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Synthesizing Humans With the Planet: Regenerative Agriculture and Its Relevance and Application to Industrial Design

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ABSTRACT

Humans came from the earth and we have the ability to enhance or destroy its ecological processes. For approximately 10,000 years we have, in general, found ways to exploit the earth's bounty while leaving degraded eco-systems. Sustainability, arguably, is about learning how to realign and co-create with the earth and its regenerative processes. Regenerative Agriculture is a pioneering example of this potential, learning from both traditional practices and ecological science. This paper/presentation introduces and explains concepts around Regenerative Agriculture (RA) and how it can be applied to the production of renewable materials for physical products. Products employing these materials can help humans synthesize with the planet and its productive processes while healing it and fulfilling human needs. It will explain RA's principles, parameters, types, processes & applications and what materials are being produced currently that designers can integrate into their products to solve the Ecological Crisis. RA is pioneering new ways that humans can enhance the planet. A foundation for understanding RA, is how farmers are applying these processes for efficiency to ensure its success at providing both ecological services and low cost production of materials. This is critical for the success of Circular or Mutualistic Design when it comes to renewable materials. It will also explore how RA can play a significant role in reversing climate change, as these practices were identified as some of the lowest hanging fruit to decarbonize the atmosphere to pre-industrial levels in one generation as identified by Drawdown.org. Thus, integration of these materials into mass produced products can, if applied appropriately, accelerate climate decarbonization. This is a pioneering field that holds promise both ecologically and economically. It is estimated to be a $700 Billion industry in the coming decades. This paper/presentation will also identify products pioneering regenerative materials. Lastly, it will introduce several Regenerative Verification Programs, one that the Author co-created, that exist to help designers make wise choices in specifying materials that are contributing to Mutalistic future.

Keywords: Regenerative agriculture, Regenerative organic certified, Circular design, Mutualistic design, Permaganic authenticated, Land to market certification

INTRODUCTION

Regenerative Agriculture (RA) has recently hit the market with the first certified products with the promise of sequestering carbon and possibly reversing climate change. A report from the Croatan Institute projects that by 2050, "implementing climate-friendly agricultural practices could mitigate nearly 170 GtCO2e, while generating a nearly $10 trillion net financial return." (Electris, Humphreys, Lang, LeZaks, & Silverstein, 2019). These are large claims and goals with a lot of potential. However, understanding what it is, its history and if its promise is to be found is critical when deciphering if materials grown this way can in fact make our products more sustainable. If designers are aware of the farming practices and their impact, then it helps them navigate these farming certifications and to be able to make claims about their products having a net positive impact. This is fundamental if these practices are to have the projected impact that they could have as laid out by Drawdown.org (DD), which identified the best strategies to begin drawing down the carbon in our atmosphere with RA as a critical sink to store carbon in plants and soil. This paper gives a short history, practices, principles, certifications, and products currently pioneering this growing field.

HISTORY AND DEVELOPMENT OF REGENERATIVE AGRICULTURE

Sustainability at its core has been about learning to live in harmony with Earth's ecosystems and their renewable productivity. Through ecological science we have been piecing together our understanding of these ecosystems and why and how they are productive through key concepts. Permaculture Design was one of the first to do this explicitly in the mid to late 1970's (Mollison, 1978). Agro-Ecology as a concept had been around but began to formalize about 10–15 years after the first treatise on Permaculture was written (Wezel, 2009). These concepts were not alone in their endeavours in trying to transition global Industrial Agriculture towards ecological means. There had been many publications on its hazards, including Rachel Carson's seminal work "A Silent Spring" in 1964. There, of course, were also early responses to move away from those artificial means, including Organic Agriculture (1926-35) and Biodynamic Agriculture (1924) (Wight, 2018). However, Organic Agriculture as we know it today has been pared down to simply eliminate chemicals in the farming process, while not addressing tillage Agriculture's negative impacts to the soil and ecosystems as a core concept. Although many Organic Farmers do employ practices that are ecologically beneficial, such as compost, which were part of the original proposal of Organic Agriculture, they don't gain any recognition for them.

