



**SURAT TUGAS**

Nomor : 0169.a/FAPETRIK/TGS/II.3.AU/D/2025

***Assalamu'alaikum Warahmatullahi Wabarakatuh***

Segala puji kita panjatkan kehadirat Allah SWT. Semoga segala aktifitas keseharian kita mendapat rahmat dan bernilai ibadah di sisi-nya. Amin.

Dalam rangka mendukung pelaksanaan kegiatan Penelitian/Pengabdian kepada Masyarakat dosen Fakultas Pertanian, Peternakan dan Perikanan Universitas Muhammadiyah Parepare, maka dipandang perlu melibatkan mahasiswa sebagai bagian dari penguatan pengalaman akademik, praktis, dan kontekstual mahasiswa dalam implementasi tridarma perguruan tinggi.

Mahasiswa yang dilibatkan dalam kegiatan ini diharapkan dapat berpartisipasi secara aktif, disiplin, bertanggung jawab, serta menjaga nama baik fakultas dan universitas selama pelaksanaan kegiatan. Bentuk keterlibatan mahasiswa disesuaikan dengan kebutuhan kegiatan, antara lain membantu persiapan pelaksanaan kegiatan, pengumpulan data, dokumentasi, pendampingan masyarakat/mitra, pengolahan data sederhana, penyusunan administrasi kegiatan, serta tugas-tugas lain yang relevan sesuai arahan dosen pelaksana. Adapun daftar nama mahasiswa *terlampir*.

Demikian surat tugas ini diberikan kepada yang bersangkutan untuk dilaksanakan sebagaimana amanah yang diberikan.

***Wabillahi Taufiq Walhidayah.***

***Wassalamu'alaikum Warahmatullahi Wabarakatuh.***

Parepare, 15 April 2025

Dekan,



**Dr. Sukmawati, S.P., M.P.**  
**NBM. 1175 442**

1. Wakil Dekan FAPETRIK UMPAR
2. Ketua Program Studi
3. Arsip



# FAKULTAS PERTANIAN, PETERNAKAN DAN PERIKANAN

## UNIVERSITAS MUHAMMADIYAH PAREPARE

Alamat : Jl. Jend. Ahmad Yani Km. 6 Telp. (0421) 22757 Fax. (0421) 25524 - Parepare, Email : [faktan@plasa.com](mailto:faktan@plasa.com)

| No | NIM       | Nama Mahasiswa | Program Studi | Semester | Jenis Kegiatan                                                                                                     | Mata Kuliah yang Dikonversi             | Jumlah SKS | Dosen               |
|----|-----------|----------------|---------------|----------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------|---------------------|
| 1  | 220170007 | Nusul Riadi    | Agribisnis    | 5        | Perubahan Iklim dan Dinamika Risiko Produksi Usahatani Sayuran di Kabupaten Enrekang: Kajian Adaptasi dan Mitigasi | Pengembangan Kawasan Agribisnis         | 3          | Dr. Nurhapsa, M.Si. |
|    |           |                |               |          |                                                                                                                    | Manajemen Kelompok Tani dan Kelembagaan | 3          |                     |
|    |           |                |               |          |                                                                                                                    | Manajemen Strategi Agribisnis           | 2          |                     |



**PROTEKSI ISI LAPORAN AKHIR PENELITIAN FUNDAMENTAL - REGULER**

Dilarang menyalin, menyimpan, memperbanyak sebagian atau seluruh isi proposal ini dalam bentuk apapun kecuali oleh pengusul dan pengelola administrasi penelitian dan pengabdian kepada masyarakat

**LAPORAN AKHIR**

**1. JUDUL PENELITIAN**

Perubahan iklim dan dinamika risiko produksi usahatani sayuran di Kabupaten Enrekang: Kajian adaptasi dan mitigasi

| Bidang Fokus | Tema                                       | Topik (jika ada)                      | Prioritas Riset   |
|--------------|--------------------------------------------|---------------------------------------|-------------------|
| Pangan       | Teknologi Ketahanan dan Kemandirian Pangan | Pengembangan produk pangan fungsional | Swasembada pangan |

| Rumpun Ilmu Level 1 | Rumpun Ilmu Level 2 | Rumpun Ilmu Level 3                      |
|---------------------|---------------------|------------------------------------------|
| ILMU EKONOMI        | ILMU EKONOMI        | Bidang Ekonomi Lain Yang Belum Tercantum |

| Skema Penelitian                 | Strata (Dasar/Terapan/Pengembangan) | Nilai SBK   | Target Akhir TKT | Lama Kegiatan |
|----------------------------------|-------------------------------------|-------------|------------------|---------------|
| Penelitian Fundamental - Reguler | Riset Dasar                         | 150.000.000 | 2                | 1 Tahun       |

**2. IDENTITAS PENGUSUL**

| Nama, Peran                                                                           | Jenis | Program Studi/Bagian | Bidang Tugas                                                                                                                                                                                                                                                                                      | ID Sinta                |
|---------------------------------------------------------------------------------------|-------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| NURHAPSA<br>0912106901<br><br>Ketua Pengusul<br>Universitas Muhammadiyah<br>Pare-pare | Dosen | Agribisnis           | Melakukan koordinasi dalam pelaksanaan penelitian, bersama tim menyusun instrumen penelitian, analisis data, memvalidasi dan sinkronisasi data hasil penelitian, serta menyusun laporan kemajuan dan laporan akhir pelaksanaan penelitian, menyusun luaran wajib dan luaran tambahan bersama tim. | <a href="#">5974432</a> |
| RAHMAWATI<br>0925097901<br><br>Anggota<br>Universitas Muhammadiyah<br>Pare-pare       | Dosen | Teknik Sipil         | Mendesain instrumen, melakukan klasifikasi dan tabulasi data, mengkoordinasikan penelitian bersama lembaga-lembaga/ instansi terkait dalam penelitian, serta menyusun artikel publikasi bersama tim, dan pengelolaan keuangan.                                                                    | <a href="#">6020825</a> |
| SITTI NURANI SIRAJUDDIN<br>0021047114<br><br>Anggota<br>Universitas Hasanuddin        | Dosen | Agribisnis           | Mengkoordinasikan penelitian bersama dengan tenaga lapangan, bertanggungjawab atas jalannya penelitian di lapangan, termasuk koordinasi dengan mahasiswa dan tim teknis yang terlibat.                                                                                                            | <a href="#">6005354</a> |

### 3. MITRA KERJASAMA PENELITIAN (Jika Ada)

Pelaksanaan penelitian dapat melibatkan mitra kerjasama yaitu mitra kerjasama dalam melaksanakan penelitian, mitra sebagai calon pengguna hasil penelitian, atau mitra investor

| Mitra | Nama Mitra | Dana |
|-------|------------|------|
|-------|------------|------|

### 4. LUARAN DAN TARGET CAPAIAN

#### Luaran Wajib

| Tahun Luaran | Kategori Luaran   | Jenis Luaran                               | Status target capaian | Keterangan                                                                                                                                                                                                                      |
|--------------|-------------------|--------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | Artikel di Jurnal | Artikel di Jurnal Bereputasi Internasional | Accepted/Published    | <a href="https://jgiass.com/journal-of-global-innovations-in-agriculture-sciences">https://jgiass.com/journal-of-global-innovations-in-agriculture-sciences</a> , Society for Innovative Agriculture, University of Agriculture |

### 5. ANGGARAN

Rencana Anggaran Biaya penelitian mengacu pada PMK dan buku Panduan Penelitian dan Pengabdian kepada Masyarakat yang berlaku.

