

**PILOTING TEKNOLOGI PEMANENAN AIR BERBASIS BIOPORI SKALA RUMAH
TANGGA UNTUK RESILIANSI PENANGGULANGAN GENANGAN BANJIR DI
WILAYAH KABUPATEN SIDRAP**

UNIVERSITAS MUHAMMADIYAH PAREPARE



LAPORAN AKHIR

DISUSUN OLEH:

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HIBAH RISET MUHAMMADIYAH

BATCH VII

2023/2024

I. PENDAHULUAN

1. Latar belakang

Wilayah Kabupaten Sidrap merupakan salah satu daerah yang sering mengalami masalah genangan banjir saat musim hujan tiba. Faktor topografi dan drainase yang kurang memadai menjadi penyebab utama masalah ini. Salah satu Solusi yang dapat diadopsi adalah memanfaatkan teknologi pemanenan air berbasis biopori skala rumah tangga. Biopori merupakan lubang-lubang kecil yang dibuat di tanah untuk meningkatkan infiltrasi air ke dalam tanah. Teknologi ini telah terbukti efektif dalam mengurangi genangan banjir di beberapa daerah.

Banjir merupakan salah satu bencana alam yang sering terjadi di berbagai wilayah di Indonesia, termasuk Kabupaten Sidrap. Banjir dapat disebabkan oleh berbagai faktor, seperti curah hujan yang tinggi, Pembangunan yang tidak terkendali, dan sistem drainase yang tidak memadai. Salah satu dampak yang ditimbulkan oleh banjir adalah genangan air yang dapat mengakibatkan kerugian material dan non material bagi Masyarakat, seperti rusaknya infrastruktur, hilangnya mata pencaharian, dan masalah Kesehatan akibat penyebaran penyakit.

Dalam rangka meningkatkan resiliensi dan mengurangi dampak genangan banjir, diperlukan inovasi teknologi yang dapat membantu dalam mengatasi masalah tersebut. Salah satu teknologi yang dapat digunakan adalah teknologi pemanenan air berbasis biopori. Biopori adalah lubang kecil yang dibuat di tanah untuk memperbaiki infiltrasi air hujan kedalam tanah, sehingga dapat mengurangi genangan banjir.

Penelitian ini bertujuan untuk melakukan uji coba atau piloting terhadap teknologi pemanenan air berbasis biopori skala rumah tangga di wilayah Kabupaten Sidrap. Dengan menerapkan teknologi ini ditingkat rumah tangga, diharapkan dapat meningkatkan resiliensi Masyarakat terhadap genangan banjir. Selain itu, pemanenan air berbasis biopori juga memiliki potensi untuk meningkatkan ketersediaan air tanah, mengurangi erosi tanah, serta meningkatkan produktivitas pertanian.

Penelitian ini penting dilakukan mengingat masih minimnya penggunaan teknologi pemanenan air berbasis biopori di Masyarakat, terutama di daerah yang rentan terhadap genangan banjir. Dengan demikian, hasil penelitian ini diharapkan dapat memberikan kontribusi dalam pengembangan Solusi adaptasi terhadap perubahan iklim serta penanggulangan bencana banjir di Kabupaten Sidrap maupun wilayah lainnya. Selain itu, penelitian ini juga diharapkan dapat memberikan masukan bagi pemerintah dalam penyusunan kebijakan terkait penanganan bencana banjir dan pengelolaan sumber daya air secara berkelanjutan.

2. Rumusan Masalah Penelitian

Berdasarkan uraian pada bagian latar belakang, maka dirumuskan masalah penelitian yaitu

1. Bagaimana efektivitas teknologi pemanenan air berbasis biopori skala rumah tangga dalam mengurangi genangan banjir di wilayah Kabupaten Sidrap.

2. Bagaimana kelayakan penerapan teknologi pemanenan air berbasis biopori skala rumah tangga dari segi ekonomi, sosial, dan lingkungan.

3. Tujuan Penelitian

Berdasarkan masalah penelitian yang akan diselesaikan, maka tujuan penelitian ini adalah

1. Menguji efektivitas teknologi pemanenan air berbasis biopori skala rumah tangga dalam mengurangi genangan banjir di wilayah Kabupaten Sidrap.
2. Menilai kelayakan penerapan teknologi pemanenan air berbasis biopori skala rumah tangga dari segi ekonomi, sosial, dan lingkungan.

II. TEMUAN SEMENTARA

Temuan sementara yang diperoleh dari penelitian ini adalah

1. Efektivitas Teknologi Biopori : Berdasarkan pemantauan awal, teknologi pemanenan air berbasis biopori skala rumah tangga telah menunjukkan hasil yang positif dalam mengurangi genangan banjir di wilayah Kabupaten Sidrap. Rumah tangga yang menerapkan teknologi ini mengalami peningkatan kemampuan dalam menyerap air hujan ke dalam tanah, mengurangi volume genangan, serta memperbaiki drainase lingkungan sekitar.
2. Dukungan Masyarakat : Respon masyarakat terhadap penerapan teknologi biopori cukup positif. Mereka menyadari manfaatnya dalam mengurangi dampak banjir dan merasa termotivasi untuk melanjutkan penggunaan teknologi ini di rumah tangga mereka.
3. Kendala dan Tantangan : tingkat pemahaman dan kesadaran masyarakat terhadap pentingnya perawatan dan pemeliharaan biopori. Selain itu, aspek teknis seperti pemilihan lokasi yang tepat dan perawatan yang tepat juga menjadi faktor krusial dalam kesuksesan teknologi ini.

III. RENCANA KE DEPAN

Adapun rencana untuk ke depan dari penelitian ini adalah memperluas implementasi teknologi pemanenan air berbasis biopori skala rumah tangga ke lebih banyak rumah tangga di wilayah Kabupaten Sidrap, penguatan pendidikan dan pelatihan, monitoring dan evaluasi berkelanjutan, kolaborasi dengan pihak terkait, penelitian lanjutan, pengembangan model percontohan, memperbaiki hasil review artikel yang di submit di jurnal yang telah dijanjikan dan jika memungkinkan menambah satu luaran tambahan berupa artikel yang terbit di jurnal pengabdian masyarakat .

Dengan mengimplementasikan rencana kedepan ini secara berkelanjutan dan melibatkan berbagai pemangku kepentingan, diharapkan teknologi pemanenan air berbasis biopori dapat menjadi solusi yang efektif dan berkelanjutan dalam mengurangi genangan banjir dan meningkatkan resiliensi masyarakat di wilayah Kabupaten Sidrap.

IV. DAFTAR LUARAN WAJIB DAN TAMBAHAN

Luaran wajib yang dijanjikan berdasarkan proposal yang diajukan adalah Karya Monumental (paten) dan artikel yang terbit di Jurnal JGEET (Journal of Geoscience, Engineering, Environment, and Technology) . Artikel yang dijanjikan sudah jadi draft dan akan segera

disubmit pada Jurnal JGEET (Journal of Geoscience, Engineering, Environment, and Technology) tahun 2024.

V. KENDALA

Kendala yang dihadapi dalam pelaksanaan penelitian ini adalah keterbatasan Sumber Daya baik dari segi anggaran maupun dari segi tenaga kerja, perubahan kondisi lingkungan seperti perubahan iklim atau kondisi tanah yang tidak sesuai dengan asumsi awal yang dapat mempengaruhi efektivitas dan kelayakan teknologi yang diuji, respon masyarakat yang tidak terduga, kesulitan teknis misalnya masalah dengan desain atau instalasi biopori, ketidakpastian kebijakan, kesulitan komunikasi dan koordinasi .

