Yes, vetiver grass **significantly reduces soil erosion** and **improves crop yields** by enhancing soil quality, moisture retention, and nutrient availability on sloping and erosion-prone farmland.

1. Introduction

Vetiver grass (Chrysopogon zizanioides) has been widely studied and implemented as a biological soil and water conservation measure, particularly in tropical and subtropical regions. The literature consistently demonstrates that vetiver grass hedgerows or strips, when established across slopes, act as effective barriers to soil erosion, reduce runoff, and improve soil fertility, leading to increased crop yields. Studies from Ethiopia, Nigeria, India, and other regions show that vetiver grass increases soil organic carbon and available phosphorus, reduces nutrient loss, and enhances soil moisture retention, all of which contribute to higher productivity for crops such as maize, cassava, cowpea, and others (Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya, 2013; OlaOLU, 2006; Oshunsanya & Aliku, 2017; Jiru & Wari, 2019; Oshunsanya, 2013; Dass et al., 2010). The effectiveness of vetiver grass is influenced by factors such as hedgerow spacing, integration with other soil management practices, and local adoption by farmers. Overall, the evidence supports vetiver grass as a low-cost, sustainable solution for soil conservation and yield improvement in erosion-prone agricultural systems (Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya, 2013; OlaOLU, 2006; Oshunsanya & Aliku, 2017; Jiru & Wari, 2019; Oshunsanya, 2013; Dass et al., 2010).

2. Methods

A comprehensive literature review was conducted using the Consensus academic search engine, which aggregates over 170 million research papers from sources including Semantic Scholar and PubMed. The search strategy targeted studies on vetiver grass, soil conservation, and crop yield impacts, using both foundational and recent research, as well as interdisciplinary and methodological diversity. In total, 1,027 papers were identified, 468 were screened, 332 were deemed eligible, and the top 50 most relevant papers were included in this review.

Search Strategy

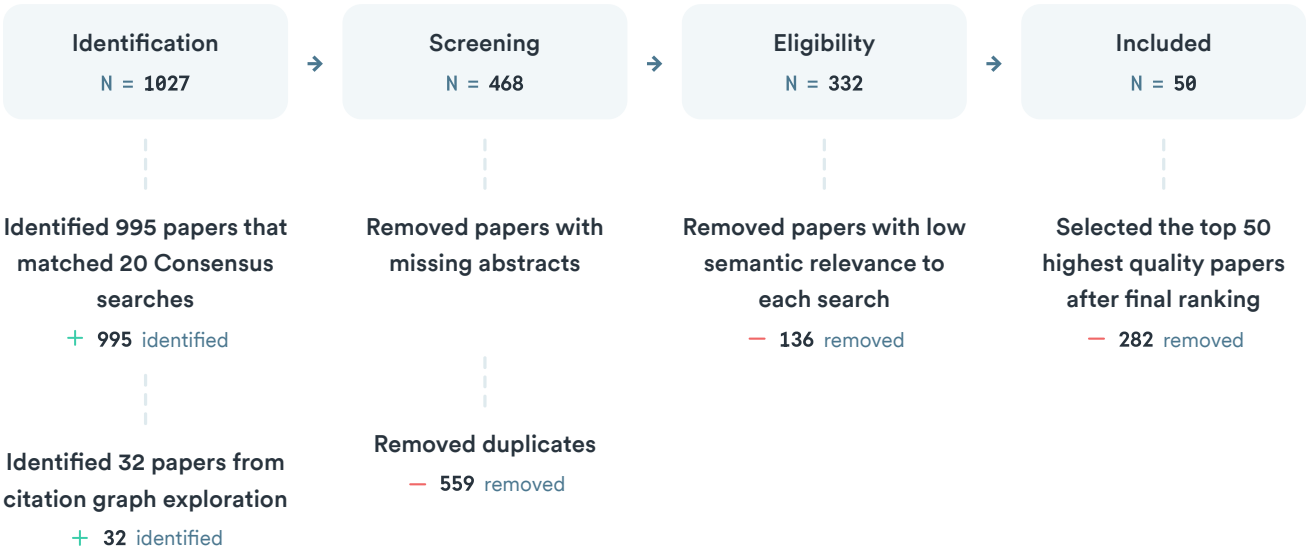

FIGURE 1 Flow diagram of the vetiver grass soil conservation and crop yield literature search.

Eight unique search groups were used, focusing on foundational research, terminology diversity, critique, interdisciplinary expansion, contextual factors, methodological diversity, and citation graph exploration.