Others that collaborated and pioneered their own solutions around these ecologically based farming methods included J.I. Rodale of the Rodale Institute, a major contributor to American Organic Ag dating back to the '40's, Wes Jackson of The Land Institute, Masanobu Fukuoka, author of the *One Straw Revolution* and Alan Savory, founder of Holistic Management. Permaculture's originators were also influenced by pioneers such as P.A. Yeoman, who developed comprehensive farm and community planning around passive

water management to improve the hydrological cycle starting in the 1950's, as well as J. Russell Smith and his book, *Tree Crops* from the 1930's.

THE ESTABLISHMENT OF REGENERATIVE AGRICULTURE, ITS PRINCIPLES AND CERTIFICATIONS

Regenerative Agriculture as a term was first put forth in 1983 by Robert Rodale, son of J.I. Rodale. However, most of these pioneers on the agriculture side began to be formalized under other terms including Sustainable Agriculture, Organic Agriculture, Permaculture and Agro-Ecology from the mid to late 1980's through 2017. Regenerative Agriculture began to have a resurgence since then primarily due to the launch of Regenerative Organic Certified (Giller, Hijbeek, Andersson, & Sumberg, 2021). Rodale launched this certification, in the fall of 2017, however this wasn't the first and was most likely inspired by a meeting with their Executive Director, Mark Smallwood and the author and his co-originators, Luke & Angela Ebner, on their Permaculture Farm Certification, Permaganic Authenticated (PA) in the fall of 2012 to explore collaboration, which fizzled after that 1st meeting. PA had a soft launch in the spring of 2012 at the Carbon Farming Course at the Pfeiffer Center in Spring Valley, NY where they interacted with employees and board members of Rodale, including their head scientist, Dr. E. Ingham who served on PA's board of advisors, which led to that meeting. PA received its USPTO approval as a certification mark in March of 2017. PA is much more grassroots while Rodale had obtained funding from the National Science Foundation, and backing from Patagonia, Dr. Bronner's Soap & Horizon Organic Milk, much more than our small organization could pull together. They have since begun to collaborate with other organizations such as Demeter Certified (Biodynamic Farming), Textile Exchange (textile certification), several animal welfare certifications and Fair-Trade Certifications. These two certifications both use 3 standards of certification and 3 levels of progress listed in this table.

Table 1. Certification areas of PA & ROC (Trauth, 2023) (Regenerative Organic Alliance, 2023).

PA 'Ethics'	ROC Areas of Certification	PA Levels of Progress	ROC Levels of Progress
Earth Care (agriculture)	Soil Care	Pioneer	Bronze
People Care (Buildings & Education)	Animal Welfare	Emergent	Silver
Fair Share (Surplus to Community & Ecosystem	Social Fairness	Regenerative	Gold

PA pulls these from Permaculture's 3 Ethics and the 3 levels of regeneration of disturbed ecosystems (except Climax is the highest level not Regenerative).In these similarities they both attempt to help farmers to minimize or eliminate tillage while also addressing industrial livestock management issues and farmer/worker issues or challenges and thus, both qualify as RA. The

primary difference between these two are that ROC aims to shift large and small Organic Farmers who are primarily working with annual cropping and grazing. PA, on the other hand, primarily focuses on perennials, Agro-ecological/forestry systems, green living for the farmers, passive irrigation through Keyline Design, and social/cultural integration due to its foundation in Permaculture. ROC has national and international scope, while PA is still scaling up and primarily limited to the Midwest states of the US. PA is currently being launched and managed by Great Rivers and Lakes Permaculture Institute (GRLPI - the author currently serves as the Board President), which represents 6 states in the Midwest (IL, IN, KY, MI, OH, WI) on behalf of the Permaculture Institute of North America (PINA). Both organizations seek to further professional standards for Permaculture and are represented by long-time leaders of the movement.

A third independent player, Land to Market, created by the Savory Institute, has come to certify Regenerative Agriculture, with a focus on livestock. It was launched in March of 2018. Alan Savory had pioneered Regenerative Grazing practices in Africa to restore the Savannah's of the region. He eventually developed Holistic Management International and the Savory Institute. It has proven to be a successful method to work with livestock in a way that is ecologically positive (Land to Market, 2023).

