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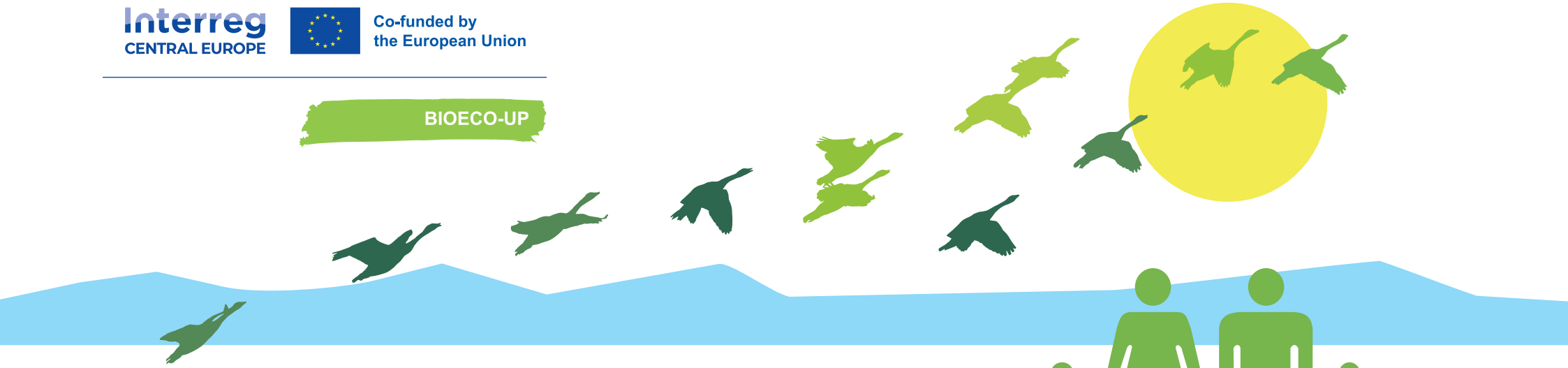
BIOECO-UP



ECO-FRIENDLY LIVING STARTS AT HOME

LEARN WHAT BIOECONOMY IS AND HOW TO CREATE SIMPLE AND SUSTAINABLE BIO-BASED PRODUCTS

Let’s make bioeconomy be the practice, not just a theory!

CONTENT

FOREWORD

Have you ever envisioned a perfect world where the oceans gleam with unspoiled beauty, full of freely swimming fish and turtles among vibrant coral reefs? A world where migratory birds continue their ancient journeys across continents, heralding the arrival of spring and the resilience of nature overcoming winter's grip. In this world, free from pollution, floating plastic bottles, and oil slicks, clean air fills your lungs, and the soil nourishes plants with the essential nutrients needed to sustain life. Nature, in turn, provides your body with wholesome food, rich in vitamins and trace elements.

Imagine your home surrounded by lush green fields, where your beloved pet joyfully explores the grass, showing happiness and energy. Picture a community where neighbours walk or cycle to local markets, purchasing fresh, locally grown produce, enjoying local brews, and preparing meals free of harmful additives. Envision cars that emit no pollutants, textiles that do not release microplastics into freshwater systems, and a harmonious natural environment where every piece of the puzzle fits seamlessly into a balanced ecosystem.

Such snapshots of a sustainable future may seem utopian in today's world.

In reality, humanity faces daunting environmental challenges: climate change, raw material shortages, pollution, and ecosystem degradation to name a few. Industrial practices and intensive agricultural production often rely on non-renewable materials, such as oil, exacerbating the overexploitation of our planet.

Yet, the modern bio-based sectors contribute not only to depletion of limited natural resources but also a critical part of the solution. By rethinking how we grow food, utilize resources, and produce goods, we can significantly reduce harmful emissions, prevent soil degradation, conserve freshwater, and support local economies.

This approach enables the creation of value-added products while fostering healthier ecosystems.

Achieving these goals requires collective effort—not just from industries and governments but also from individuals. One transformative solution is bioeconomy: a holistic framework that harnesses renewable biological resources, such as plants, residues, algae, and waste, to produce everyday essentials—food, cosmetics, clothing, medicine, fertilizers, and more—in a sustainable manner. By prioritizing bio-based products made from local resources, we can reduce waste, save energy, decrease pollution, and lessen our dependence on finite resources, thereby paving the way for a more liveable future for our successors.

However, for this vision to become a reality, everyone must participate. Consumers like you play a vital role in shaping a sustainable future by making informed choices that respect ecological boundaries. By adopting bio-based alternatives, we can minimize our environmental footprint, strengthen community resilience, and mitigate global challenges such as supply chain disruptions.

This publication has been created to introduce readers to the fundamentals of bioeconomy. It provides practical tips on crafting bio-based products and explains their significance in building a sustainable future. Explore the possibilities that bio-based solutions offer, and join the movement toward a greener, more sustainable world.

Let us collectively rethink our relationship with nature, our communities, and the products we use. Together, we can create a future where harmony between humanity and the environment is not merely a dream but a reality.

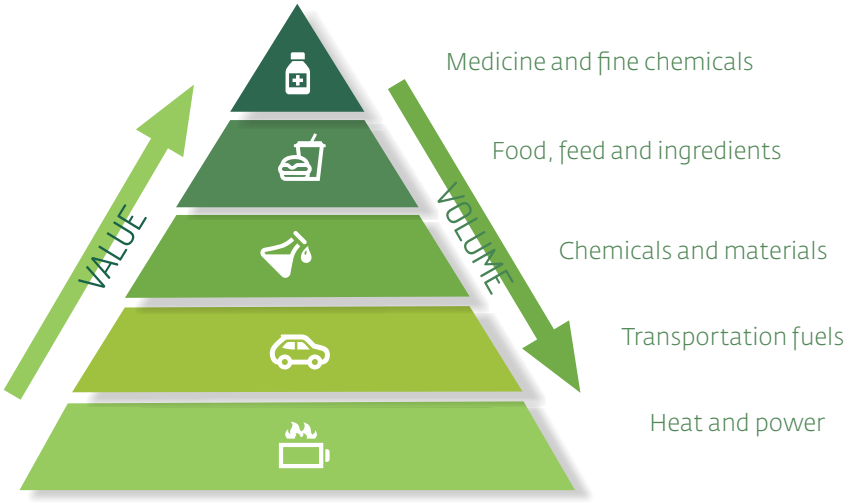
1. INTRODUCTION TO BIOECONOMY

From time to time, the shadow of a world full of challenges and conflicts looms over us. Our hope is humanity historical experiences show that we humans are capable of finding forward-looking solutions to great dramas. Just think of the collapse of the Roman Empire, the medieval invasions, or the devastation of 20th-century dictatorships and weapons of mass destruction. Although the title of the publication suggests that you will learn how to make homemade products, actually we are going to introduce you to the basics of an alternative concept named bioeconomy that may contribute to addressing the challenges of a linear economy based on non-renewable sources. We show you an alternative way of economic thinking on how economic actors should transform their relationship with production and consumption. We are convinced that the creation of homemade products and buying local value-added goods is the antechamber to the implementation of bioeconomy. It is an exciting and increasingly important concept that was launched around the world by the development of industrial biotechnology and the need to find a viable economic model respecting the boundaries of the earth without endangering people's livelihoods. It focuses on using renewable biological resources—like plants, animals, and microorganisms—to produce food, energy, and other products in a more sustainable way as well as creating value-added products from biomass.

Imagine replacing fossil fuels and non-renewable materials having harmful environmental impact with natural resources that can regenerate over time. This shift not only helps protect the environment, keep climate change, pollution, and biodiversity loss under control but also supports economic growth, job creation, and the development of innovative technologies. At its core, bioeconomy is about integrating nature's resources into everyday life in a responsible and efficient way. This involves everything from growing crops for bio-based material and bioenergy without endangering the food supply, developing biodegradable plastics, creating medicines from plants, to transforming waste into new materials, producing healthy foods for the growing number of population. The goal is to move away from a "take, make, dispose" model, which relies heavily on finite resources (e.g. petroleum) or limited renewable natural resources (e.g. soil, biomass) towards a more sustainable economic thinking.

We need to find new ways of producing goods and services that are both economically viable and environmentally friendly. Bioeconomy offers solutions by tapping into the power of biology to create sustainable products and processes. For instance, instead of using plastic made from petroleum, bio-based plastics can be produced from renewable sources like corn or sugarcane, which break down more easily and are less harmful to the planet.

One key area where bioeconomy plays a role is systemic thinking. A linear economy does not take into account that different sectors have different goals and needs. Typically, the imperatives of the sector with greater weight in the national economy prevail. Focusing on short term objectives, larger sectors are less forced to engage in dialogue with small but green companies and incorporate the objective of sustainable development into their decisions.



Another important aspect of bioeconomy is its focus on value-added creation in a cascade way. This means that we first use the biomass to process the product with higher added value than the next and so on. The pyramid shows how different products relate to each other in terms of value creation. Then, when all the value has been extracted from the biomass, the remainder can be used for energy production. Since humanity's energy needs are constantly increasing at the expense of the environment, we do not recommend supplying the missing amount of energy by biomass.

Bioeconomy also plays a role in waste reduction. Waste from food production, agricultural activities, and even household waste can be turned into valuable resources. For example, food waste can be used to create biofuels or compost, while agricultural by-products like straw or wood chips can be turned into biodegradable plastics or used in construction materials. By rethinking how we use waste, bioeconomy contributes to reducing landfill use and lowers the environmental impact of waste management.

In agriculture, the bioeconomy concept also encourages sustainable farming practices. Instead of overusing chemical fertilizers and pesticides, which reduces the resilience of the environment, bioeconomy strategies focus on organic farming and improving soil health. This ensures that agriculture remains productive in the long term without depleting natural resources. Moreover, bioeconomy innovations are helping to develop more efficient ways to grow crops, using less water and energy, and ensuring that food production can meet the demands of a growing global population.

Bioeconomy also opens up new opportunities for innovation and entrepreneurship. Scientists, engineers, and entrepreneurs are developing new bio-based materials, such as biodegradable plastics, plant-based textiles, just to mention a few. These innovations can help reduce the environmental footprint of mass consumption products while creating new industries and job opportunities.

If you're interested in the environment, technology, innovation, or simply want to make a positive impact, bioeconomy offers a way forward. Do not hesitate to join the BIOECO-UP community where you can reach valuable info on a new way of life supported by bioeconomy.

In the next few decades, bioeconomy-related industries are expected to grow rapidly, creating millions of new jobs across a wide range of sectors. From research and development to manufacturing and entrepreneurship, the opportunities are many. By investing in bioeconomy now, we can build a world where local communities thrive and our beautiful blue planet is able to meet the needs of future generations.

In conclusion, bioeconomy is not just about using nature's resources to make products—it's about creating a sustainable future where the economy, environment, and society all thrive together. By supporting innovation and shifting towards bio-based solutions, preparing education for data explosion, we can protect the planet, create new opportunities in a way that respects the environment, the natural resources and the real needs of human communities.

2. BENEFITS OF HOMEMADE BIO-BASED PRODUCTS

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There are many products that can only be produced in an industrial environment like cars, technical goods or medical equipment. Our publication offers alternatives to conventional goods made from synthetic or petroleum-based materials, which are often non-renewable and can be harmful to the environment as well as those products that have many advantages when produced at home. It contains step by step instructions for creating everyday items for own purposes using natural, renewable, and biodegradable materials.

We have collected ideas that come from the experience of households in the BIOECO-UP countries (i.e. good practice is confirmed by popular experience) and about which no negative feedback has been received.