3. Results

3.1 Soil Conservation and Erosion Control

Vetiver grass hedgerows and strips consistently reduce soil erosion and runoff on sloping farmland. Studies report reductions in soil loss by 56–90% and runoff by 60–72% compared to control plots without vetiver (Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; OlaOLU, 2006; Oshunsanya & Aliku, 2017; Dass et al., 2010; Qianru, 2001; Sudhishri et al., 2008). The grass's deep, fibrous root system stabilizes soil, while its dense above-ground growth acts as a physical barrier, trapping sediments and slowing water flow (Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; OlaOLU, 2006; Oshunsanya & Aliku, 2017; Dass et al., 2010; Qianru, 2001; Sudhishri et al., 2008).

3.2 Soil Quality and Fertility Enhancement

Vetiver grass improves key soil properties, including increased soil organic carbon, available phosphorus, cation exchange capacity, and moisture retention (Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya & Aliku, 2017; Oshunsanya, 2013; Are et al., 2012; Gesesse et al., 2014; Thu et al., 2024). These improvements are attributed to reduced topsoil loss, organic matter input from vetiver biomass, and enhanced nutrient cycling (Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya & Aliku, 2017; Oshunsanya, 2013; Are et al., 2012; Gesesse et al., 2014; Thu et al., 2024).

3.3 Crop Yield Impacts

Crops grown on land protected by vetiver grass show significant yield increases. Maize yields increased by 34–50%, cowpea by 11–21%, and cassava, okra, sweet potato, and yam also showed notable gains (Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya, 2013; OlaOLU, 2006; Oshunsanya & Aliku, 2017; Oshunsanya, 2013; Dass et al., 2010). The yield benefits are linked to improved soil fertility, moisture, and reduced erosion (Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya, 2013; OlaOLU, 2006; Oshunsanya & Aliku, 2017; Oshunsanya, 2013; Dass et al., 2010).

3.4 Practical Considerations and Adoption

Closer spacing of vetiver hedgerows (5–10 m) results in greater soil accumulation and higher yield gains, though it reduces the area available for cultivation (Babalola et al., 2007; Oshunsanya, 2013; OlaOLU, 2006). Integration with mulching, compost, or other soil management practices further enhances conservation and productivity (Babalola et al., 2003; Oshunsanya, 2013; Are et al., 2012; Gesesse et al., 2014; Thu et al., 2024). Farmer adoption is influenced by awareness, training, and perceived benefits (Hailu & Hailu, 2021; Ewetola et al., 2021).

Key Papers

Paper	Methodology	Location/Context	Main Findings	Crop(s) Studied
(Hailu et al., 2020)	Field experiment, 7 years	Ethiopia	Vetiver hedgerows increased soil organic carbon, available P, and crop yield; reduced slope by 7%	Teff, general crops
(Babalola et al., 2003)	3-year field trial	Nigeria	Vetiver strips reduced soil loss/runoff by 70–130%, increased maize yield by 50%, cowpea by 11–21%	Maize, cowpea
(Oshunsanya, 2013)	3-year field trial, spacing study	Nigeria	Closer vetiver spacing increased soil accumulation and maize/cassava yields by 6–34%	Maize, cassava
(Babalola et al., 2007)	3-year field trial, mulch/strip/fertilizer	Nigeria	Vetiver mulch and strips reduced runoff/soil loss, improved maize yield	Maize
(Oshunsanya et al., 2019)	3-year field experiment	China	Vetiver hedgerows reduced N/P runoff by 88–99%, increased maize yield	Maize

FIGURE 2 Comparison of key studies on vetiver grass for soil conservation and crop yield.

Top Contributors

Type	Name	Papers
Author	S. Oshunsanya	(Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya, 2013; Oshunsanya & Aliku, 2017; Oshunsanya, 2013)
Author	O. Babalola	(Babalola et al., 2003; Babalola et al., 2007; OlaOLU, 2006; OlaOLU, 2006)
Author	K. Are	(Babalola et al., 2007; Are et al., 2012; Adelana et al., 2011)
Journal	*Soil & Tillage Research*	(Babalola et al., 2007; Sudhishri et al., 2008)
Journal	*Catena*	(Oshunsanya, 2013)
Journal	*Agroecology and Sustainable Food Systems*	(Oshunsanya, 2013)

FIGURE 3 Authors & journals that appeared most frequently in the included papers.

4. Discussion

The evidence base for vetiver grass as a soil conservation and yield-enhancing technology is robust, with multiple field experiments, long-term studies, and reviews supporting its effectiveness (Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya, 2013; OlaOLU, 2006; Oshunsanya & Aliku, 2017; Oshunsanya, 2013; Dass et al., 2010; Ewetola et al., 2021). The strongest evidence comes from multi-year, replicated field trials in Africa and Asia, which demonstrate consistent reductions in soil loss and increases in crop yields. The improvements in soil quality—especially organic carbon and available phosphorus—are critical for sustaining productivity on degraded or erosion-prone land (Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya, 2013; Oshunsanya & Aliku, 2017; Oshunsanya, 2013; Are et al., 2012; Gesesse et al., 2014; Thu et al., 2024).

