

Discover the Top 10 Established and Emerging Practices for Soil and Crop Productivity

The Importance of Soil and Crop Productivity

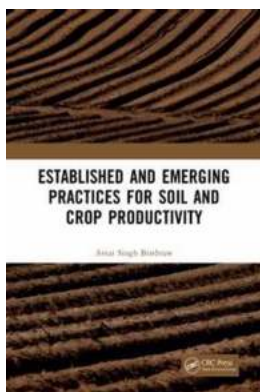
The health and productivity of soil directly impact crop growth and overall agricultural output. With a rapidly growing global population, it is crucial to ensure that we have sustainable and efficient practices in place to maximize soil and crop productivity. In this article, we will explore the top established and emerging practices that can significantly enhance soil and crop productivity.

1. Crop Rotation



One of the oldest known agricultural practices, crop rotation involves growing different crops in a sequence over several seasons. This technique helps break pest and disease cycles, prevents nutrient depletion, and improves soil structure.

By rotating crops, farmers can achieve higher yields and reduce the reliance on chemical inputs.



Established and Emerging Practices for Soil and Crop Productivity

by Avtar Singh Bimbraw (1st Edition, Kindle Edition)

★★★★★ 5 out of 5

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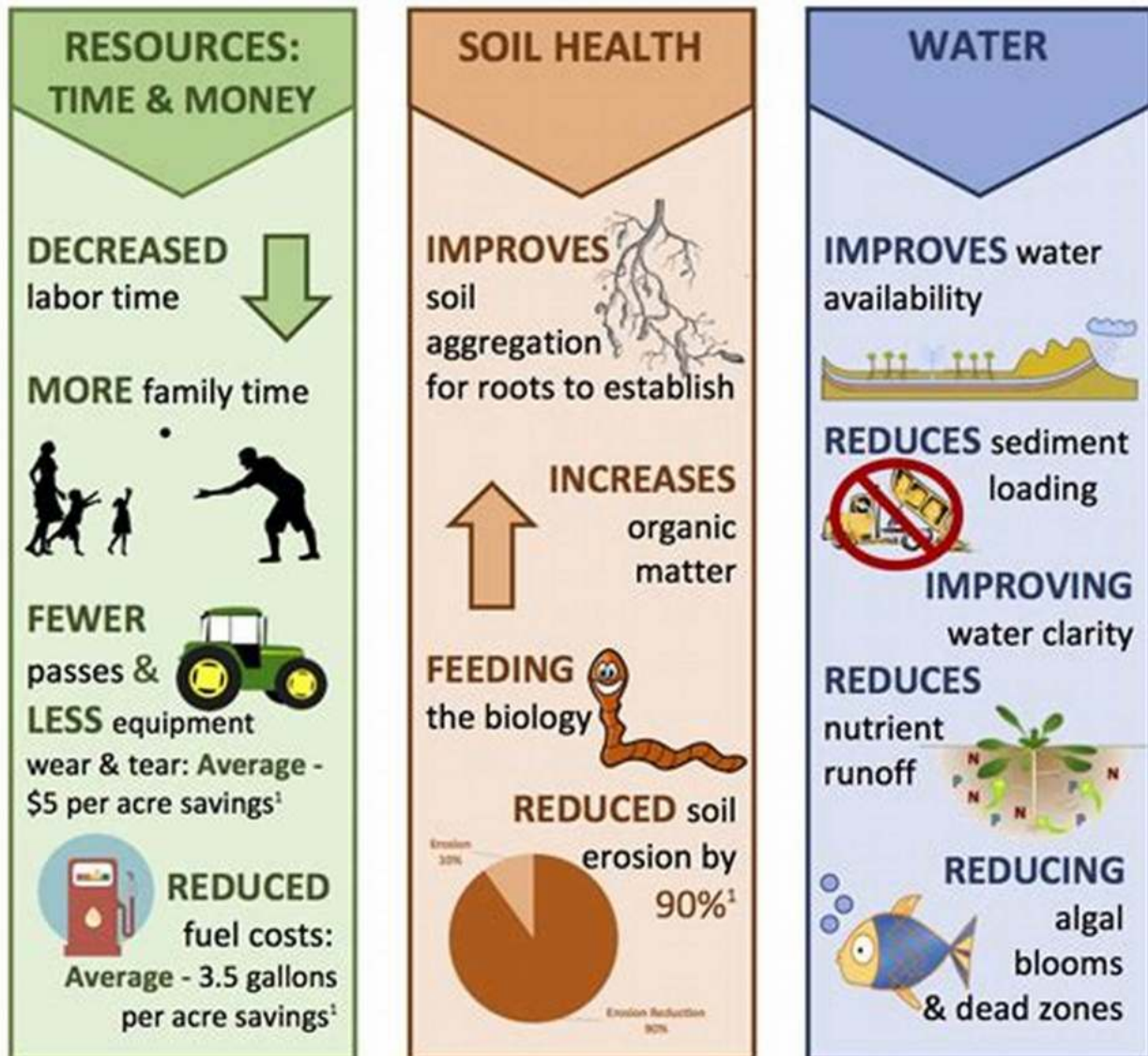
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2. Conservation Tillage