Key Points:

- Natural Ingredients: Bio-based products are made using ingredients derived from plants, animals, or other natural sources. These ingredients are renewable and can break down naturally without harming the environment.
- Sustainability: The focus is on using materials that are sustainable, meaning they can be replenished naturally and have a lower environmental footprint compared to conventional materials.
- Biodegradability: Many bio-based products are biodegradable, meaning they can decompose naturally by microorganisms, reducing waste and pollution.
- Health and Safety: Homemade bio-based products often avoid harmful chemicals found in conventional products, making them safer for personal use and better for indoor air quality.

Benefits:

- Environmental Impact: Reduces pollution and waste by using materials that are part of the natural carbon cycle.
- Renewable Resources: Relies on materials that can be sustainably harvested or produced.
- Personalization: Allows individuals to create products tailored to their preferences, such as scent or texture.
- Cost-effective: Often more economical than purchasing commercial products, especially when using readily available ingredients.

Overall, instructions for homemade bio-based products empower individuals to make eco-friendly choices, reduce their carbon footprint, and contribute to a more sustainable lifestyle.

3. FOOD AND BIOECONOMY

If you are a member of the older generations and used to live in a rural environment as a child, you may still remember the days when households generated very little waste. By the 21st century, these conditions have completely changed. Food production has grown to global and industrial scale using huge amounts of chemicals and non-degradable packaging material.

The connection between food and bioeconomy lies in using sustainable farming practices and organic crops, fruits and vegetables to improve quality food production and reduce the environmental impact of agriculture. Bioeconomy may make food systems more resilient, eco-friendly, and aligned with sustainability goals producing healthy food for the consumers. Ultimately, food plays a central role in bioeconomy, linking agriculture, industry, environmental and human health.

Get to know the environmental, economic, and social benefits of upcycled food products, non-traditional crops and homemade apple cider.

3.1. Exploring bioeconomy and non-traditional crops

In today's world, there is a significant emphasis on proper nutrition. Diversity and a balanced ratio of carbohydrates, proteins, and fats are essential not only for proper development but also for the optimal functioning of our bodies in this hectic and dynamic environment. In addition to traditional agricultural crops, alternative crops are increasingly appearing in our diets. These new ingredients enrich our food not only with important nutritional values but also bring variety and new flavors, revitalizing standard eating habits.

3.1.1. Safflower (*Carthamus tinctorius L.*)

Ara variety (yellow flowering), Tereza variety (red flowering)

Belonging to the Asteraceae family, safflower likely originates from Southwest Asia, where related wild species grow. It is known only as a cultivated plant.

This annual plant bears a striking resemblance to thistles. At the beginning of its growth, it forms a rosette of leaves. The stem is upright, woody at the base, and reaches a height of 70 to 150 cm. It is a long-day plant and blooms with a light period of about 14 hours. Depending on the sowing date and weather conditions, it begins to flower from June to early September and continues for 3 to 4 weeks. The flowers are arranged in flower heads with a diameter of 3.5 to 4 cm. Depending on the branching intensity, there can be up to 60 flower heads on a single plant. All the flowers in the head are hermaphroditic, tubular, and range in colour from yellow to red. Safflower is largely self-pollinating but is also entomophilous and produces nectar. The fruit is a white achene containing 25 to 45% oil. Today, safflower is mainly used as an oilseed crop.

Safflower oil contains up to 80% linoleic acid and is used in cooking as well as in the production of cosmetics and varnishes. In human nutrition, it plays an important role due to its high content of unsaturated fatty acids (linoleic acid) and vitamin E, contributing to the maintenance of normal cholesterol levels in the blood, and having anti-rheumatic and anti-inflammatory effects. It is used in both cold and hot cuisine.

Curd Cream with Safflower oil

What we need:

- 400 g curd
- 3 tablespoons safflower oil
- 1 teaspoon starch
- 1 teaspoon psyllium
- To taste: vanilla, sugar, paprika, fruit, horseradish

Process:

Using a hand mixer, whip the curd with the oil, starch, and psyllium until smooth. Add flavourings to taste

Bundt Cake with Safflower oil

What we need:

- 350 g semolina flour
- 250 g sugar
- 3 eggs
- 1 glass safflower oil
- 1 glass milk
- 1 teaspoon baking powder
- To taste: 1 vanilla sugar, cocoa

Process:

Whip the egg yolks with the sugar and oil.

Add the flour mixed with baking powder, milk, and the whipped egg whites.

Colour a portion of the batter with cocoa. Bake in an oven preheated to 180 °C (356 °F) for 50 minutes.

3.1.2. Common bean (*Phaseolus vulgaris L.*)

Hynek variety

Belonging to the Fabaceae family, the common bean is an annual, bushy plant. The plant features purple coloration. Sparse clusters of purple flowers grow in the leaves. The fruit is a pod, also purple in colour. The beans have a high content of proteins, fibre and also calcium, iron, potassium, B vitamins, vitamin PP, and provitamin A.

They also contain glucokinin, which helps reduce blood glucose levels, making them very suitable for diabetics. Due to their high fibre content, beans positively affect intestinal function and induce a feeling of fullness. Beans act preventatively against diseases of the liver, kidneys, and bladder. They help drain excess water from the body and strengthen the heart and circulatory system.

Spicy bean Spread

What we need:

- 500 g red beans in brine
- 3 tablespoons mayonnaise
- 2 tablespoons olive oil
- 1 tablespoon mustard
- Salt Pepper
- Chili peppers

Process:

Grind the beans, then add the remaining ingredients and mix well.

Serve spread on bread

Bean Salad

What we need:

- 500 g beans of various shapes and sizes
- Blanched onion
- Pickles
- Pickled peppers
- Salt Pepper
- 3 tablespoons olive oil
- Sweet and sour marinade

Process:

Mix all the ingredients together and let the salad rest in the refrigerator for 24 hours.

Bean Brownies

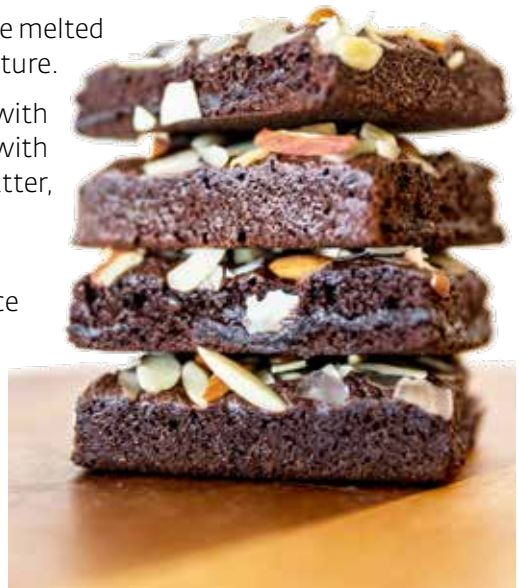
What we need:

- 300 g cooked beans, softened
- 3 eggs
- 150 g high-quality dark chocolate
- 100 g sugar
- 1 packet vanilla sugar
- 30 g cocoa powder
- 1 teaspoon baking powder
- 4 tablespoons vegetable oil (or another fat such as butter)

Process:

1. Gently melt the chocolate in a double boiler or water bath.
2. Drain the cooked beans and blend them thoroughly using an immersion blender until smooth.
3. During blending, add 4 tablespoons of oil.
4. In a separate bowl, beat whole eggs together with sugar and vanilla sugar until thick and frothy.
5. Combine the bean mixture with the melted chocolate, then fold in the egg mixture.
6. Finally, add cocoa powder mixed with baking powder. Line a baking dish with parchment paper, pour in the batter, and smooth it out evenly.
7. Bake at 175 °C (350 °F) for approximately 35-40 minutes. Once done, let it cool completely before slicing.

Enjoy your bean brownies!



3.1.3. Chickpea (*Cicer arietinum L.*)

Olga variety

Belonging to the Fabaceae family, chickpea is an annual plant with a sturdy, non-prostrate stem covered with glandular hairs. The flowers are pinkish-red. The fruit is a pod containing 1-2 brown-coloured seeds. It is an excellent source of carbohydrates, proteins, fibre, B vitamins, and several minerals, making it a nutritious staple in many diets.

Potato cookies with lupin and chickpea flour

What we need:

- 4 medium-sized potatoes
- 180 g butter
- 150 g semolina flour
- 100 g all-purpose flour
- 50 g lupin flour
- 50 g chickpea flour
- 1 egg white
- Sesame seeds, salt, cumin

Process:

1. Cook the potatoes in water until tender, then mash them into a puree.
2. Let it cool down. Add butter and all the flours to the cooled potato puree and knead into a smooth dough on a floured surface.
3. Roll out the dough and cut into shapes. Bake the cookies at 180°C (356°F).

3.2. Upcycled food products

What is food upcycling?

During food production, a significant amount of waste is being produced. However, this „waste" can be used in different ways: it can go to landfill, be composted, used in biogas plants or as animal feed. But it can be even turned into the raw material of another, high value product, for example a different food product. This is the upcycling: valorising, modifying materials or products to give them new value.

It is not an invention, this method has been applied for a very long time in households: bread leftover is suitable to make breadcrumbs, orange peel gives fantastic taste to the cakes or grape marc is made into brandy.

What can be upcycled?

Some ingredients can be easily found in households, they are produced daily. However, some of them are by-products of industrial food production, they are more difficult to reach. Let us show a bunch of waste which can be upcycled, most of them even under domestic conditions.

3.2.1. Tomato peel

It happens with many of us to peel the tomato for different pastas or other food, and we use only the fleshy tomato fruit. But why don't we use the peeled skin? By drying and grounding, it can be stored for a long time and used for seasoning, or as vegetable spice rubs and colourant ingredients.

It is very easy to prepare tomato skin powder, if we follow ***these instructions***[1]

1. After peeling the tomatoes, arrange the skins on a wire rack placed on a cookie sheet and dehydrate in the oven at 100 °C or until completely dry and crispy. Alternatively, dehydrate the skins in a food dehydrator or spreading in a drying rack in open air under the sun.

2. Place the tomato skins in a spice grinder/coffee mill and grind. They won't become completely powdery but the particles will be quite small.

If you have a large number of skins, work in batches. Store the tomato skin powder in a jar in the spice cupboard.

[1] https://zerowastechef.com/2023/07/21/blanch-peel-tomatoes-make-tomato-skin-powder/

3.2.2. Kitchen scraps

Vegetable peels or those parts of vegetables which are not used are usually thrown away or – in a more desirable case – being composted. It is sad, as they can be upcycled and tasty snacks or useful ingredients can be made from them.

Homemade vegetable stock

Ingredients, as instructed by ***Tasty.co***[1]

1. Remove the tops/bottoms/skins/stems from any vegetables you are preparing and place them in a ziplock bag - they can stay frozen up to 6 months.
2. You can add a wide variety of vegetable scraps (think sweet!): onion, garlic, celery, carrot (tops, bottoms, skins), potato peel, corn cobs, winter squash, zucchini, and other squash, beet greens, fennel, chard, lettuce, parsnips, green beans, pea pods, bell peppers, eggplant, mushrooms (stems), asparagus, and herbs like dill, thyme, parsley, cilantro, and basil (including stems). Avoid adding high proportions of vegetables like cabbage, Brussels sprouts, broccoli or cauliflower as they might add a bitter taste to your stock.
3. Continue like this until bag is full.
4. Put the frozen scraps into a pot and fill the pot with water until scraps just start to float.
5. Bring water to a boil and then let it simmer for 30-60 minutes.
6. Taste it and adjust the flavour with more salt, seasonings, herbs, tomato paste.
7. Strain and pour into containers.
8. Refrigerate stock up to 4 days or freeze up to 3 months.
9. Enjoy! You can use it in soups, for cooking grains like rice in a mixture of some broth and water or adding liquid to a slow cooker meal. It's also a great base for making your own gravy.