**Total RAB 1 Tahun Rp 67.550.000,00**

**Tahun 1 Total Rp 67.550.000,00**

| Kelompok                                    | Komponen                           | Item                                      | Satuan           | Vol. | Biaya Satuan | Total     |
|---------------------------------------------|------------------------------------|-------------------------------------------|------------------|------|--------------|-----------|
| Analisis Data                               | HR Pengolah Data                   | Pengolah data (2 orang )                  | P (penelitian n) | 2    | 1.000.000    | 2.000.000 |
| Bahan                                       | ATK                                | Isi ulang pensil merek kenko (unit)       | Paket            | 1    | 15.000       | 15.000    |
| Bahan                                       | ATK                                | Map plastik transparan (buah)             | Paket            | 5    | 2.500        | 12.500    |
| Bahan                                       | ATK                                | Pulpen frester                            | Paket            | 1    | 35.000       | 35.000    |
| Bahan                                       | ATK                                | Penghapus pensil (dos)                    | Paket            | 1    | 15.000       | 15.000    |
| Bahan                                       | ATK                                | Pensil merek Joyko                        | Paket            | 5    | 5.000        | 25.000    |
| Bahan                                       | ATK                                | Papan alas                                | Paket            | 4    | 15.000       | 60.000    |
| Bahan                                       | ATK                                | Spidol Snowman (dos)                      | Paket            | 1    | 25.000       | 25.000    |
| Bahan                                       | Bahan Penelitian (Habis Pakai)     | Foto kopi dokumen pendukung penelitian    | Unit             | 150  | 500          | 75.000    |
| Bahan                                       | Bahan Penelitian (Habis Pakai)     | Foto kopi kuesioner                       | Unit             | 150  | 500          | 75.000    |
| Bahan                                       | Bahan Penelitian (Habis Pakai)     | Kertas A4                                 | Unit             | 2    | 50.000       | 100.000   |
| Bahan                                       | Bahan Penelitian (Habis Pakai)     | Kertas F4                                 | Unit             | 1    | 55.000       | 55.000    |
| Bahan                                       | Bahan Penelitian (Habis Pakai)     | Spanduk kegiatan                          | Unit             | 2    | 150.000      | 300.000   |
| Bahan                                       | Bahan Penelitian (Habis Pakai)     | Tinta printer epson L3110 ( 1 set)        | Unit             | 1    | 300.000      | 300.000   |
| Pelaporan Hasil Penelitian dan Luaran Wajib | Biaya pembuatan dokumen uji produk | Biaya penyusunan laporan akhir penelitian | Paket            | 1    | 2.000.000    | 2.000.000 |

| Kelompok                                    | Komponen                                                   | Item                                                                 | Satuan    | Vol. | Biaya Satuan | Total      |
|---------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------------|-----------|------|--------------|------------|
| Pelaporan Hasil Penelitian dan Luaran Wajib | Biaya Pendaftaran KI                                       | Biaya pendaftaran KI                                                 | Paket     | 1    | 400.000      | 400.000    |
| Pelaporan Hasil Penelitian dan Luaran Wajib | Biaya pembuatan dokumen uji produk                         | Biaya registrasi seminar nasional (2 orang)                          | Paket     | 2    | 1.750.000    | 3.500.000  |
| Pelaporan Hasil Penelitian dan Luaran Wajib | Biaya pembuatan dokumen uji produk                         | Biaya proofreading artikel                                           | Paket     | 1    | 2.532.500    | 2.532.500  |
| Pelaporan Hasil Penelitian dan Luaran Wajib | Biaya pembuatan dokumen uji produk                         | Biaya penyusunan laporan kemajuan penelitian                         | Paket     | 1    | 2.000.000    | 2.000.000  |
| Pengumpulan Data                            | Biaya konsumsi                                             | Konsumsi kegiatan FGD (2 x 15 Org)                                   | OH        | 30   | 42.500       | 1.275.000  |
| Pelaporan Hasil Penelitian dan Luaran Wajib | Biaya konsumsi rapat                                       | Konsumsi rapat/ pertemuan                                            | OH        | 25   | 75.000       | 1.875.000  |
| Pengumpulan Data                            | Biaya konsumsi                                             | Konsumsi pengumpulan data (5 orang x 10 hari)                        | OH        | 50   | 100.000      | 5.000.000  |
| Pelaporan Hasil Penelitian dan Luaran Wajib | Biaya Publikasi artikel di Jurnal Bereputasi Internasional | Publikasi artikel                                                    | Paket     | 1    | 10.000.000   | 10.000.000 |
| Pengumpulan Data                            | HR Pembantu Peneliti                                       | Dokumentasi penelitian (1 orang)                                     | OJ        | 10   | 25.000       | 250.000    |
| Pengumpulan Data                            | HR Pembantu Peneliti                                       | Enumerator : pengumpulan data di lapangan (3 orang)                  | OJ        | 150  | 45.000       | 6.750.000  |
| Pengumpulan Data                            | HR Petugas Survei                                          | Entry data dan analisis data (3 orang x 5 kegiatan)                  | OH/OR     | 15   | 75.000       | 1.125.000  |
| Pengumpulan Data                            | Penginapan                                                 | Penginapan                                                           | OH        | 2    | 1.000.000    | 2.000.000  |
| Pengumpulan Data                            | Penginapan                                                 | Sewa penginapan : 4 kamar                                            | OH        | 10   | 600.000      | 6.000.000  |
| Pengumpulan Data                            | Transport                                                  | Transport lokal pembantu lapangan (3 orang)                          | OK (kali) | 10   | 75.000       | 750.000    |
| Pengumpulan Data                            | Tiket                                                      | Tiket mengikuti seminar nasional (2 orang)                           | OK (kali) | 2    | 2.500.000    | 5.000.000  |
| Pelaporan Hasil Penelitian dan Luaran Wajib | Uang harian rapat di luar kantor                           | Kegiatan rapat di luar kantor/pertemuan tim (3 orang x 5 kegiatan)   | OH        | 15   | 100.000      | 1.500.000  |
| Pengumpulan Data                            | Uang Harian                                                | Uang harian rapat / pertemuan di luar kantor (5 orang x 5 pertemuan) | OH        | 25   | 100.000      | 2.500.000  |
| Sewa Peralatan                              | Kendaraan                                                  | Sewa kendaraan +BBM                                                  | OK (kali) | 10   | 650.000      | 6.500.000  |
| Sewa Peralatan                              | Peralatan penelitian                                       | Sewa kamera dan peralatan pendukung penelitian (hari)                | Unit      | 10   | 150.000      | 1.500.000  |
| Sewa Peralatan                              | Ruang penunjang penelitian                                 | Sewa ruangan untuk FGD                                               | Unit      | 2    | 1.000.000    | 2.000.000  |