BENEFITS OF CONSERVATION TILLAGE



¹ Values cited from "Top 10 Conservation Tillage Benefits," Conservation Technology Information Center at Purdue University (2017)

Traditional tillage practices involve turning over the soil, which can lead to erosion and soil degradation. Conservation tillage methods, such as no-till or reduced tillage, minimize soil disturbance by leaving the crop residues from the previous season on the field. This helps retain moisture, improves organic matter content, and reduces soil erosion.

3. Precision Agriculture

Benefits of Precision Farming

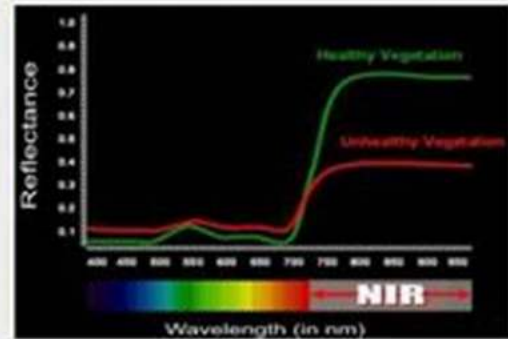
Satellite imagery can show:

Crop health re: nutrient deficiencies, diseases, water deficiency and surplus, weed infestations and insect damage.

Predict crop yield.