[1] https://tasty.co/recipe/how-to-make-veggie-stock-with-kitchen-scraps

Homemade chips from vegetable peels

Ingredients, as suggested by ***Tasty.co***[2]
Packed vegetable peels such as: russet potatoes, sweet potatoes, and/or large carrots 1 tsp bagel seasoning
1 tsp extra-virgin olive oil

Process:

1. Preheat the oven to 220 °C. In a large bowl, toss peels, seasoning, and oil until coated. Spread peels in an even layer on a large baking sheet.
2. Bake peels, tossing halfway through and watching carefully in the last few minutes, until golden brown and crisp, 10 to 15 minutes. Let cool on a baking sheet.

[2] https://www.delish.com/cooking/a46487812/veggie-peel-chips-recipe/

3.2.3. Fibre-rich brownie cakes[1]

What we need:

- 150 g pulp (filtered from 5 batches of homemade plant-based milk, collected in freezer in a plastic container)
- 1 tsp of tapioca starch
- 1-2 tbsp of date paste / sugar / erythritol / sweetener of your choice
- 1 tbsp cocoa powder or carob powder
- 1 tbsp of pumpkin seed flour or almond flour
- 3-4 tbsp of rice flour
- 1 tsp of baking powder
- Pinch of salt
- Plant-based milk (amount needed depends on how dry the pulp is)
- Optional: orange zest, dark chocolate chips, dried apricot cut into small pieces, raisins etc.

Process:

1. Mix the dry ingredients and add them to the pulp.
2. If using date paste as sweetener, it might be useful to mix it with 2-3 tbsp of plant milk before adding it to the other ingredients.

3. Mix it to combine.
4. If the mixture is too dry, add some plant-based milk to have a texture that will be easy to scoop into the silicone mould.
5. Adjust the sweetness of the mixture to your taste and add optional ingredients before scooping into the silicone mould.
6. Bake the cakes at 180 °C for 25-30 minutes.

3.2.4. Salty, vinegary juices

Stop dumping out leftover pickle juice, olive brine, and more, and start turning them into something delicious. They can be used in thousands of ways, as they are a great addition to homemade ketchup, hummus, pasta and pizza sauces, soups, vegetable broth or even cocktails, and ***much more***.[2]

Dirty Martini Salad *Dressing*[3]

What we need:

- ½ cup olive brine (simply a mixture of salt, vinegar and water but as olives marinate, the liquid takes on a fantastically rich and delicious olive flavour)
- ¼ cup white wine vinegar
- 5-6 pcs green olives
- 1 garlic clove, coarsely chopped
- ½ shallot, coarsely chopped 1 tablespoon lemon juice
- 1 teaspoon fresh rosemary, coarsely chopped
- ¼ teaspoon ground black pepper
- 1 cup extra virgin olive oil salt to taste

Process:

1. In a blender or small food processor, combine the olive brine, white wine vinegar, olives, garlic, shallot, lemon juice, rosemary, salt and pepper. Pulse or blend until only small pieces of the rosemary remain.
2. Slowly add in the olive oil in a steady stream while the blender or food processor is running to create an emulsification.
3. Serve over your favourite salad.

[1] https://tejmentesreceptek.hu/recept/brownie-szurlemenybol/

[2] https://www.seriouseats.com/a-gazillion-ways-to-use-leftover-pickle-juice [3] https://www.savoryexperiments.com/dirty-martini-salad-dressing/

3.2.5. Brewer's spent grain

Brewer's spent grain is a by-product of beer production. It does not contain any alcohol, but it is rich in proteins and fibres. Usually, it is used as animal feed, but nowadays it gets more and more popular as an ingredient of new food products. It has cereal taste, slightly nutty. Homebrewers can make tasty and nutritious ***bread*** [1] using the spent grain and it can be a delicious addition to pie crust, banana bread, pizza dough or energy bars.

During the BIOECO-UP workshop [2] in Szeged, Hungary, participants could taste the Brewer's Cracker, prepared in many different tastes. Granola can also be made of it.

For more information, please ***visit this site***.[3]

3.2.6. Cascara

The well-known coffee beans are covered with a cherry-like fruit, which is not used for coffee production. The term "cascara" refers to the dried fruit or husks of coffee cherries and it is used in different ways. In many cases, it is used as animal feed or being composted, although it is rich in antioxidants and polyphenols. In many places in the planet, it is consumed as tea or cold brew.

It is important to mention that cascara can be used in many other ways, as it has a fruity and sourish taste and it can be used as an ingredient of desserts.

According to the ***Secontaste***[4] experts, you can prepare cascara tea very easily.

(For more information and cascara recipes, please ***visit this site*** [3].)

Hot steeping: 15 g cascara + 300 ml boiling water, steep for 10-15 minutes, then strain and enjoy.

Cold steeping: 50 g cascara + 1 litre boiling water, let it cool, steep in the refrigerator overnight (12-24 hours), strain, and serve chilled.

[1] https://www.food.com/recipe/spent-grain-beer-bread-417899
[2] https://www.youtube.com/watch?v=W0wzIKedwC0
[3] https://www.secontaste.com/post/edible-beer-dregs

3.2.7. Cocoa husk

Cocoa husk is the outer protective layer of the well-known cocoa bean. As only the inner part of the bean is used to make cocoa powder or chocolate, the other part of the cocoa bean is removed during processing. It is sugar free, full of antioxidants, fibres and nutrients, it has intense coca taste and stimulant effect. When upcycled, it can be consumed as tea or infusion, or even can be an ingredient of cookies.

How to make cocoa husk tea? You can follow the instructions of ***Amish Tea Shop***: [6]

What we need:

- 2 cups of water
- 1 cup of milk
- 1 cup cocoa husk
- 1/4 cup of brown sugar
- Pinch of salt
- A cinnamon stick or nutmeg, a few drops of vanilla extract, grated chocolate (optional)

[4] https://www.secontaste.com/
[5] https://www.secontaste.com/post/coffee-and-its-byproducts-unveiling-the-marvels-of-cascara
[6] https://www.asamiteashop.com/blogs/asami-naturals/how-to-make-cocoa-tea-the-best-recipe-to-follow

Process:

1. Take a medium size pan and add your spices with 2 cups of water. Boil some water and let it simmer on low heat for a few more minutes.
2. Add your cocoa husks and steep for 5 to 10 minutes, depending on your flavour preferences. You can also add the grated chocolate towards the end of this step.
3. Add the milk, salt, and sugar to the taste. This will ensure that your cocoa tea is sweetened and flavoured to perfection. Keep whisking until your cocoa tea reaches the desired temperature. Let the mixture simmer for a few more minutes, then turn off the heat.
4. Add the vanilla extract and mix well. You can really use this freedom to experiment with different pairings and express your creativity.
5. Pour your cocoa tea mixture through a strainer to remove the remaining solid particles. Pour into warm mugs and get ready to serve.
6. Finish by adding your garnishes! Try the unlimited options out there. Be the innovator of your own custom cocoa tea recipe. You can go for garnishes like yummy whipped cream, colourful marshmallows, a tiny sprinkle of cinnamon, or even a drizzle of sweet caramel sauce. This is where you can express your creativity and make your cocoa tea special.

3.3. Homemade apple cider

The goal of the following instructions is to make your own cider at home. Cider is a fermented alcoholic beverage made from apple juice. For its production, it is advisable to combine different varieties of apples. The production process is similar to the production of wine and not to beer, as many people mistakenly believe. It is good to use 100% apple juice, but it is also possible to add pears or dilute the juice with water.

What we need:

- Apples
- Approximately 15 kg for about 5-6 litres of juice
- Use apples with peel
- Bruised apples can be used as well
- Do not wash - remove only coarse dirt
- Best during apple season - use different varieties
- Clean container
- Fermentation lock
- Juicer

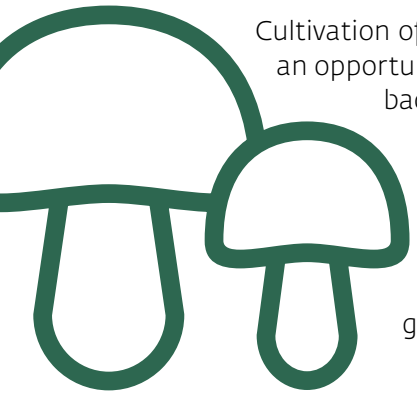
Process:

1. Remove coarse dirt from the apples without washing them, as the surface contains yeasts necessary for the fermentation process.
2. Juice the apples using a juicer. *
3. Pour the obtained juice into a clean container suitable for fermentation. Try to minimize the air content in the container.
4. Seal the container with a fermentation lock. Pour water into a fermentation lock.
5. Store sealed container in a place with a temperature of 15-20 °C for 7-10 days. Fermentation should start within 24 hours.
6. After 10 days, check the fermentation process. Pour the juice into clean containers and leave them in a cool place (approx. 10 °C) for 2-3 months to complete the final fermentation.
7. After this period, your cider is ready for consumption. It is recommended to store it in a cool place. In the refrigerator, the cider lasts up to six months, but it is best to consume it within 2 months. It tastes the best when chilled with ice cubes.

Enjoy your homemade cider!

* After juicing the apples, the solid matter (the residue) can be dried and used as feed for domestic animals (e.g. horses).

3.4. Mushroom cultivation on wood



Cultivation of mushrooms in the context of bioeconomy presents an opportunity to create your own supply of mushrooms in your back yard or cellar.

Wood is an excellent alternative and a natural environment for mushrooms to grow on, it harnesses the natural relationship between mushrooms and wood. Mushrooms mainly thrive on dead organic material; therefore, wooden logs present an ideal growth medium.

What we need:

- Log of (Beech, Oak, Hornbeam or Chestnut).
- Mushroom growing kit (***Mycelium on wooden plugs***[1]).
- Controlled environment (humidity between 70-80%; temperatures between 15-20 °C.)
- Driller with 7mm drill bit.
- Melted paraffin or beeswax.

[1] https://www.goba.eu/izdelek/bukov-ostrigar-micelij-na-cepkih/

Instructions for growing mushrooms with mycelium on plugs:

1. Coniferous and fruit wood is not suitable.
2. The trunks should be healthy and not brittle, and the bark intact.
3. Drill 7 mm diameter holes around the circumference of the trunk into which the mycelium-coated plugs are inserted. Coat the openings of the filled holes with melted paraffin or beeswax, also coat the ends of the trunks (see picture below).

Place the trunks in a shady place in the garden where they can get soaked by the rain. It is important that the trunks do not dry out, but at the same time they should not get soaked. Avoid places where water is held and strong winds blow. Wet cellars are also suitable for the overgrowing stage. The overgrowing process takes at least 12 months!

PHOTO: Andrej Gregori

4. BIO-BASED COSMETICS

Perhaps it is not an exaggeration to say that beauty care is as old as the rise of great cultures. We have historical knowledge that cosmetic recipes were found in the tombs of the pharaohs, ancient Greek beauty care was of a high standard, pearl powder has been used in traditional Chinese medicine, skin care has been an important part of Ayurveda, historically, India has a very rich cosmetic cultural ***tradition***[1] and perfumes played an almost essential role in ***most of the ancient civilizations***[2]. Cosmetic ingredients have traditionally been natural, however the rise of petrochemicals in the 19th century brought new opportunities and contributed to widespread distribution of cheap cosmetic products. For decades, cosmetics have used petroleum because it is cheap, durable, consistent in quality, and non-allergenic. ***Petrochemical-derived ingredients***[3] are sparking an innovative revolution in makeup formulas. Vibrant colors are gaining popularity, and foundations seamlessly match the skin. Nowadays, we are again experiencing a renaissance of cosmetics made from natural (or better to say: bio-based) ingredients thanks to biotechnology-driven innovations and consumer awareness raising related to sustainability issues. By incorporating eco-friendly principles, we can minimize environmental and health impact but also support biodiversity, and circular economy. By making homemade cosmetics we are not just reviving the practices of our great-grandmothers we contribute to waste reduction and sometimes more skin friendly alternatives for fossil based ingredients.