\*. KEMAJUAN PENELITIAN

## **A. RINGKASAN**

Perubahan iklim yang ditandai dengan pergeseran pola hujan, peningkatan suhu, serta frekuensi kejadian iklim ekstrem seperti kekeringan, banjir, dan angin kencang berdampak signifikan terhadap produksi tanaman sayuran. Penelitian ini bertujuan untuk menganalisis risiko produksi dan strategi mitigasi serta adaptasi yang dilakukan petani sayuran dalam menghadapi risiko iklim di Kabupaten Enrekang, Sulawesi Selatan. Penelitian dilaksanakan di Kecamatan Anggeraja dan Kecamatan Alla dengan jumlah sampel sebanyak 70 petani yang dipilih secara acak sederhana. Data diperoleh melalui observasi, wawancara, FGD, dan dokumentasi, kemudian dianalisis menggunakan distribusi frekuensi. Hasil penelitian menunjukkan bahwa strategi mitigasi utama yang diterapkan petani meliputi penggunaan varietas tahan iklim (35,71%), perubahan jadwal tanam (14,23%), serta kombinasi penggunaan varietas tahan iklim dengan pupuk dan pestisida sesuai anjuran (34,29%). Sementara itu, strategi adaptasi dilakukan melalui penggunaan bibit tahan iklim (32,86%), diversifikasi tanaman (14,29%), penanaman berbagai jenis tanaman dalam satu lahan (11,43%), serta kombinasi bibit tahan iklim dengan pola tanam beragam (41,43%). Selanjutnya hasil analisis risiko produksi usahatani dengan menghitung nilai variance (167.235.74), simpangan baku (4089.44) dan koefisien variasi (0,97) menunjukkan bahwa risiko usahatani sayuran tinggi. Temuan ini mengindikasikan bahwa petani di Kabupaten Enrekang relatif adaptif terhadap perubahan iklim meskipun masih menghadapi keterbatasan teknologi dan sumber daya. Diperlukan dukungan kebijakan, penyuluhan, dan inovasi teknologi berkelanjutan untuk meningkatkan kapasitas petani dalam menjaga keberlanjutan produksi hortikultura di tengah tantangan perubahan iklim.

## **B. KATA KUNCI**

perubahan iklim;risiko produksi;mitigasi;adaptasi;usahatani sayuran  
false

Pengisian poin C sampai dengan poin H mengikuti template berikut dan tidak dibatasi jumlah kata atau halaman namun disarankan ringkas mungkin. Dilarang menghapus/modifikasi template ataupun menghapus penjelasan di setiap poin.

**C. HASIL PELAKSANAAN PENELITIAN:** Tuliskan secara ringkas hasil pelaksanaan penelitian yang telah dicapai sesuai tahun pelaksanaan penelitian. Penyajian meliputi data, hasil analisis, dan capaian luaran (wajib dan atau tambahan). Seluruh hasil atau capaian yang dilaporkan harus berkaitan dengan tahapan pelaksanaan penelitian sebagaimana direncanakan pada proposal. Penyajian data dapat berupa gambar, tabel, grafik, dan sejenisnya, serta analisis didukung dengan sumber pustaka primer yang relevan dan terkini.

Kondisi iklim beberapa tahun terakhir mengalami perubahan yang cukup signifikan. Beberapa tahun terakhir musim kemarau waktunya cukup panjang sementara musim hujan waktunya lebih pendek. Kondisi ini menjadi salah satu tantangan utama dalam sektor pertanian global. Pergeseran pola cuaca, peningkatan suhu, perubahan pola curah hujan, serta frekuensi kejadian iklim ekstrem seperti kekeringan dan banjir semakin sering terjadi. Kondisi ini menyebabkan terjadinya perubahan iklim (climate change). Hal tersebut sangat mempengaruhi produksi dan produktivitas tanaman hortikultura termasuk tanaman sayuran yang sangat bergantung pada kestabilan kondisi lingkungan. Seiring dengan peningkatan populasi dan kebutuhan akan produk hortikultura dalam hal ini adalah berbagai jenis sayuran, tantangan yang dihadapi para petani semakin besar. Dampak dari perubahan iklim ini tidak hanya mengancam ketersediaan pangan, tetapi juga berdampak pada ekonomi pertanian, terutama bagi petani kecil yang memiliki keterbatasan dalam mengakses teknologi adaptasi dan mitigasi iklim. Selain itu, perubahan iklim juga berkontribusi terhadap penurunan pendapatan riil rumah tangga, khususnya rumah tangga petani, pengusaha bidang pertanian, rumah tangga yang memiliki pendapatan rendah di daerah perkotaan. Penelitian ini bertujuan untuk mengkaji strategi adaptasi serta mitigasinya yang dilakukan oleh petani sayuran di Kabupaten Enrekang. Jumlah sampel sebanyak 70 petani sayuran. Adapun karakteristik petani responden ditunjukkan pada Tabel 1.

Tabel 1. Karakteristik Petani Responden Berdasarkan Umur, Tingkat Pendidikan, Pengalaman Usahatani dan Luas Lahan Usahatani.

| No                                | Uraian         | Jumlah    | Persentase (%) |
|-----------------------------------|----------------|-----------|----------------|
| <b>Umur Responden (thn)</b>       |                |           |                |
| 1                                 | 25-40          | 11        | 15,71          |
| 2                                 | 41-60          | 50        | 71,43          |
| 3                                 | >60            | 9         | 12,86          |
|                                   | <b>Total</b>   | <b>70</b> | <b>100</b>     |
| <b>Tingkat Pendidikan</b>         |                |           |                |
| 1                                 | Tidak tamat SD | 3         | 4,3            |
| 2                                 | Tamat SD       | 16        | 22,9           |
| 3                                 | Tamat SMP      | 15        | 21,4           |
| 4                                 | Tamat SMA      | 34        | 48,6           |
| 5                                 | Sarjana        | 2         | 2,9            |
|                                   | <b>Total</b>   | <b>70</b> | <b>100</b>     |
| <b>Pengalaman Usahatani (thn)</b> |                |           |                |
| 1                                 | 1 - 10         | 27        | 38,57          |
| 2                                 | 11 – 20        | 18        | 25,71          |
| 3                                 | 21 – 30        | 14        | 20,00          |
| 4                                 | 31 – 40        | 10        | 14,26          |
| 5                                 | >40            | 1         | 1,43           |
|                                   | <b>Total</b>   | <b>70</b> | <b>100</b>     |
| <b>Luas Lahan Usahatani (ha)</b>  |                |           |                |
| 1                                 | <0,25          | 10        | 14,3           |
| 2                                 | 0,25 – 0,49    | 25        | 35,7           |
| 3                                 | 0,50 – 0,99    | 28        | 40,0           |
| 4                                 | >1,00          | 7         | 10,0           |
|                                   | <b>Total</b>   | <b>70</b> | <b>100</b>     |

Berdasarkan Tabel 1 dapat dijelaskan bahwa rata-rata umur petani adalah 49,6 tahun, serta rentang usia antara 25–73 tahun. Distribusi frekuensi memperlihatkan dominasi kelompok umur paruh baya (45–60 tahun) yang mencapai lebih dari 71,43% responden, sedangkan petani muda (<40 tahun) hanya sekitar 15,71%. Hal ini menunjukkan bahwa sektor pertanian masih didominasi oleh petani yang berusia menengah hingga

berpengalaman, namun namun regenerasi petani muda relatif terbatas. Faktor umur menentukan produktifitas petani dan tingkat adopsi petani terhadap inovasi [1]. Oleh karena itu pentingnya keterlibatan generasi muda dalam pertanian untuk keberlanjutan jangka panjang, yang juga sekaligus menunjukkan perlunya strategi penyuluhan dan kebijakan yang sesuai dengan karakteristik usia petani.