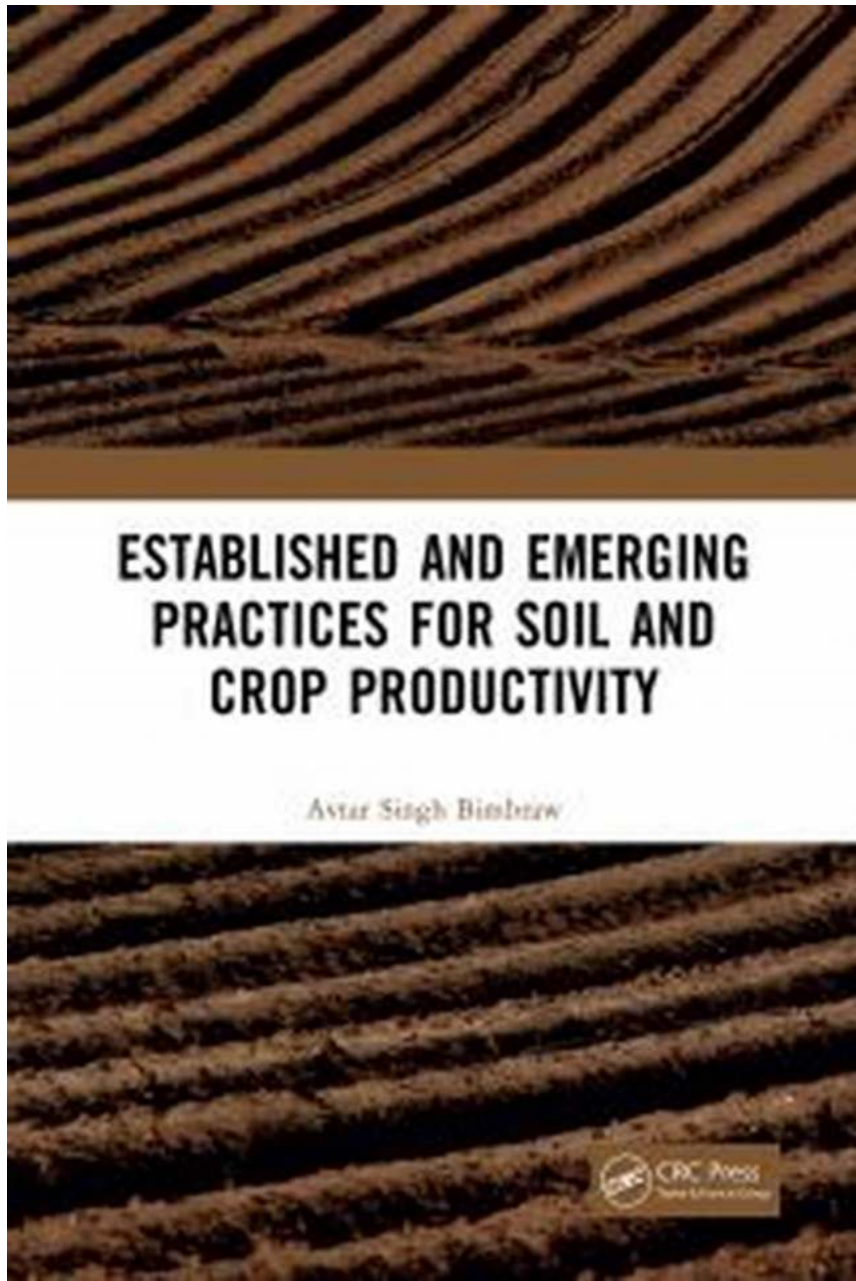
Landsat provides free data!

Helps the environment by lowering pollution.



With advancements in technology, precision agriculture has gained popularity. This practice involves using GPS, sensors, and other technologies to precisely apply inputs, such as fertilizers and water, based on the specific requirements of each crop. Precision agriculture minimizes waste, maximizes resource utilization, and improves overall efficiency.

4. Cover Cropping



Cover cropping involves planting non-cash crops, such as legumes or grasses, during idle periods. These cover crops protect the soil from erosion, suppress weeds, and improve soil fertility by fixing nitrogen. They also enhance soil structure and contribute organic matter, leading to improved soil health and crop productivity.

5. Organic Farming

How Organic Farming Benefits the Environment

Organic farming can be profitable, and organic food appeals to consumers as both a healthy and ethical choice. Beyond money and ethics, though, organic farming practices result in numerous environmental benefits.

01

Reduced Exposure to Pesticides and Chemicals



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The Organic Trade Association notes that if every farmer in the U.S. converted to organic production, we could eliminate 500 million pounds of persistent and harmful pesticides from entering the environment annually. Pesticide and chemical use results in many negative environmental issues:

- Pesticides allow disease resistance to build up in plants, weeds, plant-eating insects, fungi, and bacteria.
- Pesticides and chemicals sprayed on plants contaminate the soil, water supply, and air. Sometimes these harmful pesticides stick around for decades (maybe longer).

Organic farming practices prioritize the use of natural inputs and techniques to maintain soil health. By avoiding synthetic chemicals, organic farming promotes biodiversity, reduces water pollution, and improves soil structure. Organic farmers focus on soil building practices, such as composting, crop rotation, and biological pest control, to enhance crop productivity.

6. Agroforestry

Benefits of UK Agroforestry Agroforestry: The integration of agriculture and forestry on the same plot of land.

2 Main Types of Agroforestry

Silvopasture **Silvoarable**

Trees and livestock **Trees and crops**

Increases biodiversity **Diversified farm income** **Mitigates flood risk** **Improves soil health** **Shelter for livestock**

Climate change mitigation, increased cultural and aesthetic value, improved food security, climate regulation and carbon storage, improved animal welfare

Suzie Robinson: ee14s2r@leeds.ac.uk

Agroforestry combines agricultural practices with the cultivation of trees. Integrating trees with crops provides numerous benefits, such as improved soil fertility, reduced erosion, increased water infiltration, and enhanced biodiversity. Agroforestry systems also offer additional income opportunities through timber and fruit production.