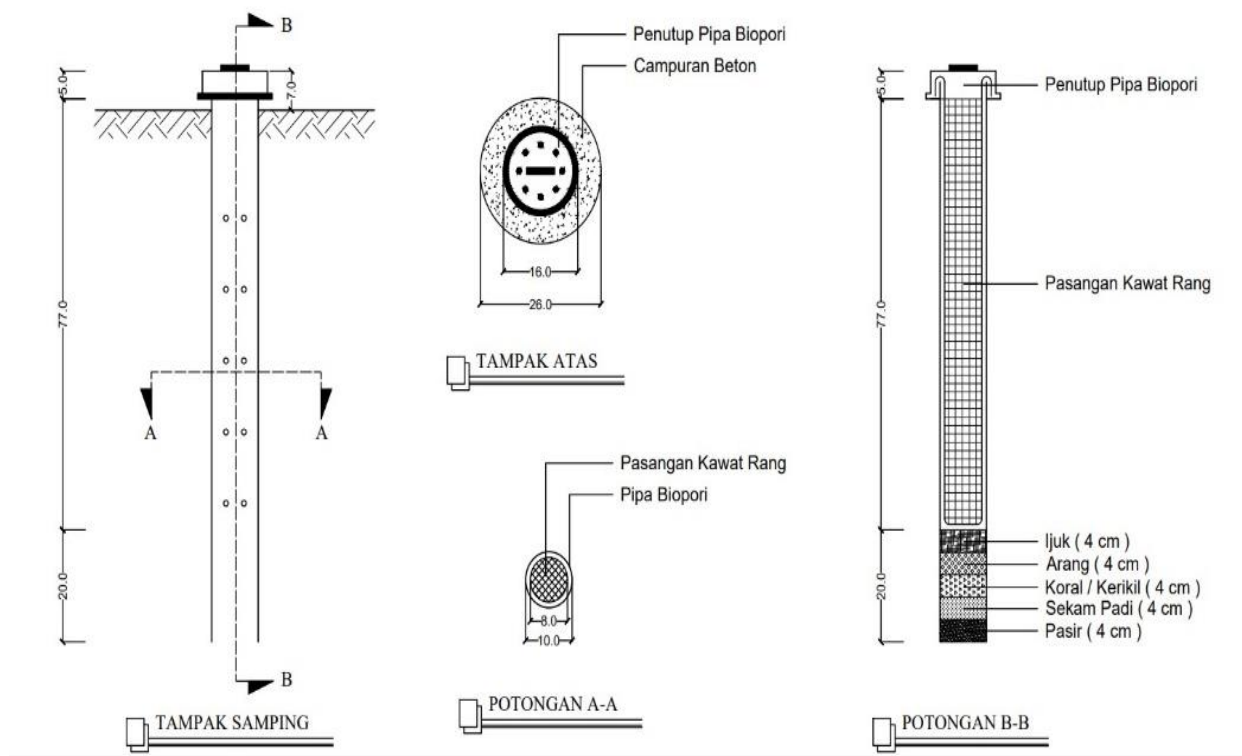
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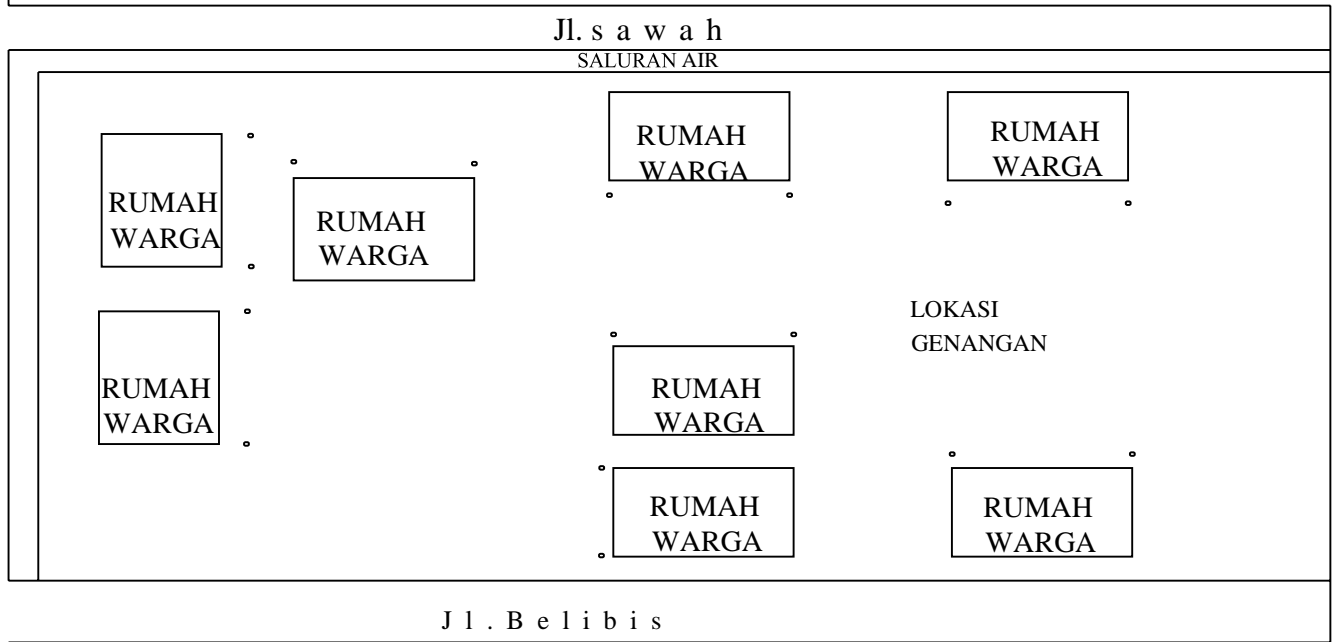
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LAMPIRAN

Adapun Desain dan Skema Model Teknologi Biopori kegiatan penelitian sebagai berikut:



Gambar 1. Desain Model Teknologi Biopori



Gambar 2. Skema Model Teknologi Biopori



Survey Lokasi Penelitian

Gambar 3.



Gambar 4. Proses Perakitan Biopori



Gambar 5. Proses Penggalian Tanah dan Pemasangan Lubang Biopori



Gambar 6. Lokasi Penelitian

RENCANA ANGGARAN BIAYA (100%)

No	Jenis Pembelanjaan	Item	Satuan	Vol	Biaya Satuan	Total
1	Rapat Tim	Transpor + konsumsi (2 kali)	org/hr	6	150.000	900.000
2	Survei Lokasi	Transpor + konsumsi + Honor	org/hr	3	630.000	1.890.000
3	Pembelian Bahan	Pipa PVC 8" + Rang + kawat + tutup Pipa+ijuk+arang+Pasir+kerikil	paket	1	8.050.000	8.050.000
4	Perakitan Biopori	Konsumsi + Honor	org/hr	1	150.000	150.000
5	Penggalian Tanah lubang biopori	Konsumsi + Honor (10 Lubang biopori)	org/hr	10	100.000	1.000.000
6	Pemasangan lubang resapan biopori	Konsumsi + Honor (10 Lubang biopori)	org/hr	1	150.000	150.000
7	Pembuatan Laporan Kemajuan & Luaran	Pembuatan Laporan	paket	1	1.360.000	1.360.000
8	Pembuatan Laporan Akhir	Pembuatan Laporan	Paket	1	1.500.000	1.500.000
9	Pendaftaran Paten Sederhana	Daftar Paten	Paket	1	1.500.000	1.500.000
10	Jurnal sinta 2	Publikasi	paket	1	3.500.000	3.500.000
TOTAL						20.000.000

Formulir Evaluasi Capaian

BORANG LUARAN RISETMU BATCH VI

a. Skema Penelitian yang diikuti:

Penelitian Dasar

b. Luaran Wajib Penelitian (sesuai panduan):

Karya Monumental (Paten Sederhana) **terdaftar**

c. Capaian Penelitian/Pengabdian kepada Masyarakat (wajib dipilih salah satu):

1. <25%
2. 25% - 50%
3. 51% - 75%
4. **>75%**

d. Target Publikasi Luaran wajib

1. Jurnal 1

- | | | |
|-----------------------|---|---|
| a. Nama Penulis | : | Dr. Rahmawati, ST., M.Eng |
| b. Nama Jurnal | : | JGEET (Journal of Geoscience, Engineering, Environment, and Technology) |
| c. Penerbit Jurnal | : | Department of Geological Engineering, Faculty of Engineering, Universitas Islam Riau |
| d. Judul Artikel | : | Analysis of community and practitioner perceptions of biopori-based water treatment technologies in the context of flood resistance |
| e. Lembaga Pengindeks | : | Sinta, Garuda, Google Scholar, Journal Stories, Open AIRE, BASE, Cite Factor, Microsoft Academic, Dimension, Metadata From Crossref, Road |
| f. Quartil | : | 2 |
| g. Status | : | (Draft, Submitted , Under Review, Accepted, Published) |

2. Jurnal 2

- | | | |
|-----------------------|---|-------|
| a. Nama Penulis | : | |
| b. Nama Jurnal | : | |
| c. Penerbit Jurnal | : | |
| d. Judul Artikel | : | |
| e. Lembaga Pengindeks | : | |
| f. Quartil | : | |
| g. Status | : | |
- (Draft, Submitted, Under Review, Accepted, Published)

e. Kendala (apabila luaran wajib belum tercapai):

Banyaknya penulis yang memasukkan artikel di Jurnal JGEET (Journal of Geoscience, Engineering, Environment, and Technology) sehingga menunggu antrian.

f. Luaran Tambahan (diisi jika ada target luaran tambahan)

Kemajuan pencapaian luaran tambahan:

1. Produk inovasi berupa hasil Kekayaan Intelektual/KI Paten/Paten sederhana/Desain industri

- a. Nama Inventor : Rahmawati, Nurhapsa, Ahmad Fahmi
- b. Nama Pemilik Paten/Paten sederhana: Rahmawati, Nurhapsa, Ahmad Fahmi
- c. Nomer Pendaftaran :
- d. Tanggal Pendaftaran :
- e. Status (*Draft*, Terdaftar) : Draft

2. Produk inovasi berupa hasil Kekayaan Intelektual/KI Hak cipta yang bernilai komersial

- a. Nama Pencipta :
- b. Nama Pemilik Hak Cipta :
- c. Nomer Pendaftaran :
- d. Tanggal Pendaftaran :
- e. Status (*Draft*, *Granted*) :

3. Buku

- a. Nama Penulis :
- b. Nama Penerbit Buku :
- c. Nomer ISBN :
- d. Tanggal terbit :
- e. Status :

(Draft, Terkirim ke Penerbit, *Published*)

4. Publikasi di media massa

Link berita/artikel:

- 1.
- 2.