At its core, Regenerative Organic Agriculture's core principles are

1. Soil Building,
2. Livestock management in a way that enhances the soil
3. Care for the Farmers/Workers (if they struggle financially they may exploit their land to make ends meet)

These strategies address and can reverse the biggest issues that tillage farming and over grazing have created, which are soil loss and desertification, which comes in around 12 Million hectares/yr, globally (Montgomery, 2007).

PRACTICES FOR DEVELOPMENT OF REGENERATIVE MATERIALS FOR DESIGNERS

Despite the simple and paired down aims of RA, there are a myriad of farming practices that achieve these aims, even when you just focus on materials Industrial Designers can use that are produced in these ways. I will break it down into timber & products, animal fibres and leather and plant based fibres. To identify the farming practices impacts on Climate Change, I will defer to Drawdown.org's (DD) research on the top 80 strategies for their Scenario 2 which is roughly in-line with 1.5°C temperature rise at century's end, the higher goal of the two Scenarios laid out by Drawdown (Project Drawdown, 2023).

Timber & Other Materials from Tree Products

The Timber/Forestry industry has been a pioneer in these practices going back to 1993 with the establishment of the Forestry Stewardship Council. It was spawned in Toronto Canada in response to the failure to produce an

agreement to stop deforestation at the 1992 Earth Summit in Rio (Forest Stewardship Council US, 2023). They have several certifications that would meet RA standards around materials that designers use like rubber, wood and fibre, but due to time we won't delve into details (Forest Stewardship Council, 2023). However, there are more ways to raise timber in sustainable ways than just a forest, which include Polyculture farming (more than one crop), Alley Cropping, Silvopasture and Forest Farming. These are all different ways to incorporate tree crops either into existing farming or pasture methods. Silvopasture ranks at number 11 on DD's list and is the second "Sink" out of those 11. A Sink is a source for stable Carbon storage that not only stops climate change but can reverse it through this sequestering process. Forest Farming is incorporating other enterprises, such as wild herb harvesting or crop production in the forest under or over story, while producing timber above. All of these practices would qualify as regenerative.

Many of these Timber production methods are the easiest sinks to scale up due to increasing profits when implemented. Beyond Silvopasture, RA Timber production methods include DD's other sinks such as (13) Tree Plantations on Degraded Land; (14) Perennial Staple Crops, (17) Tree Intercropping; (18) Multi-strata Agroforestry, (22) Abandoned Farmland Restoration (this is included in all three methods of renewable materials production listed here because it can be applied to all 3 of them. While not certified by RA programs as it depends on the method the farmer uses to restore it, it can still play a major role in reversing climate change), (23) Bamboo Production, (32) Indigenous People's Land Tenure, (50) Perennial Biomass Production. Combined, these are some of the most critical Carbon Sinks listed on DD's list. Because of FSC's long history, finding many these materials is simple due to their widespread availability.

Animal Fibres & Leathers

Animal based fibre and leather can have very detrimental impacts on our soil due to overgrazing or due to environmental impacts from waste from feedlots, a common practice for livestock, especially cattle, used for food. Livestock grazing is typically the last straw before a degraded landscape becomes desert due to bare soil being exposed and ultimately washing away, exposing subsoils and bed rock over time. However, it has been proven through the work of Alan Savory and others such as Darren Dougherty of Regen Ag and verified through DD that Mob Grazing or Rotational Grazing can build soil at a much faster rate than nature can on its own, while sequestering carbon. This is through mimicking the natural process grazing herd animals employ in relation to predator animals to protect themselves. These herds are constantly moving to new grass while maintaining a tight herd to protect themselves from the predators. This has multiple benefits including the animal manure being mashed into the soil along with seeds, reseeding the pasture & feeding the soil microorganisms that transform it, building soil. Ranchers, such as Joel Salatin of Polyface farms, have been known to have built 12 of soil and increased soil carbon from 1% to 6% in 50 years in certain climates. There are other examples of this type of impact such as Susana Lein of Salamander