7. Nutrient Management



Emerging Nutrient Management Technologies for Improving Crop Productivity and Soil Health

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India has come a long way from a country struggling to feed its population to one of the world's top agricultural producers. During the green revolution, India witnessed a boom in its agricultural food grain production, but at the expense of soil health. Faulty nutrient management practices like imbalanced and non-judicious application of chemical fertilizers, neglecting organic manures and legumes etc., have not only deteriorated our soils but also damaged the ecosystem. These issues have prompted scientists to look for new tools to manage our most precious resource i.e., the soil, to maximize crop productivity with lesser inputs and minimize the negative impact on the environment. These new technologies are referred to as emerging technologies as their development, practical applications, or both are still largely unrealized. Emerging technologies that find their application in nutrient management are; geomaterials, nanotechnology, enhanced efficiency fertilizers, crop simulation modelling, information and communication technology and artificial intelligence and robotics. Geomaterials are the naturally occurring minerals that are widely used as a soil amendment, such as, zeolite, bentonite, vermiculite etc. They have been reported to improve the nutrient use efficiencies by reducing their losses and improve the physical properties of the soil. Advances in nanotechnology have made it possible to engineer materials with precisely determined properties that can efficiently supply nutrients to the crops such as nanofertilizers, nano-biofertilizers and nanozeolite) or help in real-time monitoring of crop's nutrient needs (nanosensors). Crop simulation models, which are the mathematical algorithms to represent quantitative knowledge about a crop's interaction with its environment, can be used as decision support systems to refine fertilizer application. Information and communication technology, comprising of networks, electronic devices and services that permits the collection and/or exchange of data which can help in monitoring and optimising nutrient needs of the crop as well as manage the soil health. Artificial intelligence and machine learning are creative tools to monitor and manage soil health. These, in integration with robotics, can be used for collecting soil samples and application of fertilizers in the field. All these emerging technologies offer innovative approaches to increase crop production while efficiently managing the nutrient requirements of the crops and conserve the soil resources. However, the integration and implementation of new technologies into the existing cropping systems remain the most challenging tasks.

Keywords: Artificial intelligence, crop modelling, nanotechnology, soil health

Optimal nutrient management is crucial for maintaining soil fertility and crop productivity. Soil testing and analysis help determine the nutrient requirements of crops, allowing farmers to apply fertilizers more efficiently. By adopting practices like precision nutrient application, soil amendments, and balanced nutrient ratios, farmers can prevent nutrient imbalances and optimize crop yield.

8. Integrated Pest Management

What is IPM?

Integrated Pest Management is a science-based approach that combines a variety of techniques. By studying their life cycles and how pests interact with the environment, IPM professionals can manage pests with the most current methods to improve management, lower costs, and reduce risks to people and the environment.

IPM tools include:

- Alter surroundings
- Add beneficial insects/organisms
- Grow plants that resist pests
- Disrupt development of pest
- Prevention of pest problem developing
- Disrupt insect behaviors
- Use pesticides

1 IDENTIFY/MONITOR

Determine the causal agent and its abundance (contact your local extension agent for help).

2 EVALUATE

The results from monitoring will help to answer the questions: Is the pest causing damage? Do we need to act? As pest numbers increase toward the economic threshold, further treatments may be necessary.

3 PREVENT

Some pest problems can be prevented by using resistant plants, planting early, rotating crops, using barriers against climbing pests, sanitation, and sealing cracks in buildings.

4 ACTION

IPM uses multiple tools to reduce pests below an economically damaging level. A careful selection of preventive and curative treatments will reduce reliance on any one tactic and increase likelihood of success.

5 MONITOR

Continue to monitor the pest population. If it remains low or decreases, further treatments may not be necessary, but if it increases and exceeds the action threshold, another IPM tool should be used.

WHERE CAN YOU PRACTICE IPM?



Buildings and Homes:

Inspect, identify pests, keep pests out, clean to deny pests food and water, vacuum, trap, or use low-risk pesticides.