Thanks to the goodness that nature offers us (herbs), we have the opportunity to simply create our own unique biocosmetics, which are fully natural, as effective as store substitutes, and are created from exactly the products we like.

[1] https://www.mdpi.com/2079-9284/10/3/71

[2] https://www.mdpi.com/2079-9284/10/3/71

[3] https://cosmeticseurope.eu/cosmetics-industry/history-cosmetics/

4.1. Making biocosmetics from oat flour

For those who aim to avoid fossil-based materials and prepare their own eco-friendly and skin-friendly biocosmetics at home using simple ingredients and procedures. The aim is to minimize waste, promote sustainability and create bio-based products with added value. If you want to pay attention to your environment and the health of your skin, following our procedure you can make three different examples of personalized biocosmetics. You just have to choose the fruit juice to start with: do you want an anti-aging cream? Choose a grape juice; do you want an antioxidant serum? Choose a pomegranate juice; do you want an anti-inflammatory and soothing cosmetic? Choose a chamomile decoction.

4.1.1. Oatmeal and fruit facial serum

What we need:

- 5 g oat flour (about 1 teaspoon)
- 100 ml boiling water (about 1/2 cup)
- Fruit juice or decoction (or a 1:1 mixture of yogurt and fruit juice or decoction)

Process:

1. In a small saucepan, add the oat flour to the boiling water and stir continuously for 10 minutes, until it thickens slightly.
2. Strain the mixture through a fine sieve (you can also use a thin cloth) to separate the liquid mixture from the thicker mixture.
3. To the liquid mixture and add 1 teaspoon fruit juice or a mixture obtained by separately mixing 1 tablespoon yogurt with a tablespoon fruit juice. Stir gently until the consistency is smooth.

How to Use: Your serum is ready! Apply it to your face, leave it on for 5 minutes and then rinse with warm water.

4.1.2. Oat and fruit face cream

What we need:

- 5 g oat flour (about 1 teaspoon)
- 100 ml boiling water (about 1/2 cup)
- 1/2 teaspoon wheat germ oil
- Fruit juice or decoction (or a 1:1 mixture of yogurt and fruit juice or decoction)

Process:

1. In a small saucepan, add the oat flour to the boiling water and stir continuously for 10 minutes, until it thickens slightly.
2. Strain the mixture through a fine sieve (you can also use a thin cloth) to separate the liquid mixture from the thicker mixture that is on the surface of the sieve.
3. Recover the liquid mixture and bring to a boil until its volume has decreased to a quarter of its initial volume.
4. The liquid mixture is thick and creamy, add 1/2 teaspoon of wheat germ oil and mix vigorously for about 1 minute.
5. Add 1 teaspoon of fruit juice to the mixture thus obtained. Mix gently until you obtain a homogeneous consistency.

How to Use: Your cream is ready to be applied to your face.

4.1.3. Oat and fruit exfoliating face mask

What we need:

- 5 g of oat flour (about 1 teaspoon)
- 100 ml of boiling water (about 1/2 cup)
- 1 teaspoon honey
- Fruit juice or decoction (or a 1:1 mixture of yogurt and fruit juice or decoction)

Process:

1. In a small saucepan, pour the oatmeal into the boiling water and stir continuously for 10 minutes, until it thickens slightly.
2. Strain the mixture through a fine sieve (you can also use a thin cloth) and collect the thicker mixture that is left on the surface of the filter.
3. Add to the thick mixture 1 teaspoon of a solution, prepared separately, and made up of 1 teaspoon of honey and 1 teaspoon of fruit juice. Stir vigorously until you have obtained a thick and homogeneous cream.
4. Add 1 teaspoon of raw cane sugar and stir until the sugar crystals are well distributed in the mixture. Note: the sugar crystals must remain visible and must not dissolve.

How to Use: apply the cream on the face until it covers the surface of the skin, massage for 2 minutes and finally rinse with water.

4.2. Possibilities of using essential oils in everyday life

Most essential oils available in stores are highly synthetic, which can negatively impact human well-being. Utilizing natural essential oils to create your own massage oils, toothpaste, insect repellents, or perfumes provides a healthier alternative and addresses various challenges faced in modern society.

4.2.1. Massage oil

What we need:

- A 100 ml sterilized glass bottle
- A mix of chosen base oils
- Chosen essential oils

Process:

1. Fill approximately ¾ of the bottle with the base oil mixture.
2. Add 10-15 drops of essential oil(s) to the bottle.
3. Close the bottle tightly and shake gently to mix.

Notes:

- A combination of apricot oil and sweet almond oil is a versatile and effective base.
- Adding avocado oil will result in a richer, more nourishing blend with anti-aging properties, though it may take longer to absorb.
- For relaxation, use essential oils such as lemon, bergamot, or lavender.
- A floral-citrus blend or tangerine oil can also create an uplifting and soothing massage oil.

4.2.2. Tick, insect and mosquito repellent

What we need:

- A 100 ml sterilized glass bottle
- Vodka
- Lemongrass or lavender infusion (or distilled water)
- 3 selected essential oils (options include lavender, lemon, lemongrass, eucalyptus, or mint)

Process:

1. Pour vodka into the bottle until it reaches about 1 cm from the bottom.
2. Add 5 drops of each of the three chosen essential oils (do not exceed three oils with 5 drops each).
3. Fill the remainder of the bottle (approximately 75 ml) with the flower infusion or distilled water.
4. Seal the bottle and shake vigorously to combine.

Notes:

- This natural repellent is safe and effective when applied as needed to exposed skin.
- The combination of essential oils enhances the product's ability to repel insects while providing a pleasant fragrance.

Mosquito repellent B

What we need:

- Natisol 60 g
- Aqua purificata 220.8 g
- Geogard 221 2.4 g
- ESSENTIAL OILS:
- Lemon, eucalyptus 4.5 g
- Tea tree 4.5 g
- Javanese citronella 4.5 g
- Lavender 3 g
- Cloves 0.3 g

Process:

1. Combine Natisol (60 g) and Aqua purificata (220.8 g) in a suitable container. Mix them thoroughly to ensure they are well blended.
2. Add Geogard 221 (2.4 g) to the base solution created in step 1. Stir well to ensure even distribution of the preservative.
3. Add Essential Oils and stir the mixture thoroughly to ensure that the essential oils are evenly dispersed.
4. Storage and Application: Store the repellent in a suitable container with proper labelling.
5. Before each use, shake the repellent well to ensure all ingredients are mixed properly. Apply as needed, avoiding contact with eyes and sensitive areas.

4.3. Face toner and peeling made from grape's residues

For production, we will use grape seeds from blue grapes and additional ingredients such as floral water obtained by distillation with flower extracts (e.g. lavender, rose petals), and cold-pressed grape seed oil, which can be made at home or purchased in high organic quality.

Grape seeds are rich in polyphenols, which have strong antioxidant effects, protecting the skin from free radicals and oxidative stress. They also contain vitamin E, known for its antioxidant properties and ability to regenerate the skin. The flavonoids present in the seeds have anti-inflammatory and antioxidant effects helping to protect skin cells and reduce inflammation. Linoleic acid, an essential fatty acid found in seeds, promotes hydration and skin elasticity and has anti-inflammatory effects. Other ingredients include minerals such as zinc, copper and iron, which are important for skin health.

4.3.1. Face toner

What we need:

- Grape seeds from blue grapes
- Floral water*
- Mortar and pestle
- Containers for finished toner

Process:

1. Let the obtained seeds from blue grapes (preferably organic) dry naturally or use a fruit dryer.
2. Use a mortar and pestle to grind the dried seeds into a fine powder.
3. Pour the floral water into a clean container.
4. Add the desired amount of grape seed powder to the container with water (2 g of grape powder per 1 litre of floral water are recommended).
5. Close the container and shake well to mix the powder with the water.
6. The final product does not require special storage conditions. Shake the liquid before each use. Any sediment formed is not a defect of the product.
7. Apply the face water to a cotton pad and use it as a toner or makeup remover. Do not rinse off with water after application.

* Floral water

What we need:

- Pot with a lid
- Heat-resistant stand (e.g. ceramic muffin tin)
- Bowl for collecting floral water (should not be too wide - just so it does not touch the edges of the pot)
- Herbs/flowers to be processed - approx. 5 handfuls
- Ice bag

Process:

1. Place the stand in the pot.
2. Pour water into the pot: approx. 2-3 cm from the bottom of the pot and soak the herbs in this small amount of water. Check occasionally to prevent burning herbs during distillation!
3. Place the bowl on the stand to collect the floral water. Cover the pot with the lid upside down. The bowl should not touch the pot or the lid.
4. Bring the water to a boil. Once boiling, place the ice bag on the lid and reduce the heat to maintain a gentle boil. Distill for about 20 minutes, no longer.
5. After 20 minutes, turn off the heat and let the pot cool down. Carefully remove the bowl from the pot - the floral water is ready.

4.3.2. Peeling

What we need:

- Grape seeds from blue grapes
- Cold-pressed grape seed oil
- Mortar and pestle
- Containers for mixing and for the finished peeling
- Natural essence (optional)

Process:

1. Let the obtained seeds from blue grapes (preferably organic) dry naturally or use a fruit dryer.
2. Use a mortar and pestle to grind the dried seeds into a powder (does not have to be a fine powder).
3. Pour the grape seed powder into a clean container (according to the desired amount of peeling).
4. Add grape seed oil and mix thoroughly. Adjust the amount of powder or oil to achieve the desired consistency.
5. Add a few drops of natural essence to give it a pleasant fragrance. (Optional)
6. Store the final product in a clean, sealable container. The peeling does not require special storage conditions.
7. Use the peeling on the face once a week. Apply the desired amount to the face and gently massage in circular motions. Leave it on for a moment and then rinse off with warm water. The peeling can also be used to soften the skin of the whole body. The application procedure is the same.

4.4. Herbal cosmetics: tincture and balm

We will show you how to simply and effectively use the healing power of nature (e.g. using herbs) to prepare your own balm and tincture. These natural products are a great way to take care of your health and well-being with the help of gifts that nature offers us. Get ready for a creative and useful activity that will bring you not only pleasure, but also practical use in everyday life.

4.4.1. Balm

What we need:

- Beeswax
- Coconut oil
- Olive oil
- Rosemary
- Calendula (fresh and dried)
- Essential oils (e.g. mint, tea-tree; be cautious with thyme and motherwort)
- Containers for the finished balm
- 2 bowls
- Wooden spoon, ladle, scissors, knife

Process:

1. In a water bath, melt beeswax together with coconut and olive oil (ratio 1:1:1).
2. Add fresh calendula flowers and chopped rosemary to the melted mixture. Cook everything together, stirring occasionally, for 10 minutes.
3. Let the mixture stand for 24 hours.
4. After 24 hours, reheat the mixture in a water bath and bring it to boil, then strain it through a sieve with larger holes to prevent clogging.
5. Add essential oils to the mixture.
6. Keep the mixture warm in the water bath over low heat.
7. Prepare the containers for the balm, add dried calendula to containers as a decoration.
8. Pour the balm into the containers using suitable kitchen utensils. Close the containers once the balm has solidified. The balm is now ready to use. The balm has regenerative and moisturizing effects. It can be used as a lip balm, for treating herpes and also as a balm for dry hands, face, insect bites, injuries, or rashes.

4.4.2. Tincture

What we need:

- Green walnuts
- Alcohol
- 4l jar
- Cloves
- Whole cinnamon
- Star anise
- Vanilla bean
- Sugar

Process:

1. Add longitudinally cut walnuts in the jar, filling it 3/4 full.
2. Add a package of cinnamon, cloves, star anise and a split vanilla bean.
3. Add sugar to taste (not too much to avoid making the tincture too sweet).
4. Pour alcohol over the mixture.
5. Stir and place the jar in a sunny spot for 3 weeks, stirring occasionally.
6. After 3 weeks, strain the mixture and pour it into suitable containers/ bottles.