However, some studies note that yield benefits may be less pronounced in the first few years or under certain conditions (e.g., drought, low adoption rates, or when vetiver is used alone without other conservation measures) (Hellin & Haigh, 2002). The area taken out of production by hedgerows and the need for farmer training and awareness are practical considerations for scaling up adoption (Oshunsanya, 2013; OlaOLU, 2006; Hailu & Hailu, 2021; Ewetola et al., 2021). Integration with other soil management practices (e.g., mulching, composting) can further enhance benefits (Babalola et al., 2003; Oshunsanya, 2013; Are et al., 2012; Gesesse et al., 2014; Thu et al., 2024).

Claims and Evidence Table

Claim	Evidence Strength	Reasoning	Papers
Vetiver grass significantly reduces soil erosion and runoff on sloping farmland	Strong	Multiple long-term, replicated field studies show 56–90% reductions in soil loss and runoff	(Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; OlaOLU, 2006; Oshunsanya & Aliku, 2017; Dass et al., 2010; Qianru, 2001; Sudhishri et al., 2008)
Vetiver grass increases soil organic carbon and available phosphorus	Strong	Consistent findings of higher organic C and P in vetiver plots across diverse contexts	(Hailu et al., 2020; Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya & Aliku, 2017; Oshunsanya, 2013; Are et al., 2012; Gesesse et al., 2014; Thu et al., 2024)
Vetiver grass increases crop yields (maize, cassava, cowpea, etc.)	Strong	Field trials report 11–50% yield increases, especially for maize and cowpea	(Babalola et al., 2003; Oshunsanya et al., 2019; Babalola et al., 2007; Oshunsanya, 2013; Oshunsanya, 2013; OlaOLU, 2006; Oshunsanya & Aliku, 2017; Oshunsanya, 2013; Dass et al., 2010)
Closer vetiver hedgerow spacing increases soil accumulation and yield, but reduces cultivable area	Moderate	Spacing studies show trade-off between conservation benefits and land use	(Babalola et al., 2007; Oshunsanya, 2013; OlaOLU, 2006)
Integration with mulching or composting further improves soil quality and yields	Moderate	Studies show additive effects of vetiver with organic amendments	(Babalola et al., 2003; Oshunsanya, 2013; Are et al., 2012; Gesesse et al., 2014; Thu et al., 2024)
Vetiver grass alone may not always produce significant yield gains in the first years or under drought	Weak	Some studies report limited or delayed yield benefits, especially in dry years or without other practices	(Hellin & Haigh, 2002)

FIGURE 4 Key claims and support evidence identified in these papers.

5. Conclusion

The literature strongly supports the use of vetiver grass for soil conservation and crop yield improvement in erosion-prone agricultural systems. Vetiver hedgerows reduce soil loss, enhance soil fertility, and increase yields for a range of crops, especially when combined with other soil management practices. Adoption is influenced by spacing, farmer awareness, and integration with local practices.

5.1 Research Gaps

Despite the strong evidence base, gaps remain in understanding the long-term economic impacts, optimal integration with other conservation practices, and adoption barriers in different socio-economic contexts.

Research Gaps Matrix

Outcome Measured	Maize	Cassava	Cowpea	Mixed Crops	Soil Quality Only
Soil Erosion	12	7	4	6	8
Soil Fertility	10	6	3	5	7
Crop Yield	11	6	4	5	2
Farmer Adoption	3	2	1	2	1
Economic Analysis	2	1	1	1	GAP

FIGURE 5 Matrix of research topics and study attributes for vetiver grass studies.

5.2 Open Research Questions

Future research should focus on the long-term economic impacts, optimal integration strategies, and adoption barriers for vetiver grass in diverse farming systems.

Question	Why
What are the long-term economic impacts of vetiver grass adoption for smallholder farmers?	Understanding profitability and cost-benefit is crucial for scaling up adoption and policy support.
How can vetiver grass be optimally integrated with other soil management practices for maximum yield and conservation benefits?	Identifying best practices for combined approaches will maximize both conservation and productivity.
What are the main barriers to farmer adoption of vetiver grass in different socio-economic and agro-ecological contexts?	Addressing adoption barriers is essential for widespread implementation and impact.

FIGURE 6 Open research questions for future vetiver grass studies.

In summary, vetiver grass is a proven, sustainable tool for soil conservation and crop yield improvement, but further research is needed to optimize its use and ensure broad adoption.

These papers were sourced and synthesized using Consensus, an AI-powered search engine for research. Try it at https://consensus.app

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