Farms:

Check for pests/pest damage regularly, identify accurately, choose pest-resistant plant varieties, encourage/introduce beneficial insects, time planting to avoid pests, and if needed use low-risk pesticides.



Managed Natural Systems:

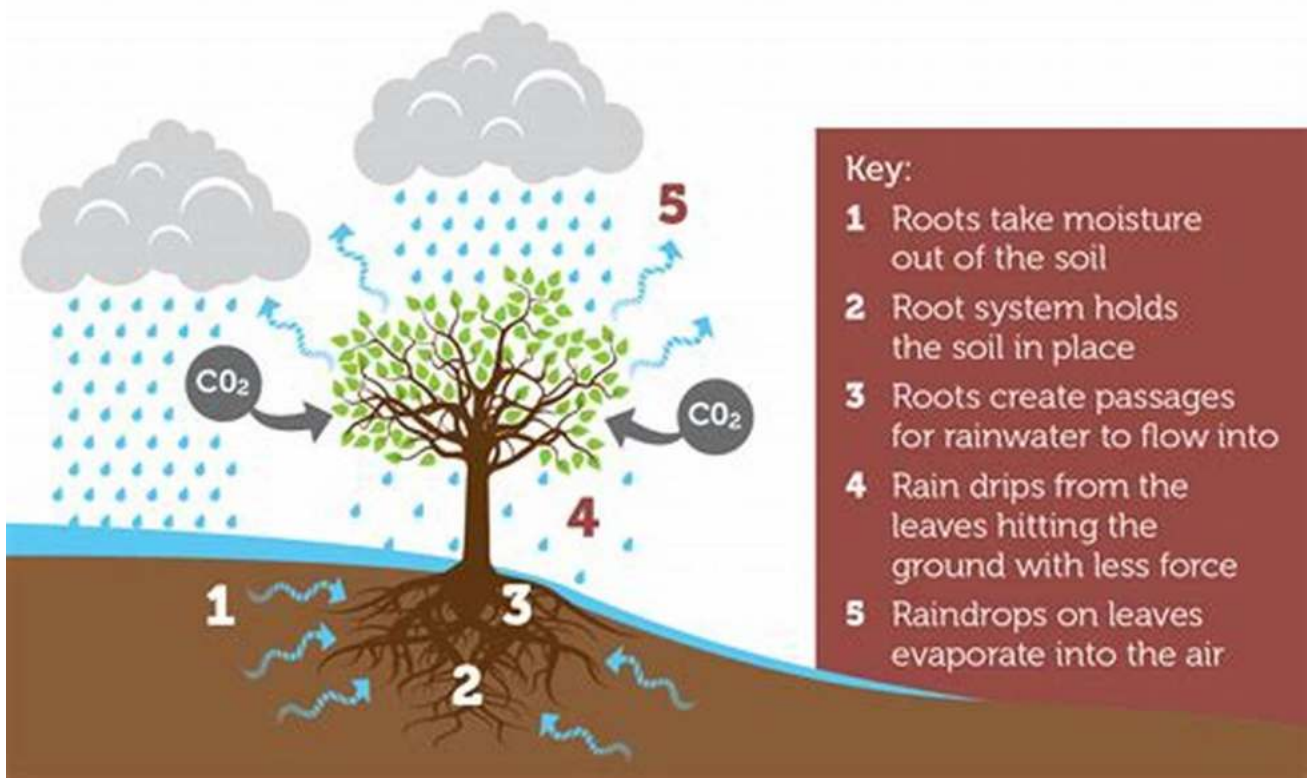
Identify the pest and use management options that have minimal risks to pollinators, humans, and pets.



The Entomological Society of America is the largest organization in the world serving the needs of entomologists and other insect scientists. Our journals are a resource for policymakers and the general public who seek to understand the importance and diversity of earth's most diverse life forms— insects. Learn more at www.ESA.org.

Integrated Pest Management (IPM) focuses on combining various pest control strategies to minimize the use of chemical pesticides. IPM techniques include biological control, cultural practices, and monitoring systems. By promoting natural pest predators and implementing preventive measures, farmers can effectively manage pests while minimizing the negative impacts on soil and crop health.