Parepare, 30 Juli 2024

Ketua Peneliti,



(Dr. Rahmawati, ST.M.Eng)
NIP/NIK 959 770



DRAFT PATEN

Deskripsi

PROSES PEMANENAN AIR BERBASIS BIOPORI PADA SKALA RUMAH TANGGA SEBAGAI PENGENDALI BANJIR

Bidang Teknik Invensi

Invensi ini berkaitan dengan teknik pengelolaan air hujan dan pengurangan genangan banjir, khususnya pada skala rumah tangga, dengan menggunakan teknologi biopori. Teknologi ini juga termasuk dalam bidang teknik sipil dan lingkungan. Khususnya pemanenan air menggunakan pipa diameter 8 – 10 cm.

Latar Belakang Invensi

Kabupaten Sidrap sering menghadapi masalah genangan banjir selama musim hujan. Genangan air ini menjadi masalah yang serius, mengganggu aktivitas sehari-hari warga, merusak infrastruktur, dan berpotensi menyebabkan masalah kesehatan. Masalah banjir di Kabupaten Sidrap disebabkan oleh beberapa faktor, termasuk buruknya sistem drainase, rendahnya resapan air tanah, dan perubahan iklim yang meningkatkan intensitas curah hujan. Sistem drainase yang ada seringkali tidak mampu menampung volume air hujan yang besar, sehingga air menggenangi di permukaan tanah.

Rendahnya resapan air tanah juga menjadi salah satu penyebab utama genangan banjir. Banyaknya lahan yang telah beralih fungsi menjadi permukiman dan infrastruktur keras menyebabkan berkurangnya area resapan alami. Ketika hujan turun, air tidak dapat meresap ke dalam tanah dengan cepat, sehingga terjadi genangan di permukaan. Perubahan iklim yang menyebabkan peningkatan intensitas hujan juga memperburuk situasi, karena sistem drainase yang ada tidak dirancang untuk menangani curah hujan ekstrem.

Teknologi biopori menawarkan solusi yang inovatif untuk mengatasi masalah genangan banjir ini. Teknologi ini bekerja dengan cara meningkatkan kapasitas resapan air tanah melalui pembuatan lubang biopori yang diisi dengan material organik. Lubang biopori, yang memiliki diameter 8-10 cm dan kedalaman 80-100 cm, memungkinkan air hujan untuk meresap ke dalam tanah lebih cepat, mengurangi genangan air di permukaan, dan mengurangi beban pada sistem

drainase. Material organik seperti pasir, sekam, kerikil, arang, dan ijuk digunakan untuk mengisi lubang biopori guna meningkatkan infiltrasi air dan aktivitas mikroorganisme tanah.

Invensi ini berkaitan dengan teknik pengelolaan air hujan dan pengurangan genangan banjir, khususnya pada skala rumah tangga, dengan menggunakan teknologi biopori. Teknologi ini juga termasuk dalam bidang teknik sipil dan lingkungan, dengan fokus pada pemanenan air menggunakan pipa diameter 8-10 cm. Invensi ini adalah sistem biopori skala rumah tangga yang dirancang untuk meningkatkan resapan air hujan dan mengurangi genangan banjir. Sistem ini mencakup pembuatan lubang biopori di sekitar rumah, sistem pengumpulan dan penampungan air hujan, serta integrasi dengan sistem drainase lokal.

Sistem biopori ini memungkinkan air hujan untuk diserap ke dalam tanah melalui biopori, sementara kelebihan air yang tidak terserap dialirkan ke sistem drainase. Dengan demikian, genangan air di sekitar rumah dapat dikurangi secara signifikan. Tujuan dari invensi ini adalah untuk menghasilkan suatu teknologi pemanenan air berbasis biopori skala rumah tangga yang mampu meningkatkan resiliensi terhadap genangan banjir di wilayah Kabupaten Sidrap. Sistem ini diharapkan dapat membantu masyarakat dalam mengatasi masalah genangan air dengan cara yang sederhana namun efektif.

Selain itu, sistem ini juga memungkinkan pemanfaatan air hujan sebagai sumber air alternatif untuk keperluan rumah tangga seperti menyiram tanaman, mencuci, dan keperluan lainnya. Air hujan yang tertampung dalam sistem ini dapat digunakan kembali, mengurangi ketergantungan pada sumber air bersih yang mungkin terbatas, terutama selama musim kemarau. Dengan demikian, teknologi ini tidak hanya membantu mengurangi genangan banjir tetapi juga memberikan manfaat tambahan dalam bentuk pengelolaan sumber daya air yang lebih baik.

Dilakukan analisis pada proses pemanenan air berbasis biopori skala rumah tangga untuk resiliensi penanggulangan genangan banjir di wilayah Kabupaten Sidrap. Sistem biopori skala rumah tangga dengan menggunakan pipa diameter 8-10 cm terdiri dari beberapa lapisan material organik seperti pasir 4-8%, sekam 4-8%, kerikil 4-8%, arang 4-8%, dan ijuk 4-8%. Pasangan kawat rang 60-80% digunakan untuk memperkuat struktur lubang biopori. Bahan-bahan ini dipilih karena kemampuannya dalam meningkatkan infiltrasi air dan mendukung kehidupan mikroorganisme tanah yang membantu proses dekomposisi material organik.

Secara keseluruhan, invensi ini bertujuan untuk menyediakan solusi praktis dan efektif dalam mengatasi masalah genangan banjir di lingkungan rumah tangga, khususnya di wilayah Kabupaten Sidrap. Dengan teknologi biopori ini, diharapkan masyarakat dapat lebih resiliensi

terhadap dampak negatif dari banjir, serta memanfaatkan air hujan secara lebih optimal. Implementasi teknologi ini juga diharapkan dapat menjadi contoh bagi daerah lain yang menghadapi masalah serupa.

Invensi teknologi yang berkaitan dengan biopori juga telah diungkapkan sebagaimana terdapat pada paten IDS000007189 Tanggal 08-01-2024, dengan judul metode biopori dengan mulsa vertikal untuk pengelolaan air dan hara pada perkebunan kelapa sawit produktif. Dimana invensi ini berhubungan dengan peningkatan serapan air pada areal perkebunan kelapa sawit menghasilkan lubang biopori membantu menekan terjadinya genangan banjir pada tapak lahan. Lubang biopori sedalam 1 m, berdiameter 10cm dapat menampung air sebanyak 0.03 m³ (30 liter). Disamping itu tanah akan lebih gembur sehingga memudahkan terjadinya pertukaran udara di dalam tanah. Kehadiran lubang resapan secara langsung akan menambah bidang resapan air, hara dan kesuburan biologi tanah. Mulsa vertical yang ditambah kan pada lubang biopori akan meningkatkan kesuburan biologi tanah, dengan kata lain lubang biopori disamping sebagai sumur resapan juga meningkatkan kesuburan kimia dan biologi tanah. Pembangunan biopori sedalam 100cm dengan TKKS 32 Kg sebanyak 63 per tanaman akan memperoleh kadar hara tanah, tanaman, jumlah total mikroba yang lebih baik. Hasil analisis kadar hara tanah pada perlakuan biopori 100/32Kg TKKS adalah: (N:0,16); (P:12,75); (K:0,36); (Ca:1,44); (Mg:1,27) dan (C-organik 1,13). Hal ini didukung peningkatan total mikroba sebesar 70,22% jika dibandingkan tanpa biopori dan mulsa vertical.

Invensi teknologi selanjutnya yang berkaitan dengan biopori juga telah diungkapkan pada pangkalan data kekayaan intelektual Nomor IDP000051844 Tanggal 10-07-2018, dengan judul modifikasi lubang resapan biopori untuk peresapan dan penyuplai air dan unsur hara serta pembuatan kompos. Dimana Invensi ini berhubungan dengan perbaikan kualitas tanah melalui percepatan pengembalian bahan organik tanah, sekaligus penyediaan bahan organik terdekomposisi sempurna melalui proses alami dari mikrob-mikrob lokal (*indigenous microbes*) sebagai bahan pembenah tanah (amelioran). Invensi ini dipergunakan untuk meningkatkan kualitas lahan dan memiliki keunggulan jika dibandingkan teknologi lain. Modifikasi lubang resapan biopori adalah lubang resapan biopori yang berbentuk kotak dengan lubang kecil yang terletak pada dasar lubang biopori yang berbentuk kotak. Lubang resapan biopori dapat diisi dengan bahan organik yang dapat dikombinasikan dengan pupuk kandang. Dari hasil kajian yang dilaksanakan invensi ini terbukti mampu mempercepat proses perombakan bahan organik dan memproduksinya dalam jumlah besar persatuan luas, mampu menciptakan lingkungan yang cocok untuk pertumbuhan populasi mikroorganisme fungsional lokal, mampu menyimpan/meneruskan air ke

muka air tanah ketika musim hujan dan memasok air kembali ketika musim kering, sehingga kadar air tetap terjaga, mampu memasok hara tanaman dari proses perombakan bahan organik dan selanjutnya meneruskannya ke dalam lapisan bawah tanah menuju ke akar tanaman bagian bawah, dan akuisi akar menuju invensi pada sistem ini akan mengefesienkan serapan hara tanaman.