Springs farm in Berea, KY, who, using an integrated livestock (primarily chickens and geese) and annual cropping method, increased her soil carbon from 1% to 24% on the hectare of land she managed (Boutsikaris, 2015). Each 1% of increase in soil carbon per hectare is one American's carbon footprint for one year. Each type of livestock will have to have its own methods of Regenerative Grazing processes to ensure that they are restoring pasture while also sequestering carbon. Cattle grazing is the most common process and has been the most researched. These methods are also critical sinks identified on DD's list, which include (11) Silvopasture, again, (21) Managed Grazing, (22) Abandoned Farmland Restoration, (28) Improved Cattle Feed (which will reduce methane production from cattle for leather, this is not necessarily RA but is another method ranchers can use to mitigate climate change), (51) Improved Manure Management, (61) Grassland Protection (This is not directly related to RA but we as designers should be aware of this process and can advocate for when buying animal fibres). Livestock fibres and leathers raised using RA Methods can play a critical role in reversing climate change, hence their high rankings, due to ease of scaling up.

Plant Based Fibres

Plant based fibres are primarily produced employing mono-cropped annual Agriculture. Annual agriculture is the primary culprit for soil decarbonization and soil erosion, which results in desertification over decades or centuries and reduced production (Dewar, 2007). Finding ways to either replace our annual crops with perennials or transitioning our annual agriculture towards minimal tillage is critical to address these challenges. Organic Agriculture is also critical in this transition as it allows the soil micro-organisms to recover and build humus which is the key method that soils store carbon. (Leu, 2006) Incorporating support crops within monocultures help transition this farming method towards a polyculture, incorporating the benefits of those other plants. Those support plants fall into 5 categories, which include fertilization (either through plants that are nitrogen fixers – providing Nitrogen – or dynamic accumulators – providing other nutrients), pollination (supporting pollinating insects), habitat for beneficial insects (insects that will predate on pest insects), aromatic pest confusers (plants with strong scents like mint or sage that can confuse pest insects from finding the prey plant) and of course other production crops (Jacke, 2005). Many plants can fit within more than one of these categories such as soybeans, which provide nitrogen fixation while also producing another crop, soybeans. These practices that can be certified as RA can fall into numerous categories identified by DD while others identified by DD, listed here, do not necessarily fall into the category of RA but are worth considering when sourcing materials made from annual crops because they made it in DD's list to reverse climate change. They include (19) Regenerative Annual Cropping, (22) Abandoned Farmland Restoration, (29) Improved Rice Production (this one is on the edge of plant-based fibres, given our limited use of rice as a fibre, nonetheless, it is used to make paper and other materials), (47) Conservation Agriculture (this is a form of ecological farming that is between Industrial Agriculture and RA. However, it

is still important to consider it when selecting plant based fibres to move annual cropping towards a carbon sink), (59) System of Rice Intensification (in regards to plant based fibres, this is included for similar reasons to Improved Rice Production), (69) Biochar Production (incorporating Biochar in tillage farming methods has been proven to increase certain crop yields, while sequestering carbon in a stable form in the soil), (71) Bioplastics (this is incorporated in this section due to it being made from primarily annual crops that could employ RA practices), (72) Farm Irrigation Efficiency, (84) Sustainable Intensification for Smallholders. Due to our high dependence on Annual Agriculture, there are many approaches here that move it towards more sustainable means but may not meet the benchmark of RA Certification. These are worth considering in the meantime as RA practices are developed and researched for Annual crops to meet RA's standards. The development of annual agriculture took 10,000 years to get us where we are now. Fortunately, with modern science, this transition to no till farming or perennial based crops is taking a small fraction of time. The work of Wes Jackson and Teh Land Institute in Salina, KS is an example of that. It only took 40 years to get a market ready perennial based cropped (not using genetic modification, which could accelerate this process) of Kernza, a form of wheat, developed from the original wild wheat plant, which now mimics a prairie.