The tincture helps to remove and expel intestinal parasites from the digestive system. Take it 3 times a day, 30 drops (1 teaspoon) at least 15-30 minutes before meals. If you experience any painful stomach cramps, symptoms or other persistent problems, stop using the tincture. Shake the tincture well before each use to mix it properly.

WARNING: The tincture contains alcohol, so it is not recommended to drive immediately after consumption.

4.5. Queen of Hungary's Water (Tonic)

What we need:

- A 100 ml sterilized glass bottle
- Flowers/herbs: Suggested options include a sprig of fresh rosemary, dried Damask rose petals, dried lavender flowers, or alternatives such as calendula, hibiscus, cornflower petals, sage, or mint.
- Raw apple cider vinegar (preferably home-made for maximum benefits; store-bought apple cider vinegar can be used but may lack some properties).
- Demineralized water.

Process:

1. Fill the bottle about ¼ full with your chosen flowers and herbs.
2. Pour raw apple cider vinegar into the bottle until it reaches about 1 cm from the bottom, then shake vigorously.
3. Top off the bottle with demineralized water, leaving a small gap at the top, and shake vigorously again.
4. Place the bottle on a sunny windowsill and let it infuse for one week.
5. The tonic can be used as is, directly from the bottle, or the flowers and herbs can be strained out before use for easier application.

4.6. Oil balm for dry skin

What we need:

- Jojoba oil, 40 g
- Shea butter, 80 g
- Hazelnut oil, 60 g
- Macadamia oil, 60 g
- Wax, 24 g
- To taste: Essential oils

Process:

1. Heat the water in a water bath to a temperature of 65-70 °C.
2. In a previously disinfected laboratory beaker of 500 mL, weigh the specified amounts of base vegetable oils and add wax. Then place the glass in a water bath and heat until a homogeneous liquid is obtained (approx. 20 min).
3. Then take the glass out of the bath and mix the solution for a few minutes, after which add the given amount of essential oils. Mix everything together, pour more liquid into previously disinfected plastic pots and leave the mixture to cool.

4.7. Utilization of using the egg shell: skin cleansing and rejuvenation

Eggshells, which are primarily composed of calcium carbonate and protein fibres, can be repurposed in various innovative ways that align with sustainable practices and the principles of bioeconomy.

Process:

1. Eggshell powder is mixed with sour cream (30% mm) and applied to the skin.
2. It is necessary to wait 15 minutes and rinse well.
3. Repeat the procedure twice a week.
4. Preparation of the shell: The shell needs to be boiled for 10 minutes and then roasted for 10 minutes in the oven at 175 °C. After that, grind them into a fine powder in a grinder.

4.8. Soap for hands

What we need:

- Soap base - 1000 g
- Macadamia vegetable oil - 16 g
- Pigment - 10 g
- Mica gold powder - 4 g
- The smell of vanilla - 5 g
- The smell of sweet orange - 2 g
- To taste: et. oil - 3 g
- Alcohol

Process:

1. Melt the soap base in a laboratory beaker in a water bath.
2. When the base is melted, add oil and fragrance and separate into two laboratory beakers. In one glass, add pigment, and in the other, gold mica powder
3. First, pour soap with colour into the silicone mould, spray with alcohol to remove air bubbles and leave for a few minutes to set. Pour soap with gold powder, spray with alcohol and leave it to harden.
4. Remove from the mould and the soap is ready.

5. BIOPLASTICS

One of the greatest challenges of our time is cleaning our environment of plastics made from fossil raw materials and recycling them. Bioplastics can be made from renewable plant materials, such as corn, sugarcane, or potatoes, and can be an optional alternative to them. However, it should be noted that the term bioplastics refers to a family of materials, of which there are many types, following the needs of industrial or agricultural customers. They are designed to be more eco-friendly and have a lower ecological footprint. Some of them (not all types of bioplastics!) are biodegradable or compostable, meaning they break down more easily in the environment compared to traditional plastics, which can take hundreds of years to decompose. Look for the compostable eco-label to help you make the proper choice.

In households, bioplastics have a growing role in reducing plastic waste. They can be found in a variety of products like food packaging, containers, cutlery, and even cleaning products. Bioplastics like PLA (polylactic acid) are often used for compostable cups, plates, and straws. However, it's important to note that bioplastics are not perfect. It's up to you to use it in an environmentally friendly way. Some still require specific conditions to break down (industrial composting), and large-scale production of bioplastics can impact land use and food resources. In summary, bioplastics in the household provide a promising step toward reducing plastic pollution and promoting sustainability, however, a lot of research and attitude-building is still needed to find their place in our everyday life.

Bioeconomy and 3D printing: the convenient use of bioplastics

The purpose of these instructions is to set up a small hydroponic plantation for in house growing vegetables and herbs in a very limited space and using bio-based and biodegradable plastics. The design of the hydroponic container proposed is very flexible, and can be replicated as many times as it requirements for the home grown production. In this tutorial, the plants can be grown using water and some hydroponic fertilizer, some of which can be also self-produced at home. The material used for 3D printing should be, as in the tutorial, PLA (polylactic acid) which is a polymer obtained from renewable resources and which, at the end of its life, in the event that the hydroponic tower is no more in use, or somehow breaks, can be disposed of in the municipality managed compost bin, without creating additional plastic waste. All-in-all this is a convenient way to efficiently grow a vegetable garden in a very tiny space, producing everybody's own salad, basil, or strawberries, without using unknown and dangerous substances.

Hydroponic tower

What we need:

- A 3D printer: while many 3D printers are now available for a small price, note that in many places, such as in libraries or local community centers, there are shared facilities that often offer consultancy to first users.
- 3D printing PLA filament (colour of choice)
- Seeds (or grown tiny plants maybe already in soil)
- Water
- Hydroponic fertilizer (you can buy it on local flower shops or try to do it yourself with your wastes)
- An immersible water pump with timer
- Some flexible tubing

Process:

1. Export the STL File from our ***folder*** *
2. Choose Your Parameters: The next step is then deciding on the different parameters of your object and the printing process. This includes deciding on the size and placement of your print. If you are not an expert, you can seek advice at makers' center for this.
3. Create the Gcode: You will then import the STL file into a so-called slicing software. The slicing software will convert the information from the STL file into a Gcode, which is a specific code containing exact instructions for the printer.
4. PRINT! Print all the components, and repeat the holding segment and the crates as many times as you need them.

* https://drive.google.com/drive/folders/1nqFXmQ3TzbRnQDAioAkrjPrFPTYh_YNQ

* https://www.thingiverse.com/thing:5929335

The vegetable garden assembly

Process:

1. Once all the components are ready, assemble them in the tower. The tower should be placed onto a conveniently sized water container into which the immersible pumps should be placed.
2. The pump output should then be connected to a flexible tubing long enough to get to the highest level of the tower.
3. The pump should be connected to electricity (or to a small solar powered battery system) with a timer.
4. Place a plant in every single crate: you can mix as many plants as you want in the same tower: try and alternate bulk a tiny plant so that they do not interfere too much one with the others.
5. Fill the water tank with water and hydroponic fertilizer (depending on the number of plants and how big they will grow, the water and fertilizer should be re-supplied every couple of weeks up to every 4 weeks)
6. Start the pump: the pump should not work continuously, but in alternate cycles: for example, 30 minutes of and 5 on. The appropriate cycles you can find it depending on how many plants you have and how big they grow.
7. Enjoy your vegetables and herbs! Fresh strawberries, salads, basil, parsley and whatever you might prefer in your kitchen.

6. SUSTAINABLE SOIL MANAGEMENT

Soil is a rarely mentioned but essential natural resource that supports biodiversity, provides raw material to food systems, industries and contributes ecosystem services (e.g. carbon storage, water purification). Soil is home to many organisms, such as fungi and earthworms, which help recycle nutrients and store carbon. It also provides raw materials for industries like horticulture and construction. Preserving the fertility of the land is crucial for producing healthy foods, ecosystem balance that is essential for life. However, soil faces significant challenges, including erosion, pollution, degradation from over-farming, and loss of organic matter. The way we use soil is also linked to climate change, which further threatens soil fertility. Bioeconomy offers promising solutions to enhance soil health and regeneration by promoting sustainable agricultural practices and the use of organic inputs like compost and biopesticide.

Naturally also we can do a lot for preserving soil fertility by properly cultivating our kitchen garden. Let's start it by composting household organic waste to enrich the soil with essential nutrients. Crop diversification supports sustainable soil management and by using natural fertilizers, such as compost, manure, or organic mulch, we may improve soil structure and retain moisture. Additionally, by planting cover crops like legumes, we may fix nitrogen and enhance soil fertility. If we avoid chemical pesticides and herbicides, we can prevent harming soil organisms.

Learn about good practices that can help you with sustainable soil cultivation.

6.1. Biochar production

The production of biochar involves controlled combustion of biomass (carbonization) with limited oxygen supply by gradually adding biomass and finally water. This method does not allow for energy recovery as it would reduce the quality of the biochar. The goal is to obtain charcoal in amount equal to half of the burned biomass. The carbon balance in the material cycle is not positive, so biomass carbonization is the only way to preserve such a large amount of carbon (up to 50%). Historically, only the genesis of brown coal and hard coal was a similar process.

What we need:

- Wood biomass, e.g. dry wood, plant residues
- Boiler or pit dug in the ground
- Availability of water
- The possibility of lighting a fire (also legislative)

Process:

1. The carbonization process can be carried out in a pit dug in the ground or in a boiler. Wood is placed at the bottom of the boiler and then set on fire.
2. As the combustion process lasts, additional wood is added to the sides of the firebox to avoid gas emissions. Adding too much wood at the start will also produce unnecessary smoke.
3. At the end of the process, the kiln is quenched with water. After the flames disappear, if the upper part of the material has not completely burned, it should be separated and used in the next carbonization process. The obtained biochar can be stored in a dry place.

Notes:

- Biomass for biochar production can include wood and plant residues. For wood, a year of aging/drying under a roof is recommended, and if it has about 20% moisture, so it is suitable for the carbonization process. The wood species does not matter, but the fraction is crucial - preferably fine branches. The thicker the wood (over 5 cm in diameter), the longer the process lasts, and there is a risk of gas emissions. For autumn biochar production, goldenrod mowed in spring is recommended, as well as bird cherry, which produces hard biochar. Never burn wet biomass.
- The carbonization temperature reaches about 700 degrees Celsius. In the case of a clean process, combustion does not emit toxins into the atmosphere. Biomass should be added in small amounts and maintained at a high temperature, then the emissions are minimal. Lowering the combustion temperature will result in higher emissions. Initially, the biomass releases volatile organic compounds, which are then burned, providing heat to continue the process. The key element is controlling the temperature and oxygen supply. Too much oxygen can cause complete combustion of the biomass instead of carbonization, which lowers the quality of the charcoal, and gases may be released into the atmosphere. Therefore, biomass is gradually added to maintain a constant temperature and limited oxygen supply.
- Raw biochar can be applied at a rate of up to 2 tons per hectare. Any higher dose can bind nitrogen from the soil. On good soils, where the amount of carbon is sufficient, biochar may not have noticeable effects, but the lower the soil quality, the more noticeable the effects. Legumes respond very well to biochar, while cereals respond less so. Biochar can also be used as a feed additive, for example, for chickens.

6.2. The colours of photosynthesis

Natural pH indicator and soil pH test

The purpose of these instructions is to prepare a pH indicator for in-house measuring of the pH of aqueous solutions, by using red cabbage and its anthocyanins. Your red cabbage indicator should be dark blue. The colour of the cabbage indicator will change to red or pink if the solution is an acid and it will change to green or yellow if it is a base. It will remain purple or blue if the test solution is neutral.