Invensi teknologi selanjutnya yang berkaitan dengan biopori juga telah diungkapkan sebagaimana terdapat pada paten pangkalan data kekayaan intelektual Nomor S22202108203 Tanggal 30-09-2021, dengan judul tabung/kantong/wadah pada lobang biopori untuk memudahkan pemanenan kompos. Dimana Invensi ini mengungkapkan mengenai pembaharuan pada lobang biopori untuk memudahkan pemanenan kompos, lebih khusus lagi, invensi ini berhubungan dengan penambahan/pemberian Tabung/Kantong/Wadah pada lobang biopori agar pemanenan kompos pada lobang biopori mudah dilakukan. Tujuan utama dari invensi ini adalah untuk mengatasi permasalahan yang ada pada pengolahan sampah organik dengan lobang biopori, khususnya agar pemanenan kompos pada lobang biopori mudah dilakukan. Tabung/Kantong/Wadah pada lobang biopori untuk memudahkan pemanenan kompos merupakan inovasi pembuatan lobang biopori yang diberikan tambahan dengan Tabung/Kantong/Wadah sebagai penampung sampah sehingga ketika terbentuk kompos akan mudah dipanen. Lobang biopori yang dipergunakan untuk mengolah sampah organik yang memiliki kemudahan untuk pemanenan kompos dicirikan dengan terdapatnya Tabung/Kantong/Wadah dalam lobang biopori. Tujuan lain dari invensi ini adalah menjaga agar lobang biopori tetap berdayaguna dengan baik, kompos dapat dimanfaatkan dan fabrikasi bangun bangunan lobang biopori yang dilengkapi tabung/kantong/wadah didalamnya.

Invensi teknologi selanjutnya yang berkaitan dengan biopori juga telah diungkapkan sebagaimana terdapat pada paten pangkalan data kekayaan intelektual Nomor S00202305487 Tanggal 20-06-2023, dengan judul alat penerangan dengan biopori. Dimana Invensi ini mengungkapkan Suatu lampu taman yang memanfaatkan lubang resapan biopori sebagai tempat menghasilkan energi listrik, mandiri dengan siraman air kedalam lubang biopori. Listrik yang dihasilkan dari sel elektroda yang di masukan kedalam lubang biopori, sel elektroda tersebut terdiri dari dua jenis logam. Lubang biopori berisi elektroda di mana bentuk elektroda tembaga dan *zinc* tersebut adalah secara substansial persegi panjang yang telah di isi tanah merah, logam tembaga sebagai kutub positif, logam zinc sebagai kutub negatif kemudian diberi pembungkus berupa kain kapas yang dapat menyerap air. Air difungsikan sebagai media penghantar aliran elektrolit yang terjadi antara tanah merah dengan elektroda tembaga dan zinc . Sel elektroda tersebut berukuran 2,5 cm x 8 cm. Listrik yang dihasilkan 17,6 volt dan akan disimpan kedalam baterai 3,7 volt kemudian listrik akan digunakan untuk menyalakan lampu LED. Lampu akan

menyala secara otomatis saat hari mulai gelap, dan akan mati saat hari mulai terang dengan menggunakan sensor cahaya.

Uraian Singkat Invensi

Invensi ini adalah sistem pemanenan air berbasis biopori skala rumah tangga yang dirancang untuk meningkatkan resapan air hujan dan mengurangi genangan banjir di wilayah Kabupaten Sidrap. Sistem ini menggunakan pipa berdiameter 8-10 cm yang ditanam dengan kedalaman 80-100 cm di sekitar rumah. Di dalam pipa, berbagai material organik diisi dengan komposisi berikut: pasir 4-8%, sekam 4-8%, kerikil 4-8%, arang 4-8%, ijuk 4-8%, serta pasangan kawat rang 60-80%. Material-material ini dipilih untuk meningkatkan infiltrasi air dan mendukung aktivitas mikroorganisme tanah yang membantu proses dekomposisi.

Sistem biopori ini dirancang untuk aplikasi rumah tangga, dengan komposisi material yang lebih disukai sebagai berikut: pasir 4%, sekam 4%, kerikil 4%, arang 4%, ijuk 4%, dan pasangan kawat rang 80%. Lubang biopori ini memungkinkan air hujan untuk meresap ke dalam tanah lebih cepat, mengurangi genangan air di permukaan, dan mengurangi beban pada sistem drainase lokal. Invensi ini memberikan solusi praktis dan efektif dalam mengelola air hujan, meningkatkan resapan tanah, dan memitigasi risiko genangan banjir di lingkungan rumah tangga.

Uraian Lengkap Invensi

Kabupaten Sidrap sering menghadapi masalah genangan banjir selama musim hujan. Banjir ini disebabkan oleh buruknya sistem drainase, rendahnya resapan air tanah, dan perubahan iklim yang meningkatkan intensitas hujan. Teknologi biopori menawarkan solusi untuk mengatasi masalah ini dengan meningkatkan kapasitas resapan air tanah di lingkungan rumah tangga. Lubang biopori, yang diisi dengan material organik, dapat mempercepat infiltrasi air hujan ke dalam tanah, mengurangi genangan air di permukaan, dan mengurangi beban pada sistem drainase.

Invensi ini berkaitan dengan teknik pengelolaan air hujan dan pengurangan genangan banjir, khususnya pada skala rumah tangga, dengan menggunakan teknologi biopori. Teknologi ini juga termasuk dalam bidang teknik sipil dan lingkungan. Khususnya pemanenan air menggunakan pipa diameter 8 – 10 cm. Invensi ini adalah sistem biopori skala rumah tangga yang dirancang untuk meningkatkan resapan air hujan dan mengurangi genangan banjir. Sistem ini mencakup pembuatan lubang biopori di sekitar rumah, sistem pengumpulan dan penampungan air hujan, serta integrasi dengan sistem drainase lokal. Sistem ini memungkinkan air hujan untuk diserap ke dalam tanah melalui biopori, sementara kelebihan air yang tidak

terserap dialirkan ke sistem drainase. Tujuan dari invensi ini adalah untuk menghasilkan suatu Pemanenan air berbasis biopori skala rumah tangga untuk resiliensi penanggulangan genangan banjir di wilayah Kabupaten Sidrap. Dilakukan analisis pada suatu proses pemanenan air berbasis biopori skala rumah tangga untuk resiliensi penanggulangan genangan banjir di wilayah Kabupaten Sidrap. Sistem biopori skala rumah tangga dengan menggunakan pipa diameter 8-10 cm, di dalam pipa terdiri dari kedalaman penanaman pipa 80-100 cm; pasir 4% - 8%; Sekam 4% - 8%; Kerikil 4% - 8%; arang 4% - 8%; ijuk 4% - 8%; pasangan kawat rang 60 % - 80% untuk bahan material organik yang diisi dalam lubang biopori untuk meningkatkan infiltrasi air dan aktivitas mikroorganisme tanah.

Secara keseluruhan, invensi ini bertujuan untuk menyediakan solusi praktis dan efektif dalam mengatasi masalah genangan banjir di lingkungan rumah tangga, khususnya di wilayah Kabupaten Sidrap. Dengan teknologi biopori ini, diharapkan masyarakat dapat lebih resiliensi terhadap dampak negatif dari banjir, serta memanfaatkan air hujan secara lebih optimal. Implementasi teknologi ini juga diharapkan dapat menjadi contoh bagi daerah lain yang menghadapi masalah serupa.

A. Sistem Biopori Skala Rumah Tangga

Sistem ini melibatkan pembuatan lubang biopori dengan diameter 8-10 cm dan kedalaman 80-100 cm di sekitar rumah. Lubang-lubang ini diisi dengan material organik seperti pasir, sekam, kerikil, arang, dan ijuk, serta diperkuat dengan pasangan kawat rang 60-80%. Material organik ini dipilih karena kemampuannya untuk meningkatkan infiltrasi air dan mendukung aktivitas mikroorganisme tanah yang membantu proses dekomposisi. Material ini juga mampu meningkatkan kapasitas resapan tanah, sehingga air hujan dapat meresap lebih cepat ke dalam tanah, mengurangi genangan air di permukaan.

B. Komposisi Material Organik

Material organik yang digunakan dalam sistem biopori ini memiliki komposisi yang spesifik untuk memastikan efektivitasnya dalam meningkatkan infiltrasi air dan mendukung aktivitas mikroorganisme tanah. Pasir, sekam, kerikil, arang, dan ijuk masing-masing memiliki komposisi 4-8%, sementara pasangan kawat rang memiliki komposisi 60-80%. Kombinasi material ini tidak hanya meningkatkan kapasitas resapan tanah tetapi juga mendukung ekosistem tanah yang sehat, yang penting untuk proses dekomposisi material organik dan peningkatan kualitas tanah.