Selanjutnya berdasarkan tingkat pendidikan petani responden dapat dijelaskan bahwa Pada umumnya tingkat pendidikan petani responden tamat SMA (48,6%), tamat SD dan tamat masing-masing 22,9% dan 21,4%. Selebihnya sebesar 5,2% sarjana dan tidak tamat SD. Hasil ini menunjukkan bahwa petani responden memiliki tingkat pendidikan yang cukup memadai sehingga memudahkan untuk menerima dan menerapkan inovasi pada usahatani [2] Tingkat pendidikan petani bawang merah di Kecamatan Anggeraja, Kabupaten Enrekang cukup memadai sehingga petani dengan pendidikan yang cukup memadai relatif lebih mudah menerima inovasi dibanding petani yang berpendidikan lebih rendah. Selain itu, tingkat pendidikan berkorelasi positif terhadap adopsi teknologi pertanian [3]. Dibandingkan gambaran nasional terbaru, proporsi lulusan perguruan tinggi di Indonesia sekitar 10,2% dan SMA  $\pm 30,85\%$ , sedangkan selebihnya adalah yang setara tamat SMP.

Hasil analisis distribusi frekuensi menunjukkan bahwa mayoritas pengalaman usahatani dibawah 20 tahun (64,28%) dan hanya sebagian kecil yang memiliki pengalaman usahatani sekitar 15,69%) yang berpengalaman lebih dari 30 tahun. Pengalaman usahatani yang dimaksud adalah lamanya petani responden berusaha menanam sayuran yang dinyatakan dalam tahun. Pengalaman usahatani merupakan salah satu faktor penentu keberhasilan petani dalam mengelola usahatani. Ada kecenderungan semakin lama seorang petani menggeluti suatu usahatani, maka semakin banyak pengalaman yang diperoleh dan semakin tahu baik buruknya usahatani yang dikelolanya. Sejalan dengan penelitian yang dilakukan [4][5] bahwa petani yang memiliki pengalaman usahatani yang lama memiliki tingkat keterampilan yang tinggi sehingga pengalaman yang dimiliki oleh petani berpengaruh terhadap produksi usahatani hortikultura serta berperan penting dalam mendorong petani untuk mengadopsi teknologi.

Faktor luas lahan usahatani yang dikelola petani juga sangat berperan penting dalam menentukan tingkat kesejahteraan petani serta merupakan salah satu faktor produksi untuk mengelola usahatani. Berdasarkan Tabel 1 dapat dijelaskan bahwa sekitar 50% responden memiliki luas lahan dibawah 0,5 hektar sehingga masih tergolong sebagai petani gurem [6] dan sering berkaitan dengan keterbatasan skala ekonomi, akses alat/mesin dan kebutuhan usahatani lainnya untuk efisiensi penggunaan input. Untuk mengetahui strategi petani responden melakukan mitigasi dan adaptasi terhadap risiko perubahan iklim ditunjukkan pada Tabel 2 dan Tabel 3.

Tabel 2. Strategi Mitigasi terhadap Perubahan Iklim yang Dilakukan oleh Petani Sayuran di Kabupaten Enrekang

| No | Uraian                                                                                            | Jumlah    | Persentase (%) |
|----|---------------------------------------------------------------------------------------------------|-----------|----------------|
| 1  | Menggunakan varitas tahan iklim                                                                   | 25        | 35,71          |
| 2  | Mengubah jadwal tanam                                                                             | 10        | 14,23          |
| 3  | Melakukan tumpang sari                                                                            | 3         | 4,29           |
| 4  | Menggunakan pupuk dan pestisida yang sesuai anjuran                                               | 8         | 11,43          |
| 5  | Menggunakan varitas tahan iklim, mengubah jadwal tanam, menggunakan pupuk dan pestida yang sesuai | 24        | 34,29          |
|    | <b>Total</b>                                                                                      | <b>70</b> | <b>100</b>     |

Hasil analisis strategi mitigasi yang dilakukan oleh petani sayuran dalam menghadapi risiko iklim menunjukkan bahwa menggunakan varitas yang tahan terhadap iklim sebesar 35,71%. Strategi menggunakan varitas yang tahan terhadap iklim merupakan garis depan adaptasi hortikultura terhadap pemanasan dan kekeringan. Hal ini memperkuat rasionalisasi pilihan petani pada konteks risiko akibat suhu dan air yang mengalami selalu perubahan. Di negara Afrika termasuk Ethiopia, petani melakukan strategi dalam menghadapi perubahan iklim dengan mengandalkan strategi ex-ante seperti melakukan penanaman lebih awal, diversifikasi pendapatan, meningkatkan tabungan, penanaman varitas tahan kekeringan. Selain melakukan strategi ex-ante, petani di Ethiopia juga melakukan strategi pos-ante seperti pengurangan pengeluaran, penggunaan tabungan, perubahan pola konsumsi, mencari bantuan dari kerabat, pinjaman, penjualan aset, dan migrasi untuk mencari pekerjaan [7].

Petani di Kabupaten Enrekang juga melakukan strategi dalam menghadapi risiko iklim dengan cara melakukan perubahan jadwal tanam, menggunakan pupuk dan pestisida sesuai dengan anjuran. Sama halnya petani di Kabupaten Bantul, Provinsi D.I. Yogyakarta melakukan strategi dalam menghadapi risiko perubahan iklim dengan cara melakukan manajemen pengairan melalui embung, diversifikasi komoditas, serta penggunaan input organik dalam upaya menghadapi perubahan iklim. Pengelolaan sumber daya alam yang didukung dengan kearifan lokal menjadi aspek penting dalam merespons perubahan iklim dan strategi survival serta strategi konsolidasi [8][9].

Selain melakukan strategi mitigasi terhadap risiko perubahan iklim, petani sayuran di Kabupaten Enrekang juga melakukan strategi adaptasi terhadap perubahan iklim. Hal ini ditunjukkan pada Tabel 3.

Tabel 3. Strategi Adaptasi terhadap Perubahan Iklim yang Dilakukan oleh Petani Sayuran di Kabupaten Enrekang

| No | Uraian                                                                                 | Jumlah    | Persentase (%) |
|----|----------------------------------------------------------------------------------------|-----------|----------------|
| 1  | Menggunakan bibit yg tahan terhadap iklim                                              | 23        | 32,86          |
| 2  | Diversifikasi tanaman                                                                  | 10        | 14,29          |
| 3  | Menanam berbagai jenis tanaman pada satu lahan                                         | 8         | 11,43          |
| 4  | Menggunakan bibit yg tahan terhdp iklim, menanam berbagai jenis tanaman dlm satu lahan | 29        | 41,43          |
|    | <b>Total</b>                                                                           | <b>70</b> | <b>100</b>     |