COMPANIES, THEIR PRODUCTS AND CERTIFICATIONS

ROC's main success was getting companies to commit to backing it. Currently ROC claims that they have had 270 applicants, 106 farms certified, 585,872 Certified Acres, 230 types of crops (almost all of which are food crops), and 55 Brands licensed. Depending on the material and certification, it is either just budding or well established. When it comes to furniture companies that make products of FSC Certified Timber, there are almost 12 listed on FSC's website, including Ikea and William Sonoma (Forestry Stewardship Council International, 2023). However, from my understanding, this is only for forests and not those Agro-Ecological or Agro-forestry methods that were listed in the previous sections, thus there is a gap in certification currently which would encourage more timber produced with agriculture. This is a definite gap in the market currently as that is where most of DD's highest ranked sinks lie. This presents an opportunity in certification processes to advance these methods with the public, which PA, although small, certifies those practices. When it comes to RA though, there are only a few companies committed to and pioneering these practices. Here is a list of clothing and shoe companies that are:

- Patagonia has been a pioneer in this process, launching a T-shirt made of ROC Cotton in 2020. This has been followed by a growing line of products including pants, shorts and long sleeve shirts. The exact method they are employing is not fully explained beyond that they are working with small landholding farmers in India and that they are using Organic, Cover Crops, Compost, Crop Rotation, Intercropping and Low to No

Tilling. They state that they have over 2,200 farmers who are part of their ROC program for Cotton after having started in 2018 in India. (Patagonia, 2023).

- Allbird's has begun to research on how to employ Regenerative Agriculture practices to have 100% of their wool coming from regenerative sources by 2025. (Allbirds Inc., 2023).
- Koio: Men's & Women's Capri Regenerative Shoes are made of regeneratively raised leather. There is no third party certifier for these shoes, although they do have several blogs tracking the development of the shoes and blogs about Mob Grazing, a foundational grazing process for Regeneratively raised cattle. They also employ LWG Certification for tanning their leather, FSC certified natural rubber (50%) and recycled rubber (40%) (Koio, 2023).
- Timberland is seeking to have 100% of its natural materials to be sourced from RA with a net positive impact on Nature by 2030 (Savory Insitute 501c-3, 2023). Their Eathkeepers Edition is their brand that meets their highest standards employing some Regenerative Leather and other green materials. They also make regenerative leather belts. However, it is not clear if their regenerative leather is certified by Land to Market.
- Ugg Regenerate line donates to the Savory Institute with each purchase and is made from "materials from farms that practice regenerative agriculture", which is not clear if it employs regenerative or not. (Deckers Brands, 2023).
- Eileen Fisher: Regenerative Wool line, including sweaters and skirts, are certified by the Textile Exchange's Responsible Wool Standard (RWS) which has several standards (Eileen Fisher, 2023). The key standard to their RA status is that it employs "Land Health Preservation: Progressive methods of land management are practiced on RWS farms, protecting soil health, biodiversity, and native species" (Textile Exhange 501c-3, 2023).

Beyond these brands, at the time of this writing, there were many that made similar claims, yet none that one could verify based on the wording that their production methods were using RA. There were some that use carbon credits. Despite their good intentions and actions, which will help with climate change and is better than doing nothing, it is not produced in a way that is actively sequestering carbon through the farming methods of those resources. To claim regenerative while only using organic and separate carbon sequestering methods would qualify as greenwashing.

CONCLUSION

The field of Regenerative Agriculture has grown by leaps and bounds in the last decade and continues to grow in its impact as its been identified as one of the best ways we can sequester the carbon in our atmosphere that has already been released over the last 200+ years of Industrialization and 10,000 years of decarbonizing the soil on earth through anthropogenic practices. It has the added benefit of simultaneously restoring soil. However, the question remains, what is the fastest way to sequester enough carbon, as scientists

warn, to prevent us from reaching one of the 6 tipping points in the next 25–75 years. Drawdown.org has identified those strategies and many, especially tree integration into agriculture, are not explicitly defined within these certification frameworks, beyond the work of PA. Thus how do we get them to be integrated given their importance? Transitioning tillage agriculture could take decades, thus its lower ranking in DD. Designers can create demand for materials produced using these methods, sometimes by working directly with the producers and offering incentives for them to employ these practices or working with suppliers who have verified the use of them in their production. This is critical if we are going to avert a climate catastrophe. We have very little time to enact it. Nonetheless, the reach and power of industry, can leverage its influence to accelerate this change in time, creating a future that works for everyone and every being on earth.

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