C. Aplikasi Rumah Tangga yang Disukai

Untuk aplikasi rumah tangga, komposisi material yang lebih disukai adalah sebagai berikut: pasir 4%, sekam 4%, kerikil 4%, arang 4%, ijuk 4%, dan pasangan kawat rang 80%. Komposisi ini dipilih berdasarkan hasil analisis yang menunjukkan bahwa kombinasi ini memberikan hasil terbaik dalam meningkatkan infiltrasi air dan mendukung aktivitas mikroorganisme tanah. Dengan menggunakan komposisi ini, sistem biopori dapat bekerja secara optimal dalam meningkatkan resapan air dan mengurangi genangan banjir di lingkungan rumah tangga.

D. Tujuan dan Manfaat Invensi

Tujuan utama dari invensi ini adalah untuk meningkatkan resiliensi terhadap genangan banjir di wilayah Kabupaten Sidrap melalui teknologi biopori yang efektif dan mudah diterapkan. Dengan meningkatkan kapasitas resapan tanah dan mengurangi volume air permukaan, sistem ini membantu mencegah genangan air dan mengurangi beban pada sistem drainase kota. Selain itu, sistem ini juga memungkinkan pemanfaatan air hujan sebagai sumber daya yang berharga, mengurangi ketergantungan pada sumber air bersih, dan menyediakan solusi yang berkelanjutan untuk masalah pengelolaan air hujan.

E. Implementasi dan Evaluasi

Implementasi teknologi ini dilakukan di beberapa rumah di Kabupaten Sidrap untuk menguji efektivitasnya dalam mengurangi genangan air dan meningkatkan resapan tanah. Proses implementasi meliputi pemasangan sistem biopori di sekitar rumah, pemasangan talang air dan pipa penyalur, serta tangki penampungan air hujan. Evaluasi dilakukan dengan memantau tingkat genangan air sebelum dan sesudah pemasangan sistem biopori, serta mengukur jumlah air yang terserap oleh tanah melalui biopori dan jumlah air yang tertampung dalam tangki.

F. Hasil dan Dampak

Hasil dari implementasi teknologi ini menunjukkan bahwa sistem biopori skala rumah tangga efektif dalam mengurangi genangan air dan meningkatkan resapan tanah. Air hujan yang biasanya menggenang di permukaan tanah sekarang dapat terserap dengan cepat melalui biopori, mengurangi risiko banjir dan dampak negatifnya. Selain itu, air hujan yang tertampung dalam tangki penampungan dapat dimanfaatkan untuk berbagai keperluan rumah tangga, mengurangi ketergantungan pada sumber air bersih.

Klaim

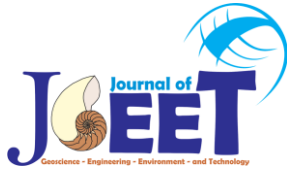
1. Sistem Pemanenan air biopori skala rumah tangga dengan menggunakan pipa diameter 8-10 cm, di dalam pipa terdiri dari:
 - Kedalaman penanaman pipa 80-100 cm;
 - pasir 4% - 8%;

- Sekam 4% - 8%;
 - Kerikil 4% - 8%;
 - arang 4% - 8%;
 - ijuk 4% - 8%;
 - pasangan kawat rang 60 % - 80% untuk bahan material organik yang diisi dalam lubang biopori untuk meningkatkan infiltrasi air dan aktivitas mikroorganisme tanah;
2. Sistem biopori skala rumah tangga dengan menggunakan pipa diameter 8-10 cm sesuai pada klaim (1), dimana untuk aplikasi rumah tangga yang lebih disukai dengan komposisi pasir 4%, sekam 4%, kerikil 4%, arang 4%, ijuk 4%, pasangan kawat rang 80%

Abstrak

PROSES PEMANENAN AIR BERBASIS BIOPORI PADA SKALA RUMAH TANGGA SEBAGAI PENGENDALI BANJIR

Invensi ini berkaitan dengan teknik pengelolaan air hujan dan pengurangan genangan banjir, khususnya pada skala rumah tangga, dengan menggunakan teknologi biopori. Teknologi ini juga termasuk dalam bidang teknik sipil dan lingkungan Khususnya pemanenan air menggunakan pipa diameter 8 – 10 cm. Invensi ini adalah sistem biopori skala rumah tangga yang dirancang untuk meningkatkan resapan air hujan dan mengurangi genangan banjir. Sistem ini mencakup pembuatan lubang biopori di sekitar rumah, serta integrasi dengan sistem drainase lokal. Tujuan dari invensi ini adalah untuk menghasilkan suatu Pemanenan air berbasis biopori skala rumah tangga untuk resiliensi penanggulangan genangan banjir di wilayah Kabupaten Sidrap. Dilakukan analisis pada suatu proses pemanenan air berbasis biopori skala rumah tangga untuk resiliensi penanggulangan genangan banjir di wilayah Kabupaten Sidrap. Sistem biopori skala rumah tangga dengan menggunakan pipa diameter 8-10 cm, di dalam pipa terdiri dari kedalaman penanaman pipa 80-100 cm; pasir 4% - 8%; Sekam 4% - 8%; Kerikil 4% - 8%; arang 4% - 8%; ijuk 4% - 8%; pasangan kawat rang 60 % - 80% untuk bahan material organik yang diisi dalam lubang biopori untuk meningkatkan infiltrasi air dan aktivitas mikroorganisme tanah.



Analysis of community and practitioner perceptions of biopori-based water treatment technologies in the context of flood resistance

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Process : Submit

Abstract

This study examines differences in perception between communities and practitioners of biopori-based water harvesting technologies in the context of flood management in Passeno Village, Baranti District, Sidenreng Rappang District, South Sulawesi Province, Indonesia. Using a quantitative approach, the study involved 30 respondents consisting of 27 members of the peasant group community and 3 practitioners. Data is collected through surveys with structured questionnaires and analyzed using descriptive and inferential statistical techniques. Research results show that communities give a higher assessment of the effectiveness and ease of implementation of biopori technology than practitioners. The main obstacle identified was a lack of knowledge and government support, with the proposed solution being intensive investigation and government subsidies. Although there were no significant differences in perception between the two groups, the study highlighted the importance of education, government support, and field experience in influencing biopori technology acceptance. These findings provide valuable insights for designing more effective communication and education strategies and encourage collaboration between communities and practitioners in sustained flood mitigation efforts.

Keywords: biopori, water harvest technology, flood resistance, community perception, practitioner perception

1. Introduction

1.1 Sub Introduction

The surge in flood disasters has underscored the need for innovative solutions to enhance population resilience to flooding (Kumar et al., 2023). Technology, such as deep learning for flood forecasting and management (Park & You, 2023), spatial decision support systems for urban resilience modeling (Macioszek, 2023), and digital twin platforms for real-time data utilization in flood response and water management (Raikes et al., 2023), plays a pivotal role in mitigating impacts and preparing communities for disasters. By leveraging early warning systems, water treatment technologies, and smart drainage infrastructure, technology not only accelerates disaster response but also strengthens prevention structures through real-time data and predictive analysis. This aligns with global efforts to reduce disaster risks and increase community resilience, highlighting the critical importance of innovative technologies in flood

management for a more resilient and adaptive strategy (Jones et al., 2023)

The adoption of biopori-based water harvesting technologies at the household level presents a promising approach to enhancing flood resistance control. Studies have shown that surface runoff harvesting, such as snowmelt and flood water harvesting, can effectively address water scarcity issues (Teleubay et al., 2023). Additionally, the use of innovative techniques like biopori can improve groundwater quality, reduce saturated water volume, and mitigate local flooding risks (Teleubay et al., 2023). Evaluating community perceptions and factors influencing the adoption of such technologies is crucial for enhancing resilience to flood resistance on a household scale. Understanding the socio-economic and hydro-climatic conditions, as well as the management shortcomings, exposure, vulnerability, and impacts related to floods and droughts, can provide valuable insights for sustainable flood risk management strategies (Rahman et al., 2023) (Li et al., 2023). By incorporating community feedback and addressing concerns about the effectiveness and sustainability of biopori-based

water harvesting, decision-makers can develop more targeted and successful flood resilience initiatives.