Strategi adaptasi yang dilakukan oleh petani sayuran di Kabupaten Enrekang dalam menghadapi risiko perubahan iklim adalah dengan beberapa cara yaitu menggunakan bibit yang tahan iklim, menanam berbagai jenis tanaman, melakukan rotasi tanaman, membuat guludan, mengelola air secara efisien (74,29%) dan lainnya sebesar 25,72 % dengan melakukan diversifikasi tanaman dan menanam berbagai jenis tanaman pada satu lahan. Strategi adaptasi yang dilakukan petani sayuran tidak jauh berbeda dengan strategi mitigasi. Petani di Kabupaten Enrekang dalam menghadapi risiko perubahan iklim ada empat strategi yang dilakukan yaitu strategi aktif dengan cara mencari pekerjaan lain (menjadi kuli batu kumpang, ikut nelayan, beternak, dan berjualan). strategi pasif dilakukan dengan cara melakukan produksi dengan teknik tumpang sari, menggunakan pupuk organik/pupuk kandang yang berasal dari kotoran sapi, membedakan menu makanan saat musim hujan dan musim kemarau (saat kemarau menu makan pagi, siang, dan malam sama), mengutamakan kebutuhan yang penting dengan tidak mengeluarkan uang untuk hal-hal yang tidak penting seperti beli baju baru, jalan-jalan dll, menabung dengan cara membeli hewan ternak (sapi, kambing, ayam), menabung di Lembaga keuangan (Bank), strategi yang terakhir adalah strategi jaringan yang dilakukan dengan cara saling meminjam dan meminjam pupuk antar petani untuk mendukung proses produksi, melibatkan keluarga sebagai pengganti tenaga kerja untuk proses produksi; berhutang / meminjam uang, menjual asset yang dimiliki atau menggunakan tabungannya yang berupa hewan ternak (sapi). Badan Meteorologi dan Geofisika juga memberikan pelatihan kepada petani tentang bagaimana mitigasi dan adaptasi yang dilakukan oleh petani dalam menghadapi risiko perubahan iklim. seperti menyusun rencana tanam, mulai dari penyesuaian waktu tanam, jenis tanaman yang tepat apa dan kapan harus ditanam, kapan harus menunda tanam, kapan harus memanen, pengelolaan air, apa saja yang harus disiapkan agar tidak mengalami gagal panen, dan lain sebagainya.

Selanjutnya berdasarkan hasil analisis risiko menunjukkan bahwa risiko usahatani sayuran di Kabupaten Enrekang termasuk pada kategori tinggi. Hasil ini ditunjukkan pada Tabel 4.

Tabel 4. Risiko Produksi Usahatani Sayuran di Kabupaten Enrekang

| No | Uraian                       | Nilai      |
|----|------------------------------|------------|
| 1  | Produksi Rata-Rata (kg)      | 4186,36    |
| 2  | Ragam ( $V^2$ )              | 167.235.74 |
| 3  | Simpangan Baku ( $V\alpha$ ) | 4089.44    |
| 4  | Koefisien Variasi (KV)       | 0,97       |

Tabel 4 menunjukkan bahwa nilai ragam, simpangan baku dan koefisien variasi dari usahatani sayuran di Kabupaten Enrekang tinggi. Hal ini menunjukkan bahwa risiko produksi pada usahatani sayuran juga tinggi. Tingginya risiko produksi pada usahatani sayuran disebabkan oleh kondisi cuaca yang tidak menentu, tanaman rentan terhadap hama dan penyakit. Produksi yang sering berubah-ubah pada usahatani sayuran disebabkan oleh adanya kejadian yang tidak dapat dikontrol akibat perubahan iklim/cuaca, hama dan penyakit. Selain itu, produksi usahatani sayuran juga perlu memperhatikan penerapan teknologi yang tepat untuk memaksimalkan pendapatan dan keuntungan usahatani [10][11].

**D. STATUS LUARAN:** Tuliskan jenis, identitas dan status ketercapaian setiap luaran wajib dan luaran tambahan (jika ada) yang dijanjikan. Jenis luaran dapat berupa publikasi, perolehan kekayaan intelektual, atau luaran lainnya yang telah dijanjikan pada proposal. Uraian status luaran harus didukung dengan bukti kemajuan ketercapaian luaran sesuai dengan luaran yang dijanjikan. Lengkapi isian jenis luaran yang dijanjikan serta mengunggah bukti dokumen ketercapaian luaran melalui BIMA.

Luaran penelitian yang dihasilkan sesuai dengan yang dituliskan pada usulan proposal penelitian yaitu berupa artikel yang di publikasikan pada jurnal internasional bereputasi (Q4): (*Journal of Global Innovations in Agricultural Sciences* SUBMITTED).

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Kendala pelaksanaan penelitian adalah sulitnya peneliti menjelaskan instrumen penelitian karena lebih dominan petani responden (menggunakan bahasa lokal), proses wawancara harus dilakukan di malam hari karena pada siang hari petani beraktifitas di lokasi usahatani sehingga waktu yang dibutuhkan agak terbatas, lokasi tempat tinggal antar petani responden saling berjauhan sehingga tidak semua kelompok tani dapat hadir, beberapa petani responden agak sulit mengingat kondisi usahatani untuk beberapa tahun sebelumnya.

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Penelitian yang dilakukan telah mengidentifikasi strategi mitigasi dan adaptasi petani sayuran terhadap risiko perubahan iklim. Untuk tahap selanjutnya akan diidentifikasi bagaimana risiko usahatani sayuran serta pengaruh perubahan iklim terhadap produktifitas usahatani sayuran di Kabupaten Enrekang. Luaran artikel yang dihasilkan dari penelitian ini baik yang berupa luaran wajib maupun luaran tambahan dinyatakan diterima (*ACCEPTED*) pada jurnal internasional bereputasi. Selain itu, rencana selanjutnya adalah pengembangan model usahatani sayuran tahan iklim (*Climate-Resilient Vegetable Farming Model*) Berbasis Inovasi Adaptasi di Kabupaten Enrekang.

**H. DAFTAR PUSTAKA:** Penyusunan Daftar Pustaka berdasarkan sistem nomor sesuai dengan urutan pengutipan. Hanya pustaka yang disitasi pada laporan kemajuan yang dicantumkan dalam Daftar Pustaka.

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## Lampiran 1. Dokumentasi Kegiatan Penelitian



Gambar 1. Berbagai jenis sayuran yang diusahakan petani responden



Gambar 2. Wawancara dengan petani responden

## Lampiran 2. Bukti Submit Artikel di Journal Internasional Bereputasi (Q4)

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## POSTER PENELITIAN

### SKEMA PENELITIAN FUNDAMENTAL REGULER



# Perubahan Iklim dan Dinamika Risiko Produksi Usaha Tani Sayuran Di Kabupaten Enrekang: Kajian Adaptasi dan Mitigasi

**SKEMA PENELITIAN : PENELITIAN FUNDAMENTAL REGULER**  
**ANGGARAN PENELITIAN : RP. 67.550.000**

## Latar Belakang

Kondisi iklim beberapa tahun terakhir mengalami perubahan yang cukup signifikan. Beberapa tahun terakhir musim kemarau waktunya cukup panjang sementara musim hujan waktunya lebih pendek. Kondisi ini menjadi salah satu tantangan utama dalam sektor pertanian global. Hal tersebut sangat mempengaruhi produksi dan produktivitas tanaman hortikultura termasuk tanaman sayuran yang sangat bergantung pada kestabilan kondisi lingkungan. Dampak dari perubahan iklim ini tidak hanya mengancam ketersediaan pangan, tetapi juga berdampak pada ekonomi pertanian, terutama bagi petani kecil yang memiliki keterbatasan dalam mengakses teknologi adaptasi dan mitigasi iklim. Selain itu, perubahan iklim juga berkontribusi terhadap penurunan pendapatan riil rumah tangga, khususnya rumah tangga petani, pengusaha bidang pertanian, rumah tangga yang memiliki pendapatan rendah di daerah perkotaan.

