the hole should be 70-80cm on each side and 50-60cm deep. Be sure to separate the topsoil from the subsoil during removal; the nutrient-rich topsoil should be returned first.

The trees should be planted at the beginning of spring. Plan-

tation should be deep enough to provide good anchorage for young trees. After planting, 15-20cm of soil should be heaped around the sapling. The sapling should be at least one year old and have an established root system in order to minimize losses.

Soil

Paulownia is very tolerant of adverse soil conditions but is sensitive to water logging. Heavy peat or sandy soils work well; clay and rocky soils do not. Loose, well-drained soils with a pH between 5 and 8 are ideal.

Paulownia can grow well even in highly saline soils and in nutrient poor soils, where its ability to selectively absorb Ca^{++} and Mg^{++} ions gives it an advantage. As a consequence of its hardiness, Paulownia has been used with great success in mine reclamation projects.

Irrigation

As mentioned above, Paulownia is very sensitive to flooding and requires good drainage. It needs between 500mm and 2,600mm of rainfall annually, although it can tolerate less if the majority of the rainfall is during the growing season. Saplings should be irrigated

on the day they are planted and again a few days later. The tree should be well irrigated until it establishes a sufficient root system; mulching can help minimize losses due to evaporation during the warm season. Paulownia is not very sensitive to atmospheric humidity.

Weeding

The Paulownia tree is a light-loving pioneer plant; slight shade can cause deformation in saplings and 70% shade may be fatal for younger trees. It is imperative to practice effective weeding for the first year so that weeds do not overgrow the young trees; mulching is highly recommended.

Coppicing & Pruning

Coppicing is the process of cutting a tree back to ground level in order to promote the formation of a new shoot. Paulownia is a prolific shooter; it is therefore recommended that trees be coppiced, preferably during the second year. Trees should be coppiced in the late spring, just before the beginning of the growing season. Short trunked seedlings or seedlings with poorly formed trunks should be cut just above the third bud during spring of the second year, just before the emergence of new leaves; a new, straight, well-formed trunk will shoot from the lower buds. Allow several of the buds to grow out before selecting the best one.

Pruning should begin in the second or third year and should be performed throughout the growing season as new branch-

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es emerge.

Unnecessary lateral branches should be removed; the branches of the crown, however, should not be cut during the year of their emergence, as they will form the sympodial extension of the trunk. Only the first 7-8 meters of the

stem need to be kept clear of branches; after this the canopy can be allowed to assume its natural shape.

Always use a sharp, clean blade when pruning or coppicing and cover any large wounds with cloth to prevent infestation by fungi.

Testimony of a grower

since the security was in Mukono district, placing the mortgage would be a big huddle unless I had some influence to exert. In the Ugandan context this would politely mean, possibly bribing the people in the loan office.

I now thought about our original motivation to set up the UTG-SACCO, which was to gradually transform into a bank for the timber growers, where we could easily access credit facilities for our plantations and also finance other subsidiary development. From my experience with Centenary Bank, I have learnt that if we are to develop our small businesses into bigger entities, we have to seriously think of building our own lending arm of the SACCO and avoid such unnecessary bureaucracies, which are not only aimed at safeguarding the interests of the mainstream banks, but could also promote corrupt tendencies among bank loan officers. A desperate borrower will end up bribing the loan officers to hasten the cumbersome loan application process.

I also think that rather than saving with mainstream banks we should reconsider increasing saving with our own SACCO. Borrowing from it will increase our portfolio. Who knows, one day we may build our own bank that will not frustrate our business development.

The writer Sheila Kawamara-Mishambi is a tree grower and a Member of the UTG-SACCO

RESIN: Pine more than just timber

ter and tar drip from the wood leaving charcoal behind. Used as a wood preservative and water sealant (boats, roofs, ropes, etc.) and in soaps and traditional human and veterinary medicines.

Pitch

Pine Tar is heated so that the water is evaporated. When the tar thickens, it is called pitch. Pitch was traditionally used for waterproofing seams and wooden containers (buckets, barrels, boats, etc.) and roofs. Some people consider Pine Tar and Pitch the same thing, others separate them based on consistency. Pine Tar being more liquid than Pitch.

Most of the content of this article is fetched from a write-up by John Kitchener, creator and author of the website: Temperate Climate Permaculture.



UTGA News is a digital newsletter for the Uganda Timber Growers Association. It is published monthly (once a month) to briefly summarize recent forestry-related publications, projects, activities, news and other useful forestry info.

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papers, books, guides, or other resources, upcoming or past events.

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If you have friends (*of forestry*) or anyone you think will benefit if they receive UTGA News, please send their email addresses to dennisk@utga.ug.

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