The effectiveness and adoption of biopori-based water harvesting technology at the household level face several challenges, including a lack of empirical data, technical knowledge, and local policy support. This situation is similar to the broader issues faced by Natural Flood Management (NFM) strategies, which, despite being recognized for their sustainability and effectiveness in reducing flood risk, suffer from varied perceptions between practitioners and community members. Practitioners, equipped with technical and scientific knowledge, understand the mechanisms and long-term impacts of NFM better than community members, who often lack information and practical experience, leading to skepticism and hindering effective collaboration (Connelly et al., 2023). The gap in understanding and acceptance of NFM can be attributed to the lack of systematic research on its long-term impact and scalability, as well as the need for more effective communication and education approaches to bridge this gap (Connelly et al., 2023). Additionally, the governance of flood management, particularly in the UK, highlights the importance of cross-sectoral resilience standards and policy instruments, which are currently lacking, thereby compromising the realization and monitoring of adaptation targets (Carvalho & Spataru, 2023). The integration of deep learning models in flood prediction and control has shown promise in improving accuracy and effectiveness, suggesting that incorporating advanced technologies could enhance the implementation of biopori-based systems as well (Kumar et al., 2023). Furthermore, the use of multi-objective optimization and decision support tools in urban flood management, as demonstrated in Tehran, Iran, underscores the potential for cost-effective and efficient solutions through the combination of green infrastructure and technical models. In semi-arid regions like Northern Kazakhstan, the successful assessment and implementation of snowmelt and floodwater harvesting using remote sensing and GIS-based methods provide a model for similar approaches in other regions, emphasizing the need for localized and context-specific solutions (Teleubay et al., 2023). Addressing these factors through comprehensive research and improved communication strategies will be crucial for optimizing the contribution of biopori-based water harvesting technology and NFM in flood resistance efforts.

The research on biopori-based water harvesting technologies for flood management is poised to make significant contributions by exploring the differences in perceptions between communities and practitioners, a topic that has been underexplored in existing literature. This study's approach, which combines surveys and in-depth interviews, will provide a nuanced understanding of how both groups perceive and accept biopori technology, thereby uncovering the dynamics that influence these perceptions. The focus on biopori as an innovative household-level flood mitigation solution adds a new dimension to the discussion on flood alleviation technologies, which is crucial given the increasing frequency and intensity of flood events due to climate change (Zhao et al., 2023). By integrating insights from deep learning applications in flood forecasting and management, the research can enhance the precision and effectiveness of flood control strategies, thereby improving community preparedness and resilience (Kumar et al., 2023). Additionally, the study's findings on the social innovations driven by community-based flood early warning systems, such as new inter-community relations and resource utilization, can inform the design of more effective

communication and educational strategies to promote biopori technology (Canwat, 2023).

The research also aligns with findings on the long-term mental health impacts of flooding, emphasizing the need for sustained support and better collaboration between communities and practitioners to mitigate these effects (Findlater et al., 2023). Furthermore, understanding the role of flood frequency in soil fertility and diversity can provide additional insights into the environmental benefits of biopori technology, which can enhance soil health and agricultural productivity in flood-prone areas (Rayburg et al., 2023). Overall, this research not only advances the theory and practice of flood management but also offers practical solutions to strengthen community resilience to flood disasters by fostering better collaboration and understanding between communities and practitioners.

The study's objective to examine the differences in perception between communities and practitioners regarding biopori-based water harvesting technologies in flood management can be informed by several key insights from the provided contexts. Deep learning models have shown promise in improving flood prediction and management by handling large datasets and providing accurate forecasts, which could enhance the perceived effectiveness of biopori technologies among practitioners (Kumar et al., 2023). The impact of climate change on precipitation patterns, leading to increased flooding and drought stress, underscores the need for effective water management solutions like biopori technologies, which could be perceived differently based on the community's direct experiences with such stressors (Zhao et al., 2023). The study of floodplain soils reveals that intermediate flood disturbances can enhance soil fertility and diversity, suggesting that biopori technologies might be more favorably viewed in regions experiencing moderate flooding, as they could contribute to soil health and agricultural productivity (Rayburg et al., 2023).

Community-based flood early warning systems in Uganda highlight the importance of local resource utilization and social innovations in flood management, indicating that community acceptance of biopori technologies may be influenced by the degree of local involvement and resource availability (Canwat, 2023). Additionally, the long-term mental health impacts of flooding and the increased demand for support services suggest that communities heavily affected by floods might be more receptive to biopori technologies if they are perceived to mitigate such impacts (Findlater et al., 2023). By integrating these diverse insights, the study can uncover the nuanced perceptions of both communities and practitioners, considering factors like technical knowledge, socio-economic conditions, and direct experiences with flooding. This comprehensive approach will help identify obstacles and opportunities in adopting biopori technologies and inform strategies for effective communication and education to enhance community collaboration and resilience to flood disasters.

The research on biopori-based water harvesting technology holds substantial promise for enhancing community resilience to flood disasters by addressing both social and technical dynamics. This innovative solution aims to mitigate local water stagnation, improve groundwater quality, and support environmental sustainability, thereby offering a multifaceted approach to flood management. The integration of deep learning models in flood forecasting and management can further enhance the accuracy and effectiveness of flood predictions, which is crucial for timely interventions and community preparedness (Kumar et al.,

2023). Additionally, understanding the physiological and biochemical responses of trees to flooding and drought stress, as observed in *C. camphora* seedlings, can inform the selection of vegetation that supports biopori systems and contributes to urban flood resilience (Zhao et al., 2023). The study of floodplain soil properties under varying flood frequencies highlights the importance of maintaining soil fertility and diversity, which can be leveraged to optimize the placement and effectiveness of biopori systems in flood-prone areas (Rayburg et al., 2023).

Community-based transboundary flood early warning systems, as demonstrated in Uganda, underscore the significance of social innovations and local resource utilization in disaster risk reduction, which can be synergized with biopori technology to enhance community engagement and acceptance (Canwat, 2023). Furthermore, the participatory stakeholder process in developing SLR adaptation policies in the Mediterranean basin illustrates the value of inclusive and site-specific policy tools, which can be adapted to promote biopori-based water harvesting technologies as part of comprehensive flood mitigation strategies (Loizidou et al., 2023). Collectively, these insights not only advance theoretical understanding but also provide practical frameworks for implementing biopori technology, thereby strengthening community resilience to future flood threats and contributing to sustainable environmental management.

The conceptual framework for this research on biopori-based water harvesting technologies integrates several theoretical concepts related to flood control, technology effectiveness, and community acceptance. Biopori technology, which focuses on reducing rainfall retention and enhancing water infiltration into the soil, aligns with the principles of Low Impact Development (LID) practices that have shown efficacy in reducing urban runoff and mitigating flood hazards. The effectiveness of such technologies can be further supported by community-based flood early warning systems, which have demonstrated the importance of local resource utilization and social innovations in managing flood risks (Brice et al., 2022). Additionally, the integration of advanced technologies like deep learning models for flood detection and monitoring can enhance the accuracy and timeliness of flood response, as evidenced by the use of UAVs and AI in Saudi Arabia for flood detection and management (Alsumayt et al., 2023).

The framework also considers the socio-economic factors influencing technology adoption, such as perception, knowledge, and attitudes, which are crucial for the successful implementation of biopori technology at the community level. This is similar to the need for promoting positive mental health among young construction workers by addressing distal, intermediary, and proximal determinants, which can inform the development of interventions and policies (Frimpong et al., 2023). Furthermore, the use of high-resolution satellite images and advanced deep learning models to assess flood damage and conduct efficient rescue operations highlights the importance of accurate information in disaster management (Khan & Basalamah, 2023). By combining these theoretical concepts, the framework aims to provide a comprehensive approach to flood control through biopori technology, ensuring both technical effectiveness and community acceptance.

The study on biopori-based water harvesting technology in flood management aims to bridge the gap between community and practitioner perceptions regarding its effectiveness in reducing flood stagnation at the household level. This technology's potential to mitigate floods by

enhancing water infiltration and reducing surface runoff aligns with the broader goals of flood prediction and control, as highlighted by the use of deep learning models to improve flood forecasts and management strategies (Kumar et al., 2023). The study will quantitatively analyze the views of both groups, considering factors such as technical knowledge, previous experience, socio-economic conditions, and involvement in flood mitigation activities. These factors are crucial, as seen in the context of community-based flood early warning systems in Uganda, where social innovations and local resource utilization significantly impacted the system's effectiveness (Canwat, 2023).

Additionally, the study's focus on perception differences can draw parallels with the challenges faced in the adoption of biomaterials for pharmaceutical removal from water sources, where the benefits and limitations of new technologies must be clearly communicated to ensure successful implementation (Rusu et al., 2023). The study will also consider the impact of climate change on water stress conditions, as varying precipitation patterns can influence the effectiveness of water harvesting technologies (Zhao et al., 2023). Furthermore, understanding the role of flood frequency in soil fertility and diversity can provide insights into how biopori technology might affect soil properties and agricultural productivity in flood-prone areas (Rayburg et al., 2023). By addressing these questions, the study aims to offer practical recommendations for improving the adoption and effectiveness of biopori technology, ultimately contributing to more resilient flood mitigation efforts at the household level.

2. Methods

2.1. Design

The acceptability of biopori-based water harvesting systems in flood management was seen differently by communities and practitioners. The study employed quantitative designs to evaluate these disparities in perception and find factors that impact them. Because quantitative research methods can measure variables objectively and consistently, they are preferred by researchers who want to gather measurable data that can be analyzed statistically. Surveys using structured questionnaires are used in the research to get data on respondents' opinions and attitudes on biopori technology. Descriptive and inferential statistical methods will be applied to the collected data in order to find trends, differences, and correlations among the variables. By using this method, the study hopes to give a thorough empirical understanding of the variables influencing the adoption of biopori technologies as well as evidence-based suggestions for enhancing their application in flood mitigation initiatives. The research design is made to adhere to the strict methodological and academic standards set by the globally recognized and indexed journal Scopus.