Penelitian ini bertujuan untuk mengkaji risiko produksi dan strategi adaptasi serta mitigasinya pada usahatani sayuran secara komprehensif di Kecamatan Anggeraja dan Kecamatan Alla, Kabupaten Enrekang. Kebaruan penelitian ini adalah mengkaji tentang pengaruh perubahan iklim terhadap risiko produksi serta adaptasi dan mitigasi yang dilakukan oleh petani secara komprehensif khususnya di Kabupaten Enrekang. Metode pengumpulan dilakukan dengan cara observasi, wawancara, Focus Group Discussion (FGD) dan dokumentasi. Pengambilan sampel dilakukan secara acak sederhana sebanyak 70 petani responden. Data yang dikumpulkan adalah data primer dan data sekunder. Data dianalisis dengan menggunakan metode statistik. Hasil yang diperoleh dari penelitian ini yaitu strategi mitigasi yang paling banyak dilakukan adalah penggunaan varietas tahan iklim (35,71%) dan kombinasi dengan perubahan jadwal tanam serta penggunaan pupuk dan pestisida sesuai anjuran (34,29%). Sementara itu, strategi adaptasi yang dominan adalah penggunaan bibit tahan iklim disertai pola tanam beragam pada satu lahan (41,43%). Temuan ini mengindikasikan bahwa petani di Enrekang relatif responsif terhadap tantangan iklim, meskipun keterbatasan sumber daya, akses teknologi, dan regenerasi petani muda masih menjadi kendala dalam menjaga keberlanjutan pertanian hortikultura.

**TKT : 3**

## Luaran Penelitian :

Luaran wajib yang ditargetkan adalah publikasi pada jurnal internasional bereputasi Q4 (Journal of Global Innovations in Agricultural Sciences).



**TIM PENELITIAN**

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# FARMERS' MITIGATION AND ADAPTATION STRATEGIES IN DEALING WITH CLIMATE RISKS IN ENREKANG REGENCY, INDONESIA

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## ABSTRACT

Climate change, characterized by shifts in rainfall patterns, increased temperatures, and the frequency of extreme climate events such as drought, flooding, and strong winds, has a significant impact on vegetable crop production. This study aims to analyze the mitigation and adaptation strategies implemented by vegetable farmers in facing climate risks in Enrekang Regency, South Sulawesi. The study was conducted in Anggeraja and Alla Districts with a sample of 70 farmers selected using simple random sampling. Data were obtained through observation, interviews, focus group discussions (FGDs), and documentation, then analyzed using frequency distribution. The results showed that the main mitigation strategies implemented by farmers included the use of climate-resistant varieties, changes in planting schedules, and a combination of the use of climate-resistant varieties with recommended fertilizers and pesticides. Meanwhile, adaptation strategies were carried out through the use of climate-resistant seeds, crop diversification, planting various types of crops in one plot, and a combination of climate-resistant seeds with various planting patterns. These findings indicate that farmers in Enrekang Regency are relatively adaptive to climate change despite still facing technological and resource limitations. Policy support, extension services, and ongoing technological innovation are needed to increase farmers' capacity to maintain sustainable horticultural production amidst the challenges of climate change.

**Keyword:** adaptation strategies; climate change; mitigation strategies; vegetable farmers

## INTRODUCTION

Climate conditions have undergone substantial changes in recent years, leading to increasingly unpredictable weather patterns. The dry season has become longer while the rainy season has shortened, creating new challenges for agriculture [1]. These alterations in climate, combined with rising temperatures and irregular rainfall, have intensified global concerns about agricultural sustainability. Extreme weather events—including droughts, floods, and strong winds—are becoming more frequent and severe [1], as also highlighted by global climate assessments from the FAO and IPCC. These conditions contribute to climate change [2], which significantly affects the growth and productivity of vegetable crops.

Vegetable crops require stable climatic conditions to achieve optimal growth. Changes in temperature, humidity, and rainfall can disrupt the plant growth cycle, from vegetative development to flowering and harvesting. Extreme weather events may cause physical damage to plants, reduce yields, and increase susceptibility to pests and diseases [3]. Climate variability

is therefore considered one of the major production risks for horticultural farming. These challenges are exacerbated by rising demand for vegetables due to population growth, putting farmers under greater pressure to maintain consistent yields [4, 5].

Climate change also contributes to extreme climatic anomalies such as El Niño and La Niña, collectively known as the ENSO phenomenon [6]. These anomalies can cause drastic temperature fluctuations and unusual weather conditions that are harmful to crop growth. [7] explain that in monsoon areas such as Java, Eastern Indonesia, and Southern Sumatra, the Southern Oscillation strongly influences rainfall, cloud cover, temperature, evaporation, and humidity. These elements collectively determine the environmental conditions required for optimal plant development. Consequently, the occurrence of ENSO presents a significant threat to the stability of vegetable production.

In South Sulawesi Province, several major vegetable-producing regions significantly contribute to local agricultural output, including Enrekang Regency [8]. The area is known for producing shallots, cabbage, tomatoes, carrots, cayenne peppers, and large chilies, which serve as key commercial commodities. Climate change has begun to affect the productivity of these crops, as reflected in fluctuating annual yields in Enrekang. Studies indicate that changing rainfall patterns strongly influence both production and productivity of horticultural commodities in the region. These fluctuations highlight the importance of understanding climate-related production risks in vegetable farming.

Vegetable production in Enrekang is influenced by internal factors—such as seed quality, cultivation techniques, nutrient management, and labor—as well as external factors such as climate, rainfall, market conditions, and government policies. Climate change has been shown to negatively affect both the quantity and quality of agricultural products, leading to higher domestic prices and reduced product competitiveness [9]. The resulting instability affects not only agricultural productivity but also farmer income and local economic resilience. This condition is particularly concerning for smallholder farmers who have limited resources to implement climate adaptation strategies. Therefore, addressing the impacts of climate change on vegetable production is essential for promoting agricultural sustainability and farmer welfare.

## **RESEARCH METHOD**

This research was carried out in Anggeraja and Alla Districts, located within Enrekang Regency, which are known as major vegetable-producing areas in South Sulawesi. The total population of vegetable farmers in these districts is estimated at approximately 700 individuals. Based on this population, a sample size of 10% was selected, resulting in a total of 70 respondent farmers [10]. The sampling technique used was simple random sampling to ensure that each farmer had an equal probability of being selected, thereby reducing sampling bias and improving the representativeness of the sample. This approach allowed the study to capture diverse farming conditions and climate-related experiences across the two districts.

The study employed both qualitative and quantitative data to obtain comprehensive insights into climate risks and adaptation strategies among vegetable farmers. Primary data were

collected through structured and semi-structured interviews with the selected respondent farmers, focusing on their demographic characteristics, farming practices, input use, production levels, and experiences related to climate variability. In addition to interviews, field observations were conducted to directly assess farming activities, crop conditions, and local environmental characteristics. Focus Group Discussions (FGDs) were also organized to gather collective perspectives from farmers and validate individual responses, especially regarding climate risk perceptions and adaptation strategies. These multiple techniques ensured the depth and reliability of the primary data collected.

Secondary data were obtained from various supporting documents relevant to the research context. These included agricultural reports, regional statistical publications, books, scientific articles, and previous research studies published in journals and proceedings. Additionally, documents and datasets from government agencies such as the local agricultural office, the Central Bureau of Statistics (BPS), and meteorological institutions were used to support the discussion of climatic trends and agricultural development in Enrekang Regency. The combination of primary and secondary data strengthened the contextual understanding of climate impacts on vegetable farming in the study area. All secondary sources were carefully reviewed to enhance data triangulation and ensure analytical accuracy.

Data were collected using four main methods: observation, interviews, FGDs, and documentation review. Observation provided real-time information on cultivation practices and climate-related challenges faced by farmers. Interviews allowed detailed exploration of farmers' individual experiences, behavior, and decision-making processes. FGDs facilitated group discussions that highlighted communal knowledge, shared challenges, and collective coping strategies. Meanwhile, documentation review contributed valuable historical, climatic, and agricultural background information supporting the primary findings.