This pH indicator can be used to test soil pH, an essential information to know for proper plant growth. In fact, most plants prefer a pH level of acidity (like dandelions, wild strawberries, parsley and raspberry) or alkalinity (like rosemary, lavender, and chicory) in the soil and when the pH is off balance, a plant may not be able to absorb nutrients correctly. Testing soil pH is best done in the fall before the next planting season so you have time to correct it. One way to correct soil pH is to plant a nitrogen-fixing cover crop (for mild winter climates). Another way is to use soil additives or amendments to lower soil pH (make the soil more acidic) or to raise the alkalinity (increase soil pH). The type and quantity of soil amendments depend on how much the pH needs to be raised or lowered.

Another application could be pH control in small domestic pools: the pH of the pool water should always be neutral, otherwise problems may occur. As a general rule, pH should be checked at least twice a week. Water that is too acidic risks damaging the metal parts of the pool. An excessively basic pH, however, can cause irritation to the skin and eyes.

What you need to make a pH indicator:

- Head of red cabbage
- Sharp knife
- Pot to boil water in (or blender)
- Strainer or colander
- Glass bowl
- Clear cups or glasses
- Household liquids to test (vinegar, baking soda, lemon juice, soaps, bleach, ammonia,)
- Something to stir with

Process to make a pH indicator:

1. Take your red cabbage and cut off about 2-3 cups (the amount doesn't need to be exact, the more cabbage, the more indicator you will get).
2. Place the cabbage pieces inside a bowl filled with hot boiling water (you can use a microwave oven).
3. Let cool.
4. Once cooled, pour some droplets of cabbage solution into clear glasses containing the different liquids to test ("do not combine different liquids, only test one substance at a time")
5. "Gently stir or swirl the solution and see what happens!"

Process to test soil pH with the pH indicator:

1. To test your soil, add a couple of teaspoons of garden soil to a jar with about 10 ml of the cooled cabbage water. Stir and then wait for 30 minutes.
2. After 30 minutes have elapsed, check the colour in the jar. If the colour is pink, the soil is acidic; if it is more on the green spectrum, your soil is alkaline.

Procedure for checking the pH of swimming pool water:

1. To test the pH of water, add 10 ml of pool water to a jar with about 10 ml of cooled cabbage water.
2. Mix and check the colour in the jar, the colour must not vary and remain blue purple.

6.3. Earthworm compost (vermicompost)

Vermicompost is considered one of the highest quality fertilizers. It not only nourishes and keeps the plants in good condition, but the microorganisms contained in it also improve the properties of the soil.

Types of earthworms used in vermicomposting:

- Dung earthworm (Eisenia foetida) – earthworms that normally inhabit outdoor compost or manure will do well in a vermicomposter.
- California earthworm (Eisenia andrei) – a specially bred species that originated from the dung worm. The main advantages include higher resistance, rapid reproduction and a strong appetite. It can thus consume a large amount of residues and is the most suitable choice for vermicomposting.
- European earthworm (Dendrobaena veneta) – another popular type of earthworm, however, slower reproduction and processing of "food" must be expected with it.
- Common earthworm (Lumbricus terrestris) – an earthworm up to 30 centimeters long, which is also commonly found in outdoor soil in the garden or anywhere else.

Instructions for setting up a vermicomposter and its subsequent care:

1. Prepare a suitable container (if you do not want to buy a special vermicomposter directly, it can be a large enough plastic or wooden box, which you provide with holes for sufficient air circulation).
2. Fill the container with suitable bedding, such as peat, paper or straw. The bedding needs to be moistened.
3. Find the right place for the vermicomposter – a temperature of around 20 °C and plenty of light is ideal. Move the composter as needed (for example, with the change of season).
4. Move the earthworms into their new home.
5. Start feeding the earthworms regularly - always check that they have enough food, add more if necessary. But do not feed the earthworms.
6. Don't forget to keep the bedding moist, but not completely wet (too dry bedding can be moistened with a water sprayer, and the excess water should be sucked out of wet bedding). Also ensure proper air circulation (vents should never be covered).
7. In two to three months, you can look forward to the first, properly nutritious compost.

6.4. Homemade fertilizer from coffee

The aim of the following instructions is to make homemade coffee grounds fertilizer. According to statistics, around 700 billion cups of coffee are drunk annually worldwide, making coffee the second most consumed beverage after tea and the second largest commercial commodity after oil. The coffee industry therefore contributes dramatically to global waste production, with an estimated 1 tonne of green coffee generating 650kg of coffee grounds, generating thousands of tonnes of this residual matter every day.

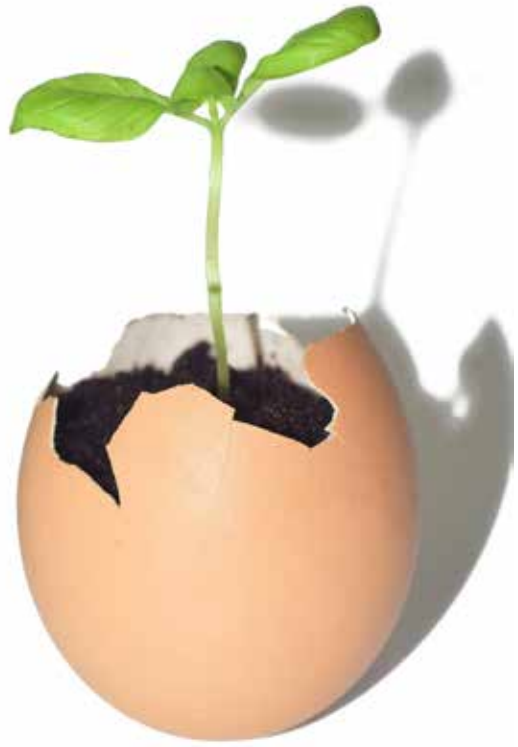
Coffee grounds are rich in organic substances such as polysaccharides, lignin, proteins, fats and other organic compounds. It is rich in nutrients such as nitrogen (2%), phosphorus, potassium and magnesium. These substances are important for improving the soil structure and its ability to retain water and nutrients. Nitrogen itself is essential for plant growth and development and also important for the production of proteins, enzymes and chlorophyll. Citrus peels can be added to increase the effect.

What we need:

- Coffee grounds
- Water
- Orange
- Board, knife
- Paper
- Bowl
- Flowers in a pot

Process:

1. Spread the coffee grounds on paper and let them dry thoroughly (this will avoid mould)
2. Cut the orange peel into small pieces
3. Mix the coffee grounds with the orange peel pieces in a bowl
4. Scatter the mixture around the flowers and water.
5. The dried coffee grounds can be worked directly into the soil to aerate it, improve the soil structure and allow better water absorption.



6.5. Natural eggshell fertilizer and tea

Eggshell fertilizer

Process:

1. This procedure requires the collection of eggshells, so it is best to place them in a container in the air where they will dry naturally. Crush the husks by hand and sprinkle them on the ground or in the ground. The shells need a longer period to release calcium into the soil, so it is ideal to do this in the fall as an additional supplement in the spring.
2. For plants such as tomatoes, peppers and eggplants, this calcium addition is extremely important in preventing flower and fruit rotting.
3. The same shells can also be used as protection against pests, especially snails. It is necessary to sprinkle the scales around the plant at a distance of 5 cm, and the sharp pieces will stick to the intruder and he will be prevented from doing further damage.

Eggshell tea

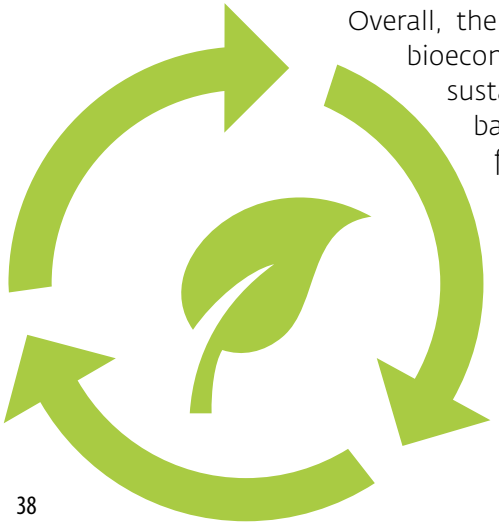
Thermally process the shells by drying them in the oven for 20 minutes at 250 °C, then cover them with boiling water and leave them to cool. Strain the solution and use it to water house plants. That way they will get the necessary minerals.

7. BIOECONOMY AND CIRCULAR ECONOMY

Circular economy and bioeconomy are closely related, as both systems aim to promote sustainability, the efficient use of resources, and the minimization of environmental impacts. The two approaches support each other and mutually strengthen sustainable economic models.

The basis of a circular economy is to make the life cycle of materials and products as long as possible, and to reduce the use of resources by recycling waste. Bioeconomy builds on biologically based resources, which are renewable and can be used in an environmentally friendly way. The connection between the two systems lies in the fact that bio-based products and processes are particularly suitable for being integrated into the model of the circular economy, where biological raw materials are not only used for production, but are returned to the cycle by recycling, composting or degrading the final products.

The application of the principles of the circular economy in the field of bioeconomy aims at extending the life cycle of materials, using products as long as possible, and recycling. In addition, biotechnological innovations such as the use of enzymes to break down waste or biogas production also contribute to the circular economy by helping to reuse energy and materials.



Overall, the combined use of circular economy and bioeconomy helps to make the economy more sustainable, reduce the demand for fossil-based resources, and promote the smoot functioning of the cycle of bio-based materials. These two approaches support each other, as both focus on using resources in a renewable way, minimizing waste and reducing environmental impacts.

7.1. Extending the life of wood and wooden products

Between 2020 and 2050, Europe is expected to face a growing shortage of wood, signaling significant changes in supply chains and sustainable forest resource management. Projections indicate that wood consumption will increase by up to 50% by 2050, placing additional pressure on already limited resources. At the same time, the European market is experiencing substantial wood exports to eastern markets, further exacerbating the strain on this critical raw material. These trends require careful monitoring and the development of strategies to promote sustainable wood usage and support the transition to a circular economy within the wood industry (B. Lesar, 2020).

Wooden products act as a significant storage pool for wood-based carbon, contributing to climate change mitigation. To preserve this beneficial property, it is essential to extend the utility of wood even after its original use is no longer viable. Recovering spent wood (ie. wood that has already undergone at least one lifecycle of use) is a sustainable strategy that aligns with the principles of the cascading use system. In addition to promoting sustainability, recovered wood products offer considerable economic benefits, reinforcing their value within a circular economy framework.

Spent wood refers to wood that has already gone through at least one lifecycle of use. Common English synonyms for this term include:

- Recovered wood
- Recycled waste wood
- Post-consumed wood

In German, the equivalent term is: Altholz.

It is important to distinguish waste wood from wood residues, as these terms are not interchangeable. While waste wood originates from post-consumer sources, wood residues typically refer to by-products generated during industrial processes. Understanding this distinction is crucial for accurately categorizing and managing wood resources within the framework of a circular economy and sustainable material use (B. Lesar, 2020.).

Spent wood is:

- Construction debris
- Old furniture

Packaging material

- Wood after the end of its primary life
- Recovered wood
- Post consumed wood

Spent wood is NOT:

- Wood residues from the processing of wood and wood composites
- Forestry residues - wood off-cuts

The quality of spent wood varies significantly and is influenced by several factors, including its dimensions, age, level of degradation, and contamination. These variations present challenges in the recovery and recycling processes, as they affect the suitability of the material for different applications. Assessing and categorizing spent wood based on these parameters is essential to maximize its potential for reuse while ensuring compliance with environmental and safety standards. This variability underscores the importance of developing advanced sorting and processing technologies to enhance the efficiency of spent wood utilization within the wood industry (B. Lesar, 2020).

Classification of recovered wood

- **Class A I:** Wood that is in its natural state and may have undergone only mechanical treatment and is not contaminated with chemicals.
- **Class A II:** Glued wood treated with surface coatings. Adhesives and coatings do not contain halogenated hydrocarbons or wood preservatives.
- **Class A III:** Exfoliated wood treated with coatings containing halogenated hydrocarbons but not containing biocidal wood preservatives.
- **Class A IV:** Degraded wood treated with wood preservatives (railway sleepers, telephone poles, fences. This class includes wood which cannot be classified in the lower three classes, with the exception of wood containing PCBs.