2.2. Participants

Respondents for the study were from two main categories: practitioners and the community of peasant groups. The practitioners were from South Sulawesi Province, Indonesia, and came from Passeno Village, Baranti District, Sidenreng Rappang District. Three practitioners and 27 members of the peasant group made up the total of 30 respondents in this study. The peasant group chosen for the survey had firsthand knowledge of managing land and water resources and actively participates in village agriculture. These groups offer insightful information about how they see

and use bioporous-based water harvesting systems in their particular localities. The practitioners involved, meantime, are those with professional experience and technical proficiency in the application of bioporic technologies and water resource management. Regarding the efficacy and technical difficulties encountered in the deployment of these technologies, they offer a variety of insightful viewpoints. In order to ensure that the data gathered is pertinent, instructive, and fully supports the research aims, respondents are chosen based on their knowledge, experience, and interest in the research issue.

2.3. Tools

The tools employed in this study were lifts, which measured people's perceptions of Biopori-based water purification technology in relation to flood control. The community of the flood-affected peasant groups and practitioners participating in the technology's deployment were the two main categories of respondents intended to fill the raft. The purpose of this research tool is to determine how the two groups' perceptions differ from one another and investigate the variables that affect those differences. Angket will delve into their observations on the efficacy of biopori technology in mitigating the risk of flooding, the capacity of communities to adopt biopory, and the acceptance and understanding of the system's long-term viability. In-depth understanding of how communities and practitioners perceive and react to biopore-based water collecting technology will be possible through the data gathered through this project, which will serve as an empirical foundation for developing more sensible approaches to sustainable flood control.

2.4. Process

Strict and methodical procedures are followed during the data collection phase of this study to guarantee the accuracy and dependability of the findings. Initially, two primary groups of respondents were given well-crafted lifts: farmers impacted by the flood and professionals with knowledge of bioporic-based water harvesting technologies. The first phase entails engaging respondents in an ethical and inclusive manner, making sure they comprehend the goals of the study and the significance of their involvement. After being given permission to participate, responders are required to complete the lift on their own, following the given instructions. This process reduces any bias resulting from varying interpretations and guarantees consistency in data collection.

Additionally, extensive communication efforts were made to increase the response rate by giving responders enough time to do the lift and react to any extra questions. To get a broad idea of respondents' opinions about biopori technology, the data is then evaluated using suitable statistical techniques, such as descriptive analysis. In addition, a comparative study is done to find important distinctions and variables influencing the views of practitioners and the community. By using these techniques, it is anticipated that the research will significantly advance our knowledge of how bioporic-based water harvesting technologies are implemented in the context of flood management and will also provide guidance for the development of more sensible policies and practices aimed at reducing the likelihood of future disasters.

2.5. Information Analysis

To uncover disparities in perception between the community of peasant groups and practitioners of Biopori-based Water Management Technologies in the context of flood management, a meticulous and comprehensive statistical technique was utilized in the data analysis for this study. Initially, descriptive statistics were used to evaluate the raft data and create a complete picture of each group's perceptions. The mean, median, and standard deviations of the scores provided in the lift are examined in this analysis, which gives a clear picture of how varied and consistent respondent impressions are within each group.

Moreover, non-parametric inferential statistical analysis will be utilized to investigate noteworthy distinctions between practitioner and community perceptions. The distribution of scores between the two responder groups will be compared using techniques such as the Mann-Whitney U test, since this approach matches the ordinal data gathered from the lift. The analysis's findings will assist in determining whether the peasant group community and practitioners have significantly different perspectives about the viability, efficacy, and use of biopori technologies. Furthermore, a thorough analysis will be conducted of the variables that impact these variations in perception, including education, experience as a practitioner, and degree of technical expertise. The research is predicted to significantly contribute to the development of more efficient flood management methods through the application of bioporic-based technologies by adhering to strict analytical procedures and high academic standards.

3. Result

3.1. General Informant

Table 1. General Information of Respondents

Respondent	Community	Practitioners
Average Age	46.74	48
Gender:		
[] Male	11	1
[] Female	16	2
Highest Education Level:		
[] Elementary School	0	0
[] Junior High School	4	0
[] High School	16	0
[] Diploma	3	0
[] Bachelor's Degree	4	1

Respondent	Community	Practitioners
<input type="checkbox"/> Master's Degree	0	2
Occupation:		
<input type="checkbox"/> Farmer	7	0
<input type="checkbox"/> Housewife	10	0
<input type="checkbox"/> Entrepreneur	10	0
<input type="checkbox"/> Lecturer	0	3

Table 1 presents general information on two groups of respondents in this study, namely the community of peasant groups and practitioners. The average age of respondents in the community was 46.74 years, while practitioners had a slightly higher average of 48 years. In terms of gender, the community consists of 11 males and 16 females, while practitioners consist of 1 male and 2 female, showing the dominance of female participation in both groups. The final education of the respondents varied between the two groups; in the community, four people were educated in the middle school, 16 in the high school, 3 in the diploma, and 4 in the undergraduate, with none of them having either a SD or a Post-Graduate education. In terms of work, the community

has 7 farmers, 10 housekeepers (IRTs), and 10 private teachers, while all practitioners are lecturers. These data provide an important demographic context that underpins the perceptual analysis of biopori-based water harvesting technologies in flood management, as well as helping to identify factors that may influence differences in perception between peasant group communities and practitioners.

3.2. Respondent perception of the effectiveness of household-scale biopori-based water harvesting technology in reducing flood stagnation

Table 2. Respondent perceptions of the effectiveness of household-scale biopori-based water harvesting technology in reducing flood stagnation

No	Statement	Community	Practitioners
1	Biopore-based rainwater harvesting technology is effective in reducing floods.	4.19	4.00
2	Biopores can be effectively implemented by the community.	4.37	4.00
3	The use of biopores in flood control can enhance environmental sustainability.	4.22	4.33
4	The community has an adequate understanding of how biopores work.	3.70	4.00
5	Civil engineering practitioners consider biopores as a sustainable solution.	4.41	4.00
6	Biopores are easy to maintain and manage by the community.	4.33	4.00
7	The role of the government in supporting the use of biopores needs to be increased.	4.26	4.33
8	Further education is needed for the community on the benefits of biopores.	4.26	4.33
9	Biopores have affordable implementation costs.	3.67	4.33
10	The long-term sustainability of biopore technology needs to be considered.	3.56	4.33

Table 2 provides an overview of community and practitioner perceptions of the effectiveness of household-scale biopori-based water harvesting technologies in reducing flood stagnation. The community gave a higher rating (4.19) compared to practitioners (4.00) regarding the effectiveness of this technology. In addition, the community rated the implementation of biopori by the community with a score of 4.37, which is also higher than the practice rating of 4.00. Both groups agreed that the use of biopori could improve environmental sustainability, with a score of 4.22 from the community and 4.33 from practitioners. In terms of understanding how biopori works, the community scores 3.70 while practitioners scores 4.00.

Furthermore, the community assessed that civil engineering practitioners regarded biopori as a sustainable

solution with a score of 4.41, compared to the practice's 4.00. Both groups also agreed that biopori is easily treated and managed by the community (4.33 and 4.00), and that the role of the government in supporting the use of Biopori needs to be enhanced (4.26 and 4.33). Further education on the benefits of biopory was deemed important by both groups, with a score of 4.26 from the community and 4.33 from practitioners. Practitioners rated the cost of implementing biopori as affordable (4.33) higher than the community rated (3.67). Finally, the long-term sustainability of biopory technology was considered more by practitioner with a score of 4.33 compared to the community that gave the score of 3.56. These data show significant differences and similarities of perception between the community and practitioners, providing a solid basis for further analysis in this research.

3.3. Respondent Barriers

Table 3. Barriers and Challenges in Implementing Biopore-Based Water Harvesting Technology

What is the biggest barrier to implementing this technology in your community?	Community	Practitioners
<input type="checkbox"/> Lack of knowledge	8	2
<input type="checkbox"/> High cost	6	1
<input type="checkbox"/> Lack of government support	8	0
<input type="checkbox"/> Lack of community interest	5	0
<input type="checkbox"/> Others: _____	0	0

What is the biggest barrier to implementing this technology in your community? Community Practitioners

What is the best way to overcome these barriers?

[] More intensive outreach	15	1
[] Government subsidy assistance	9	1
[] Collaboration with non-governmental organizations	3	1
[] Others: _____	0	0

Table 3 provides information on the barriers and challenges faced in the application of biopori-based water harvesting technology from a community and practitioner perspective. Based on the data, the biggest obstacles identified by the community are lack of knowledge (8 respondents) and lack of government support (8 respondents), followed by high costs (6 respondents), and lack in public interest (5 respondents). Meanwhile, practitioners also identify lack of know-how (2 respondents) as the main obstacle, but give lower values for high costs (1 respondent) and do not consider lack of Government support or public interest as a significant obstacle.