The collected data were analyzed using descriptive quantitative and qualitative techniques. Frequency distribution analysis was used to categorize farmer characteristics, climate-related experiences, and the types of strategies applied to mitigate climate risks. Qualitative data from interviews and FGDs were analyzed using thematic analysis to identify recurring themes and patterns related to climate adaptation behaviors. The integration of quantitative and qualitative analyses provided a comprehensive understanding of climate risk management in vegetable farming. This mixed-method analytical approach allowed the study to generate reliable conclusions and practical recommendations for improving climate resilience in the agricultural sector. To provide a clearer understanding of the procedures carried out in this study, the research flow is illustrated in Figure 1.

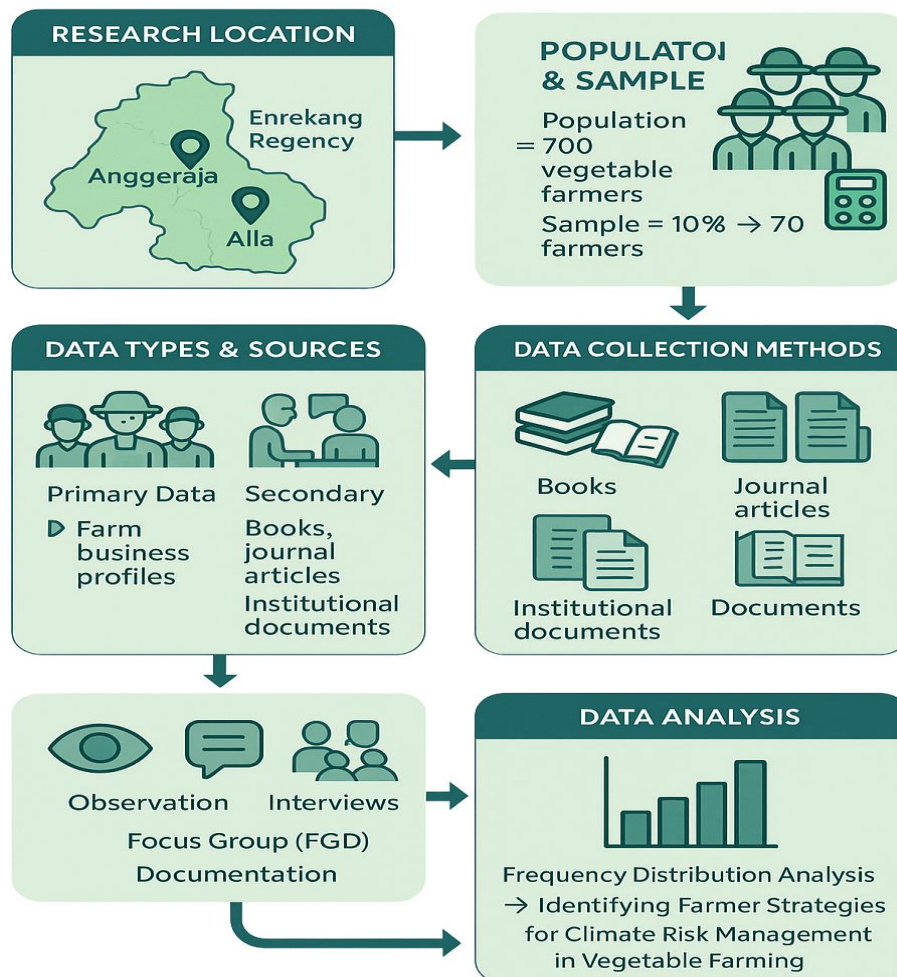


Figure 1. Research flowchart

## RESULT AND DISCUSSION

### (i) Respondent Profile

The profile of the respondent farmers presented in this study includes several key demographic and socio-economic characteristics relevant to understanding their farming behavior and decision-making processes. These characteristics consist of farm size, farmer age, educational attainment, farming experience, and number of household members. Describing these variables is essential because they influence farmers' capacity to adopt new technologies, respond to climate-related risks, and manage agricultural resources efficiently. Furthermore, such information provides important context for interpreting the findings related to production risks and adaptation strategies in vegetable farming. A detailed description of each variable is presented in the following subsections.

#### a. Age of Respondent Farmers

A farmer's age is an important factor that can significantly influence their ability, productivity, and responsiveness to agricultural innovations. Younger farmers are generally considered to have greater physical capacity and adaptability, while older farmers may possess extensive experience but face limitations in physical stamina and openness to new practices. As farmers

grow older, their productivity may gradually decline due to reduced physical strength and slower adoption of improved technologies or climate adaptation measures. Age distribution is therefore a crucial indicator for assessing labor availability, decision-making capacity, and long-term sustainability in agricultural households. Table 1 presents the age distribution of the respondent farmers in Enrekang Regency, providing insight into the demographic structure of the farming community.

Table 1. Distribution of Respondents by Age

| Number       | Age Group (Year) | Number (people) | Percentage(%) |
|--------------|------------------|-----------------|---------------|
| 1            | 25-40            | 11              | 15,71         |
| 2            | 41-60            | 50              | 71,43         |
| 3            | > 60             | 9               | 12,86         |
| <b>Total</b> |                  | <b>70</b>       | <b>100</b>    |

Based on Table 1, the average age of the farmers was 49.6 years, with an age range of 25–73 years. The frequency distribution showed that the middle-aged group (45–60 years) dominated the sample, comprising more than 71.43% of all respondents, while young farmers (<40 years) accounted for only about 15.71%. This pattern indicated that the agricultural sector was still largely managed by experienced middle-aged to older farmers, whereas the regeneration of young farmers remained relatively limited. This finding was consistent with the results reported by [11], which emphasized that age significantly influenced farmer productivity and the extent to which farmers adopted agricultural innovations. Therefore, the results highlighted the importance of encouraging greater involvement of younger generations in agriculture to ensure long-term sectoral sustainability, as well as the need for extension strategies and policy interventions tailored to the age characteristics of farming communities.

## b. Level of Education

The education level of the respondent farmers plays a crucial role in shaping their ability to effectively manage agricultural activities and make informed decisions. Higher levels of education are often associated with improved access to information, better understanding of farm management practices, and greater awareness of technological innovations and climate adaptation strategies. Conversely, farmers with lower levels of formal education may face limitations in interpreting technical information, adopting improved farming technologies, and responding efficiently to climate-related challenges. Education also influences attitudes toward innovation, as more educated farmers are generally more open to adopting new methods that can enhance productivity and reduce production risks. The distribution of respondent farmers based on their educational attainment is presented in Table 2, providing insight into the human capital characteristics of vegetable farmers in the study area.