CLASS	INTENDED APPLICATION
A I	Material use (energy possible)
A II	Material use (energy possible)
A III	Energy use (material use only with prior processing)
A IV	Energy use in large-scale combustion facilities
PCB	Non-hazardous disposal

RECYCLING PROCESS	CLASSES OF SPENT WOOD				SPECIFIC REQUIREMENTS
	A I	A II	A III	A IV	
wood chips intended for the manufacture of wood composites	YES	YES	YES	NO	Class AIII wood may only be used if the surface layer has been removed
production of synthetic gases	YES	YES	YES	YES	wood processing in Class AIV is only allowed in licensed installations
production of activated charcoal	YES	YES	YES	YES	wood processing in Class AIV is only allowed in licensed installations
energy production	YES	YES	YES	YES	wood treatment in Class AIV shall only be permitted in installations with good quality exhaust gas filtration

Source: Dr. Boštjan Lesar

You can spruce up your home with furniture made from discarded pallets.

The only limit to bioeconomy is your imagination. Think freely, you can even make garden accessories from old logs under the railway tracks.

PHOTO: Dr. Boštjan Lesar

7.2. Utilization of textile materials for fruit/ vegetable packaging

The purpose of these instructions is to sew a recycled bag from old curtains, which can be used instead of plastic bags for fruits, vegetables or other purposes. All materials used in this product are recycled and are a combination from manmade materials and natural bio-based materials that were no longer suitable for use. A bag like this can be used for years, you can repair, renew and wash it normally, which is why it is such a good alternative for a normal plastic bag.

What we need to make a bag:

- Old sheer curtains (vintage lace curtains, flower embroidered curtains or any other transparent material)
- Yarn from natural material (hemp, flex, raffia, wool, cotton yarn)
- Other materials for decoration (buttons from used clothes, old clothes, bio-based scraps)
- Scissors for textile
- Needle
- Sewing machine
- Tape
- Safety clip

Process

The bag:

1. Cut out a rectangular shape from the curtain. Determine the size yourself and keep in mind that we will fold the piece of fabric in half, so that the bag will be half the size at the end.
2. Do not sew with an ordinary straight stitch, but choose a strong elastic stitch, so that your bag will support the weight of fruits and vegetables.
3. Turn your bag inside out and fold the edge inwards. Sew with the same strong plastic stitch.

The rope:

4. Cut 3 yarns about 80 cm long and knit them into a regular braid. Since the yarns are long, help yourself by taping them to the table before knitting.
5. Once the braid is made, use a safety clip and thread it through the edge of the bag. To get into the edge of the bag, use the holes of the curtains.
6. Knot both ends of the yarn together, so that the bag can be opened and closed.

Decoration:

7. Use your imagination and decorate your bag with old buttons, scraps from bio-based materials, used clothes etc.

8. REVERSING BIODIVERSITY LOSS

Biodiversity[1] is the variety of ecosystems (natural capital), species and genes in the world or in a particular habitat. It is essential to human wellbeing, as it delivers services that sustain our economies and societies. Biodiversity is also crucial to ecosystems such as pollination, climate regulation, flood protection, soil fertility and the production of food, fuel, fibre and medicines. Due to harmful economic practices of the last century like intensive agricultural production systems; overspreading of the built environment, the overexploitation of natural resources; pollution and overconsumption humanity is witnessing a severe biodiversity loss.

Bioeconomy concept may play a significant role in supporting biodiversity in many ways. Sustainable resource management and waste reduction promote the use of renewable biological resources and making our economies circular. Using native plant species and biological by-products for bio-based products or integrating restoration practices into land management can help rebuild damaged ecosystems. Sustainable practices such as agroforestry can improve soil health, enhance ecosystem services like pollination, pest control, and soil fertility, which are crucial for maintaining biodiversity. Bio-based products reduce dependence on fossil fuels, synthetic materials, and harmful chemicals. Products made from natural, renewable resources can help reduce pollution. However, careful planning and monitoring are essential to make the fundamentals of a sustainable bioeconomy.

[1] https://www.eea.europa.eu/themes/biodiversity/intro

8.1 Breeding bumblebees for home gardening

Pollination is the process of transferring pollen from the anthers to the stigma in the flowers of plants so that fertilization can occur and subsequently produce a seed. This process is crucial for sexual reproduction of plants. In the conditions of the Czech Republic, about 20% of plants are pollinated by wind (windiness, wind pollination, anemogamy). The best-known representatives are all cereal species such as wheat, barley, oats and rye. However, most plants (80%) rely on insect pollen transmission (insect pollination, entomogamy). These are mainly fruit trees and agricultural crops (e.g. oilseed rape, various types of clover, etc.). If insects had no access to these plants, the fruit or seed crop would be zero or negligible. Pollinators thus play an important role in maintaining biodiversity, ensuring the growth and survival of a wide range of plant species. Without them, many plants could not reproduce successfully, leading to a decline in biodiversity and destabilising ecosystems. In addition to their ecological importance, pollinators also have an economic impact, as many agricultural crops depend on pollination for yield. Protecting pollinators and their habitat is therefore crucial not only for maintaining biodiversity, but also for ensuring stable food production and ecosystem health. Bumblebees, like bees, are pollinating insects. Without their activity, many plants would not produce fruit or seeds. The pollination capacity of bumblebees is great; one worker bumblebee can visit up to 2,000 flowers a day! If there is enough food in the area, it is very advisable and welcome to help the bumblebees by installing a suitable bumblebee house

Instructions for the bumblebees nest

We have relocated, or you have relocated yourself, a young bumblebee family (Bombus terrestris terrestris) consisting of a mother, 10-30 workers and a brood (larvae, pupae). From the awakening of the queen from hibernation to reaching this stage, 1.5-2 months elapsed. This family will gradually grow and within two months should start to raise sexual individuals - new queens and males. Each nest develops at its own speed, which cannot be influenced, and rearing of new queens may occur earlier. The usual lifespan is 2-4 months from hatching. The presence of workers in the nest ensures that the mother no longer flies out. Female bumblebees are faithful caretakers of the brood and will not leave the nest and fly elsewhere. Do not interfere or tamper with the nest unnecessarily to avoid damaging the brood. The goose neck, which has an internal diameter of less than 18 mm, is easily clogged and therefore removed from the inlet when fitted by our bumblebees. Moreover, the bumblebees of Troubsko do not need it and find their way out more quickly when it is not there. However, we leave it loose in the nest. It gets a scent of bumblebee pheromones, which can attract queens in spring. If you find that this applies to your bumblebee, we recommend shortening it to 4-5 cm for next year and putting a wider gooseneck on this part. If the gooseneck is larger in diameter, do not remove it.

Transport

The inlet opening must be closed. Ventilation during travel may be open but is not necessary. Do not leave bumblebee hives in the car in the sun to prevent them from overheating. Have food available (sugar dough/syrup feeder and pollen feeder) until they recover from their new housing. The feeders do not need to be removed. If it is cold at the time of collection and the bumblebees are not yet flying, check the supply in the feeder and feed the bumblebees.

Location

The bumblebee is installed in a dry, shady place. Morning sun is possible until about 8 o'clock. Evening sun is not suitable as the air temperature is already high towards evening. As protection against ants, either the legs are used, which are placed in bowls (PET bottle caps) with oil (watch out for pets that lick the oil), liquid soap, or water with spring. Oil is only recommended because of the slower drying time. Wide bowls are not recommended because the shiny liquid attracts bumblebees, which drown in it. It is also possible to place the bumblebee on a stand with a leg fitted with glue or to hang it. However, it should not sway or move.

First days - After installing the bumblebee on the final site, open the flap completely and secure it before locking. Conversely, the vent must remain closed so that the workers are not confused by the light and learn to navigate the inlet tube to the inlet. Only when they have learned to do this and the air temperature has risen above 20 °C can it be opened. Due to the fact that bumblebees have food in their hive, workers can only go out to find food after a few days. But don't expect a beehive--like operation. Workers are few and far between, and the chances of seeing one fly in are slim. Try placing a small rock, straw or leaf in the entrance hole. If the mark is removed, the worker already knows which way out and you can start learning to flap. This consists of lowering the trap gradually. The more workers the nest has, the faster the learning takes place. Ideally, day 1 fully open, day 2 closed to about 0.5 cm, day 3 fully closed. However, always close the flap at night. The hoverfly attacks the nest at night.

It flies from dusk to dawn. It is better to close the flap earlier and check after dark to see if there is still a straggler. You can help them initially by tilting the bumblebee slightly forward. The flap is then lighter. When the nest gets stronger, bring the bumblebee back into balance to make the flap heavier again. The nest is not protected until the flap is fully attached. Therefore, do not prolong unnecessary learning. Workers don't like the flap and sometimes it takes them longer to open it. Often it is only by working together, with some workers pushing from the inside and others lifting from the outside. It is necessary to arm oneself and let them suffer. A small gap may help the bumblebees to lift, but it also means that the nest is not protected. Later, you can relieve the workers by lifting the flap once when you're around. Workers sometimes lose pollen grains on the flap or under-wax the flap to keep it from coming off. It is therefore necessary to clean the flap and check for leaks. Press the pollen grains into a pet-bag and freeze in a bag with limited air access. When the nest starts to rear new queens and the large queen larvae need a lot of pollen, place the pet-cup with the pollen in the nest, preferably all the way down to the brood.

Temperatures

The Great Wood Bumblebee (Green Household), the Economy Bumblebee and the Lapwing Bumblebee can cope with the usual spring and summer temperatures. The Wall Bumblebee is less thermally protected and so extra care is needed during temperature fluctuations. It is recommended to insulate it with e.g. polystyrene. In prolonged low temperatures (daily highs below 5 °C for two or more days) and severe frosts (temperatures below - 5 °C), depletion of reserves and hypothermia can occur.

If they still have a sugar feeder, this will give the bumblebees energy for warming up. If they already have an empty feeder, put a sugar solution in a pet cap with cotton wool (ideally fructose:sugar:water in a 2:1:2 ratio) on the lining. In a pinch, even plain sugar (not cane sugar) or honey. We can also seal the bumblebee for the night and transfer it to the hallway of the house or basement. In summer, when temperatures exceed 30 °C, it is advisable to cool the bumblebee with a wet cloth on which a container of water is placed and a wick to moisten the cloth. However, it always depends on the habitat. We can tell that the nest is overheating by the worker bee sitting inside on top of the lining or even outside on the hive, swirling her wings.

Pests

Bumblebees have a number of pests. You can find out what to do in case of an infestation in our guide or at ***www.cmelaciplus.cz.***[1] There is no harm in inserting a sticky strip around the perimeter of the ventilation nets to catch any pests.

[1] http://www.cmelaciplus.cz/

The end of the nest

After the end of the nest's life, clean the hatch mechanically, with water without chemicals, or burn it. Storage in a protected place will prolong the lifetime. It can also be painted with Balacryl or other water-based paint.

Premature Death

Sometimes the nest dies prematurely. The causes can be different. In addition to inappropriate placement in the sun and pests, bumblebees can become sick with microscopic parasites that weaken the nest, be infested with bumblebees, or poisoned by pesticides. If possible, ask neighbors not to use pesticides or notify you so that you can confine the bumblebees for the necessary time.