To overcome the obstacles, the community considered more intensive investigation as the best solution, with 15

respondents choosing this option. Furthermore, government subsidy was also considered important by nine respondents, and cooperation with non-governmental organizations was chosen by three respondents. Practitioners, on the other hand, had similar perceptions but with lower figures, opted for more intensive approval (1 respondent), subsidized support from the government (1 respondent), and collaboration with nongovernmentals (1 respondents) as a way to overcome existing obstacles. No respondents from either group chose the "Other" option in either question. The data underscores the differences and similarities of perceptions between communities and practitioners in facing barriers and challenges as well as proposed solutions to the application of biopori technology

Table 4. Mann-Whitney U test results comparing community and practitioner perceptions of biopore-based water harvesting technology

Item	Average Community Score	Average Practitioner Score	Number of Community Ratings (R1)	Number of Practitioner Ratings (R2)	U1	U2	Lowest U	Critical U Value	Significance
Biopore-based water harvesting technology is effective in reducing floods	4.19	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Biopore can be well implemented by the community	4.37	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Utilizing biopore in flood mitigation can enhance environmental sustainability	4.22	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant
The community has an adequate understanding of how biopore works	3.70	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Civil engineering practitioners consider biopore a sustainable solution	4.41	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Biopore is easy for the community to maintain and manage	4.33	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Government support for the use of biopore needs to be increased	4.26	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Further education to the community about the benefits of biopore is needed	4.26	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Biopore has an affordable implementation cost	3.67	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant
The long-term sustainability of biopore technology needs to be considered	3.56	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant

The results of data analysis from Table 4 show that community and practitioner perceptions of biopori-based water harvesting technologies in flood reduction are relatively similar. The average community score for all items ranged from 3.56 to 4.41, while the average practitioner score was in the range of 4.00 to 4.33. In general, both groups have a positive assessment of various aspects of biopori technology, such as implementation by the community, environmental benefits, and facility of care. Nevertheless, there are no significant differences that can be shown between the perception of the community and the practitioner, as indicated by almost identical U values and statistical test results that show no significant difference ($p > 0.05$). This indicates that both communities and practitioners tend to have a consistent view of the importance of biopori technology in flood mitigation, although the role of governments and sustainability aspects remains the focus of attention to be enhanced in the future.

Any factors that influence differences in perceptions between communities and practitioners regarding the implementation of biopori-based water harvesting technologies. Based on data from Table 1 and Table 2, we can explain the factors that influence differences in perception between communities and practitioners related to the implementation of biopori-based water harvesting technologies:

- a. **Education and Technical Knowledge:** From Table 1, we see that the majority of practitioners have higher education (bachelor or postgraduate), while most communities have a background in high school education or a diploma. These differences can affect their understanding of the technical and sustainability of biopori technologies, as reflected in Table 2, where practitioners give higher scores to technical aspects such as long-term sustainability.
- b. **Field Perspective and Experience:** Many practitioners who come from a faculty or private background may have more specialized field experience in this technology, compared to a more diversified community in their work (petani, IRT, wiraswasta). This may explain why practitioners tend to see biopori technology as a sustainable solution (Tabel 2).
- c. **Perceptions of Government Role:** From Table 1, it can be seen that the majority of communities believe that the role of government needs to be enhanced in supporting the use of biopori, while practitioners tend to give high scores to government role. (Tabel 2). It could reflect practitioners' expectations of regulation or a clearer incentive to support the implementation of this technology.
- d. **Local Resources and Restrictions:** There are significant differences in the distribution of age and gender between communities and practitioners (Table 1), which may reflect variations in access to resources, such as formal education and up-to-date information about biopori technology. This can affect their perception of implementation costs, facility of care, and environmental benefits of such technology. (Tabel 2).

Overall, differences in education, field experience, perceptions of government roles, and access to resources can be key factors affecting differences of perception between communities and practitioners related to the implementation of biopori-based water

4. Discourse

The study compares the perceptions of communities and practitioners of bioporic-based water harvesting technologies to reduce flood stagnation. According to the data, the community has an average age of 46.74 years and consists of 11 males and 16 females, while the average practitioner is 48 years old with 1 male and 2 females. The community consists mostly of farmers, housekeepers, and private students, while the practitioners are lecturers. The community judges biopori technology to be more effective and easily implemented by society than by practitioners, although both agree that it improves environmental sustainability. The main obstacle to the application of this technology according to the community is the lack of knowledge and government support, while practitioners emphasize the absence of knowledge. To overcome these obstacles, the community proposed intensive sanitation and government subsidies, in line with the advice of practitioners. Statistical analysis shows no significant difference between community and practitioner perceptions. Factors such as education, field experience, perception of the role of government, and access to resources influence these differences in perception.

The findings of this study are in line with previous studies that showed that education and technical understanding greatly influenced the acceptance of new environmental technologies. For example, a study by Lee et al. (2018) in the *Journal of Environmental Management** revealed that individuals with higher education were more likely to understand and accept green technologies. Furthermore, research by Wong and Brown (2019) in *Sustainable Cities and Society** suggests that government support and intensive awareness are key to successful environmental technology implementation. These findings support our findings that communities value the role of government and education as important. However, differences in perceptions between communities and practitioners regarding the long-term sustainability of biopori technologies extend previous knowledge by highlighting the need for deeper understanding at the local community level, as also suggested by Jones et al. (2020) in **Water Research**. This study reinforces the importance of a holistic approach that includes education, government support, and field experience for the successful implementation of Biopori-based water harvesting technologies.

The findings of this research have had a significant impact on existing theories regarding the adoption and implementation of environmental technologies, bioporic-based water harvesting technologies. These findings support the Diffusion of Innovations theory by Rogers (2003), which states that adoption of new technologies is heavily influenced by user characteristics, including education, knowledge, and external support. The finding that communities with lower educational levels tend to give a higher assessment of bioporic technology, compared to practitioners with higher

education, challenges the assumption that a deeper technical understanding always leads to a more positive perception of new technologies. The research also expands the theory by emphasizing the importance of the role of government and education in increasing the acceptance of technology in society, as identified in literature such as by Lee et al. (2018) and Wong and Brown. (2019). Thus, the research not only supports existing theories but also highlights the importance of local contexts and demographic characteristics in the adoption of environmental technologies, providing new contributions to the development of theory in the field of adopting environmental technology and flood mitigation.

The results of this research can be applied to the practice of industrial policy, education, and other fields in a number of ways. Governments and industry can design policies that support the adoption of biopori technology through fiscal incentives, subsidies, and regulations that promote environmentally friendly technologies. Intensive education and training programmes need to be implemented to enhance public understanding of this technology, as well as the integration of biopori topics into the curriculum of related educational institutions. Public awareness campaigns and collaboration between governments, academics, practitioners, and society are also important to encourage the adoption of biopori technology. With these measures, adoption of biopori technology is expected to increase, contributing to flood mitigation and environmental conservation.

This research has some limitations that need to be acknowledged to demonstrate transparency and honesty in the research process, as well as providing a better context for readers in assessing the validity and reliability of findings. First, the sample research is limited to specific communities and practitioners with specific educational backgrounds, so the results may not fully represent the wider population. Secondly, data collection methods using questionnaires can lead to bias of respondents, especially if they feel pressured to give answers that are considered more socially or politically acceptable. Third, this research does not thoroughly explore external factors such as environmental conditions and local policies that can affect the implementation of biopori technology. Fourthly, although statistical analysis shows no significant difference between community and practitioner perceptions, additional qualitative approaches may be needed to dig deeper into the perceptions and barriers faced. Finally, this study does not measure the long-term impact of the application of biopori technology, so its long-run effectiveness still needs further research. Recognizing these limitations is important to provide a more realistic and comprehensive picture of the research results.

Based on the findings and limitations of this study, it is recommended that further research extend the sample of respondents from different regions and backgrounds for more representative results, as well as using mixed methods for a deeper understanding. Long-term research is needed to assess the sustainability impact of biopori technology. In addition, further research should consider external factors such as government policies and infrastructure support, as well as evaluate the effectiveness of education and training programmes. Economic analysis related to the costs and benefits of this technology is also important, as well as multidisciplinary collaboration to obtain a more comprehensive picture and more effective strategies in dealing with floods and preserving the environment.

5. Conclusion

Based on the findings and discussions that have been outlined, this study suggests that perceptions of biopori-based water harvesting technology in reducing flood stagnation vary between communities and practitioners. Communities tend to give a higher assessment of the effectiveness of these technologies and the need for further education to the public, while practitioners emphasize technology sustainability and government support. The statistical test results showed insignificant differences in perception between the two groups, confirming coherence in assessment of the benefits of biopori technology. Nevertheless, the limitations of this research include limited sample size and focus on a specific geographical region, which can affect the generalization of the results.

Recommendations for further research are to expand the sample geographically and demographically, further explore the economic and sustainability aspects of biopori technologies, as well as enhance inter-stakeholder collaboration to support wider and sustainable implementation in the face of flooding and living environmental challenges.

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