9. Soil Erosion Control



Soil erosion can have devastating effects on soil quality and crop productivity. Implementing erosion control measures, such as contour plowing, terracing, and erosion control structures, is essential. These practices help retain soil moisture, prevent nutrient runoff, and maintain the integrity of the topsoil.

10. Soil Conservation

Soil Conservation Practices

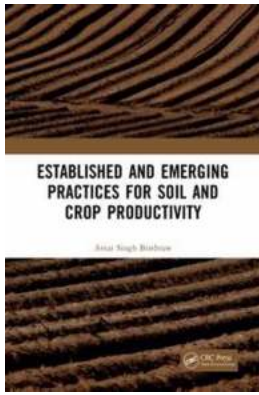
- Contour Farming**
- Terrace Farming**
- No-Till Farming**
- Organic farming**
- Restore wetlands**
- Planting vegetation cover and forest restoration**
- Planting buffer strips along stream banks**
- Windbreaks**
- Proper waste disposal and management**



Soil conservation practices aim to protect soil resources and prevent degradation. Mulching, windbreaks, and strip cropping are examples of soil conservation techniques. By reducing soil erosion, improving water infiltration, and enhancing soil organic matter content, these practices contribute to long-term soil and crop productivity.

Established and emerging practices for soil and crop productivity play a crucial role in sustainable agriculture. By implementing techniques such as crop rotation, conservation tillage, precision agriculture, and organic farming, farmers can enhance soil health, reduce resource waste, and maximize crop yield.

Incorporating these practices into agricultural systems is paramount for ensuring food security and promoting a greener, more sustainable future.



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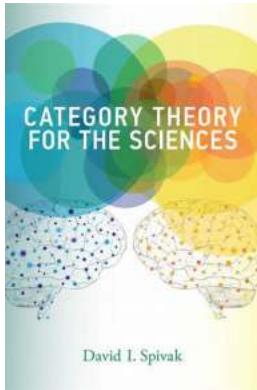
The book explains the various existing, emerging and environmentally viable technologies for the sustainable and profitable crop productivity. The book also focusses on climate change, hurricanes and tropical storms, natural resources management, crop diversification, crop resource management, cropping systems, farming system, management of land use resources, conservation agriculture, crop residue management, renewable energy, precision agriculture, integrated nutrient management, integrated pest management.

Note: T&F does not sell or distribute the Hardback in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka.



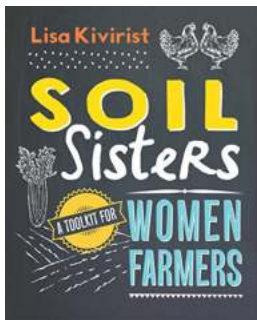
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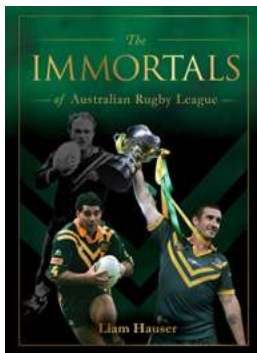
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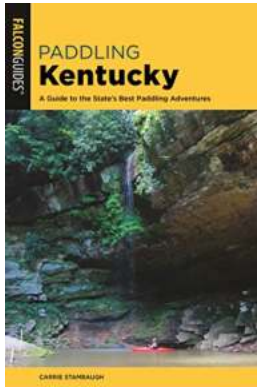
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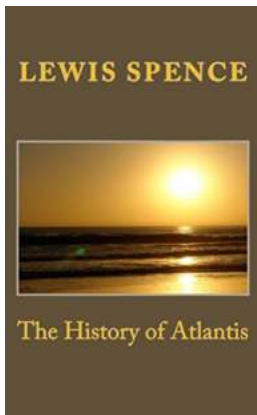
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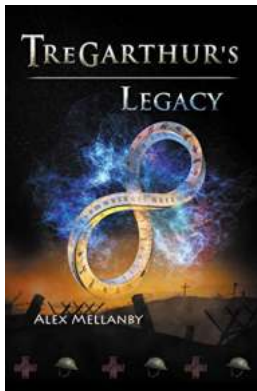
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