New Season

Next year in February/March/April, prepare the hive, fill it 2/3 full with suitable fluffy heat-resistant fill and place it with the vent closed and the flap open back on the site to be available should any of the young queens wish to return. We also recommend trying to settle a different species. For example, rock, meadow, meadow, and robin bumblebees like to nest in bumblebee boxes. Again, you can find how to do this in our guide or at ***www.cmelaciplus.cz***.[2]

[2] http://www.cmelaciplus.cz/

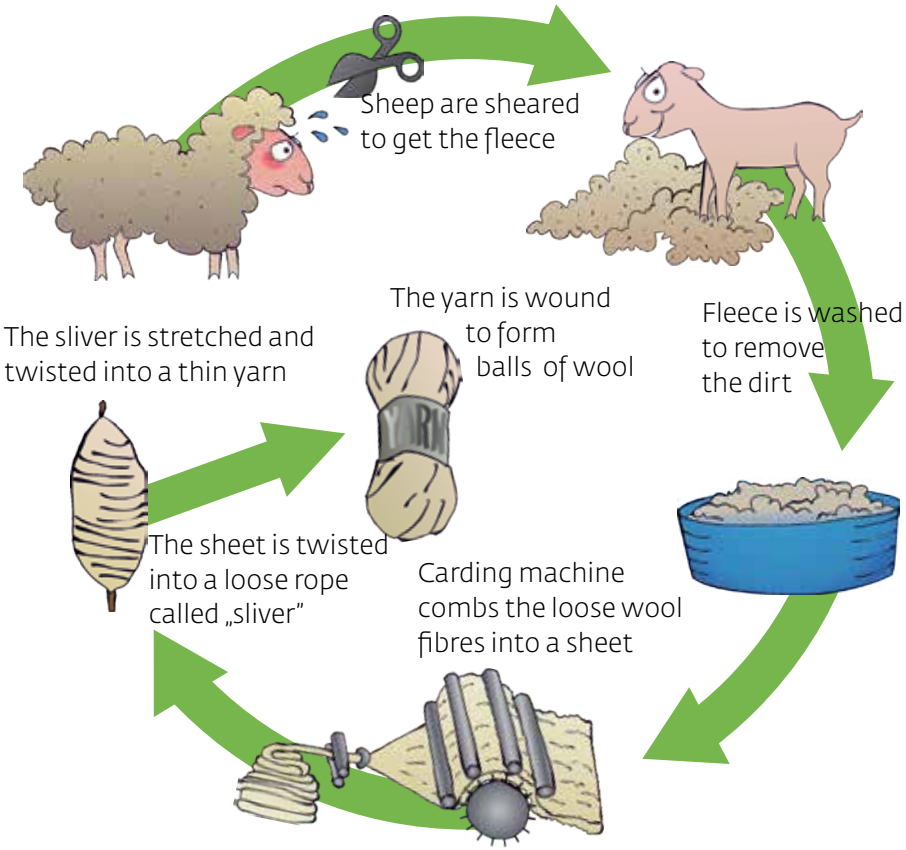
8.2. Utilization of wool for producing useful equipments and design objects

What kind of raw material is wool?

Our loveliest raw materials come from natural origin such as plant fibers or animal hair. Both have been used for thousands of years in human history, and still we have the knowledge to utilize these wonderful materials.

Fibers of plant origin are cotton, linen, hemp; we make advantage of the wavy or long fibers of the processed plants.

Fibers of animal origin: wool of sheep, lamas, alpakas, hair of angora rabbits, silk of silkworms.

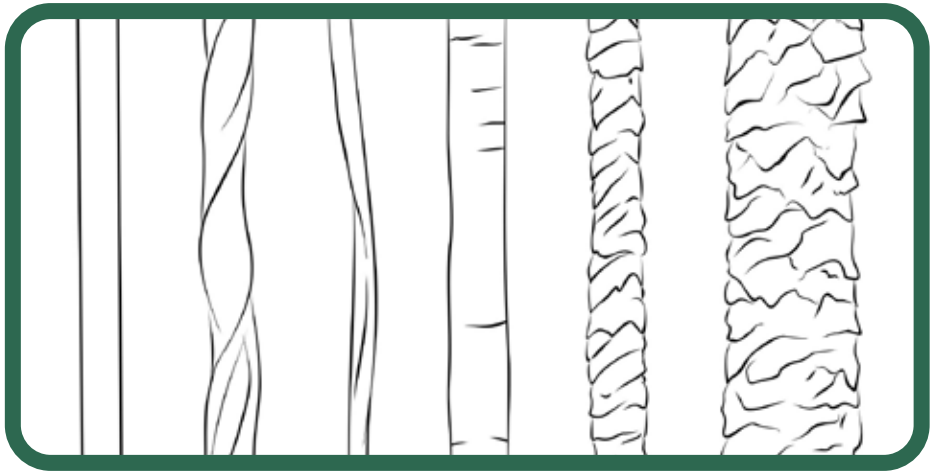


Wool, as raw material is produced in such a way that the sheep stays alive and continues to graze happily afterward. Sheep need to have their fur to be shorn in the springtime. The fleece must be cleaned with water and chemicals. Impurities of plant origin are removed after being carbonised with sulfuric acid, which process needs a lot of water. After cleaning, the fibers are carded and parallelised, this will make them suitable for spinning to end this process up with a ball of wool yarn.

At home you can use the cleaned wool itself to unleash your creative energies and produce homemade equipment and ornaments to build a connection to nature on an everyday scale.

Why is wool so good?

The secret lies in the structure of wool. There are scutes on the surface of each strand of wool. It's like velcro. We use these scutes by moving the wool strands on each other, to cling together as much as possible. You can see the rough surface of wool in the picture below.



POLYESTER	COTTON	SILK	LINEN	FINE WOOL	COARSE WOOL

How can I use wool at home?

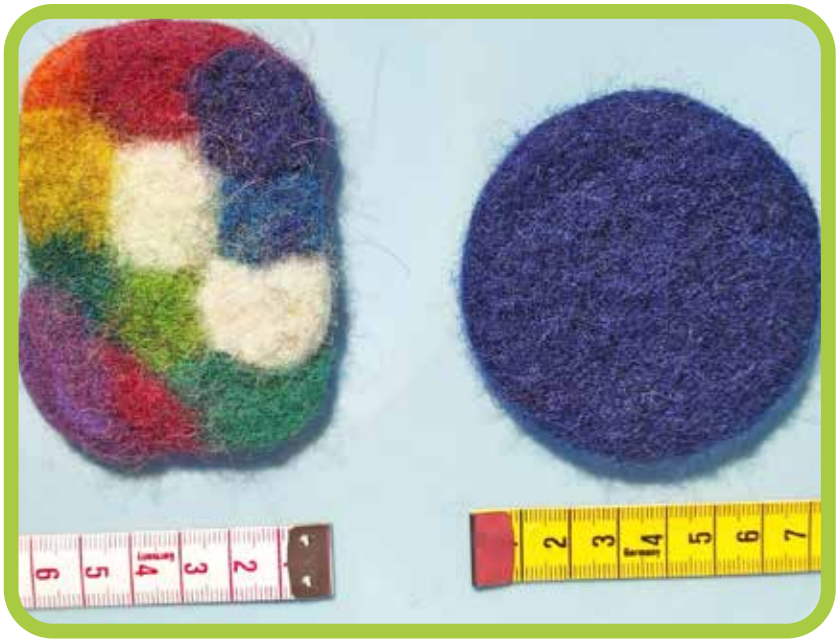
You can make small items like key holders, placemats or even bigger wall hangers at home on your own. You need only a few things and a lot of time and energy. But it is worth it!

How do I make it?

Wet method

1. You put together bunches of wool bits (make it thick) following a shape or a template you can cut out of a cardboard box or a piece of a thicker polyfoam sheet.
2. Use different colours in the several layers of wool, it will give a really beautiful outcome in the end.
3. Using a small amount of lukewarm water makes the wool wet and using a firm soap. The soap's linolene content will do the hard work.
4. By smoothing and gently rubbing the wet, foaming wool carefully, start to build the connections of the wool strands: this is called felting – at first it can fall apart from a bit harder movement – no worries: put them together and continue rubbing it.
5. After some time, the shape will be formed, it will be tougher but smaller than at the beginning - it is natural, you made the strands cling together, they are closer, their structure got into each other, they cannot be separated anymore – with a little practice you will see the ratio of the shrinkage depending on the thickness of your workpiece.
6. Remove the template and from now on you can knead the piece harder to achieve its final shape and size – the more energy you put in the harder final result you get. Our ancestors who lived in felt tents made the sheets for these tents were made by tying a big log behind horses, the big sheets were screwed onto it, and it hit the ground again and again as the horses went by. Hard job!
7. At the end wash the soap out of your work in warm water, let it dry and voilá, you made something great!

Be aware! It shrinks!



Steps of felting

- Make it wet and foamy with soap
- Rub and massage it gently
- Remove the template
- Knead it, rub it – The tougher you make it the stiffer the result will be
- Finished! You made it!

Dry method

It is usually used to decorate the surfaces of the felt pieces made by the wet method. You put the layers or bulks of the decoration wool you would like to fix, and pinch them into the base by using a needle. You need to be determined and very cautious, because the clinging will be formed by thousands of small movements, when you physically push the strands into each other's structure.

Keep going, it will be beautiful!

Watch **this video**[1] to see how we managed.

Felting needle
Be careful! It is very sharp!

[1] https://www.youtube.com/watch?v=qmpArVxjXZE

Okay, I like it. Let's give it a try!

Some ideas:

9. WELCOME TO OUR BIOECONOMY COMMUNITY

If you like the bioeconomy concept, you are committed to sustainable topics and feel like creating, don't hesitate, become a producer yourself and join the BIOECO-UP community!

Bioeconomy offers all of us the opportunity to contribute to a sustainable and circular economy. If we want to produce a bioeconomy product ourselves, we should first of all give preference to natural raw materials and renewable resources. We can start with sustainable agriculture, such as organic gardening, where we use organic manure, compost and local plants. Cosmetic products such as soaps, balms and creams made from green plants, willow, flowers or herbs can be effective as their alternatives based on fossil fuels.

Another possibility is the application of organic food production, like using fermentation technologies, where new, nutritious products can be made from local raw materials.

Of course, as a customer, we can have a significant impact on the rise of bioeconomy if we consciously choose products that come from a sustainable bioeconomy. Preference for local raw materials and ethical production processes is important. Thanks to growing consumer awareness citizens pay attention to sustainability and environmentally friendly solutions. The expansion of the market for bio-based products will ensure the success of bioeconomy businesses in the future.

Here are some approaches how we can support bioeconomy as consumers:

1. Look for products that are made from natural, renewable materials. Bio-based cosmetics, food, cleaning products and other everyday products promote sustainability by reducing the demand for fossil raw materials.
2. Support local producers and farmers to reduce the ecological footprint of transport and promote the development of the local economy.
3. When purchasing, it is also worth paying attention to packaging. Instead of plastic, choose reusable, compostable or packaged products made from recycled materials. Or simply take a glass jar and fill it with your favourite grains – without buying any packaging.
4. As customers, we can also support bioeconomy by buying quality products and by minimizing waste. Composting and reuse help to use resources more efficiently.
5. Support for ethical and sustainable brands: Companies that follow the principles of bioeconomy often support community projects, sustainable farming and the use of local labour.
6. Before purchasing, gather info on products. If we know more about how products are made and how they or the raw materials used affect the environment, we can more easily choose alternatives that support bioeconomy.

With these steps, we can not only help the spread of bioeconomy, but also contribute to a more sustainable future and healthy way of life.

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In this publication our experts took into account the recommendations of the OPENAI GPT-4o mini language model to develop the structure of chapters 1 and 10 and stylize the text.

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Bioeconomy Cluster

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If you're ready to take a step towards a sustainable future but aren't sure where to begin, this publication is your perfect guide. Across nine chapters, you'll discover how to create homemade products using organic ingredients that benefit not only you and your family but also the planet. We encourage you to share your creations with us—tag us on social media to showcase what you've made!

In addition to the detailed written instructions, you can access our training videos on the BIOECO-UP YouTube channel by scanning the QR code below:

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