Table 2. Distribution of Respondents by Education Level

| Number       | Age Group            | Number (people) | Percentage(%) |
|--------------|----------------------|-----------------|---------------|
| 1            | Not attending school | 3               | 4.3           |
| 2            | Elementary School    | 16              | 22.9          |
| 3            | Junior High School   | 15              | 21.4          |
| 4            | Senior High School   | 34              | 48.6          |
| 5            | Bachelor             | 2               | 2.9           |
| <b>Total</b> |                      | <b>70</b>       | <b>100</b>    |

In general, the education level of the respondent farmers was dominated by high school graduates, who accounted for 48.6% of the sample. Elementary school graduates and junior high school graduates represented 22.9% and 21.4%, respectively. The remaining 5.2% consisted of farmers who either held a bachelor's degree or had not completed elementary school. These findings indicated that most respondent farmers had a relatively adequate level of formal education, which may have facilitated their ability to understand, accept, and implement agricultural innovations. The results were consistent with the findings of Nurhapsa et al. [12], who reported that shallot farmers in Anggeraja District, Enrekang Regency, possessed sufficient educational backgrounds and were therefore more receptive to innovation than farmers with lower educational attainment. Furthermore, [13] stated that education level was positively correlated with the adoption of agricultural technologies, supporting the notion that better-educated farmers tended to be more open to new practices. When compared to the national context, the proportion of college graduates in Indonesia was approximately 10.2%, with high school graduates accounting for around 30.85%, while the national average years of schooling (RLS) in 2024 was about 9.2 years, equivalent to completing junior high school.

### c. Farming Experience

Farming experience referred to the length of time a farmer had been cultivating vegetables, expressed in years. It served as a key determinant of a farmer's ability to effectively manage their agricultural activities. Farmers who had been involved in farming for a longer period generally possessed greater practical knowledge and a deeper understanding of the strengths and weaknesses of their production systems. This observation was consistent with the findings of [14], who reported that farmers with extensive farming experience tended to have higher levels of skill, which in turn influenced horticultural crop production. The distribution of respondent farmers based on their farming experience is presented in Table 3.

Table 3. Distribution of Respondents by Farming Experience

| Number       | Farming experience (year) | Number of people | Percentage(%) |
|--------------|---------------------------|------------------|---------------|
| 1            | 1 - 10                    | 27               | 38,57         |
| 2            | 11 – 20                   | 18               | 25,71         |
| 3            | 21 – 30                   | 14               | 20,00         |
| 4            | 31 – 40                   | 10               | 14,26         |
| 5            | >40                       | 1                | 1,43          |
| <b>Total</b> |                           | <b>70</b>        | <b>100</b>    |

## (ii). Vegetable Farmers' Strategies in Facing Climate Risks

Based on field observations and data analysis, several strategies were identified that vegetable farmers employed to cope with climate-related risks, including rainfall anomalies, prolonged dry seasons, and increased pest and disease incidence. The frequency distribution of the mitigation strategies adopted by vegetable farmers in Enrekang Regency is presented in Table 4.

Table 4. Climate Change Mitigation Strategies Implemented by Vegetable Farmers in Enrekang Regency

| Number       | Description                                                                                                   | Number of people | Percentage(%) |
|--------------|---------------------------------------------------------------------------------------------------------------|------------------|---------------|
| 1            | Using climate-resistant varieties                                                                             | 25               | 35,71         |
| 2            | Change the planting schedule                                                                                  | 10               | 14,23         |
| 3            | Intercropping                                                                                                 | 3                | 4,29          |
| 4            | Use fertilizers and pesticides according to recommendations                                                   | 8                | 11,43         |
| 5            | Using climate-resistant varieties, changing planting schedules, using appropriate fertilizers and pesticides, | 24               | 34,29         |
| <b>Total</b> |                                                                                                               | <b>70</b>        | <b>100</b>    |

The analysis of mitigation strategies employed by vegetable farmers in response to climate risks showed that the use of climate-tolerant varieties accounted for 35.71% of the strategies adopted. The selection of climate-tolerant varieties serves as a primary adaptation measure in horticultural systems, particularly in addressing increased temperatures and fluctuating water availability. This finding supports the rationale behind farmers' choices in managing risks arising from continuous changes in temperature and rainfall patterns. Similar trends were observed in several African countries, including Ethiopia, where farmers employed ex-ante strategies such as early planting, income diversification, increasing savings, and cultivating drought-tolerant varieties. In addition to ex-ante strategies, farmers in Ethiopia also adopted post-ante measures, including reducing expenditures, utilizing savings, modifying consumption patterns, seeking assistance from relatives, obtaining loans, selling assets, and migrating for employment opportunities [15].

Vegetable farmers in Enrekang Regency also implemented various strategies to address climate risks, including adjusting planting schedules and applying fertilizers and pesticides in accordance with recommended guidelines. Comparable findings were reported among farmers in Bantul Regency, Yogyakarta Special Region, who coped with climate risks by managing irrigation through reservoir systems, diversifying commodities, and utilizing organic inputs. Effective natural resource management, supported by local wisdom, has been identified as an essential component in responding to climate change [16]. Furthermore, farmers in Polewali Mandar Regency employed survival and consolidation strategies to mitigate climate-related risks [17].

In addition to these mitigation strategies, vegetable farmers in Enrekang Regency also adopted climate change adaptation measures, as presented in Table 5.

Table 5. Adaptation Strategies to Climate Change by Vegetable Farmers in Enrekang Regency

| Number       | Description                                                                          | Number of people | Percentage(%) |
|--------------|--------------------------------------------------------------------------------------|------------------|---------------|
| 1            | Using climate-resistant seeds                                                        | 23               | 32,86         |
| 2            | Crop diversification                                                                 | 10               | 14,29         |
| 3            | Planting various types of plants on one plot of land                                 | 8                | 11,43         |
| 4            | Using seeds that are climate resistant, planting various types of plants in one area | 29               | 41,43         |
| <b>Total</b> |                                                                                      | <b>70</b>        | <b>100</b>    |

Adaptation strategies implemented by vegetable farmers in Enrekang Regency to address climate change risks included the use of climate-resistant seeds, crop diversification, crop rotation, ridge construction, and efficient water management. Efficient water management constituted the highest proportion of adaptation efforts (74.29%), followed by crop diversification through the cultivation of multiple crop types within a single plot (25.72%). These adaptation practices showed substantial similarities to the mitigation strategies previously described.

Comparable findings were reported in Tuban Regency, where farmers adopted four categories of strategies to cope with climate risks. First, active strategies involved seeking alternative sources of income, such as working as stone laborers, assisting fishermen, raising livestock, or engaging in small-scale trading. Second, passive strategies included implementing intercropping techniques, using organic fertilizers or manure derived from cattle, adjusting household food consumption patterns between rainy and dry seasons, prioritizing essential expenditures, and saving through livestock ownership (e.g., cattle, goats, chickens) or financial institutions. Third, network strategies were carried out through reciprocal borrowing and lending of agricultural inputs, particularly fertilizers, utilizing family labor as a substitute for hired labor, borrowing money, selling assets, or using livestock savings to sustain production.

In addition to farmer-driven strategies, the Meteorology and Geophysics Agency provided training to enhance farmers' capacity for climate risk mitigation and adaptation. The training included guidance on preparing planting plans, adjusting planting schedules, selecting appropriate crop types, determining optimal planting and harvesting periods, managing water resources, and anticipating potential crop failures.

## CONCLUSIONS AND POLICY RECOMMENDATIONS

The results of this study demonstrated that climate change had a substantial impact on the production and productivity of vegetable farming in Enrekang Regency. Extreme climatic conditions such as prolonged drought, increasingly erratic rainfall patterns, and heightened pest and disease outbreaks, were identified as the major risks affecting farmers. In response, farmers

implemented a range of mitigation and adaptation strategies to reduce the negative effects of climate variability on their farming activities.

The analysis showed that the most widely adopted mitigation strategies included the use of climate-resistant varieties (35.71%) and a combination of adjusted planting schedules along with the application of recommended fertilizers and pesticides (34.29%). On the other hand, the predominant adaptation strategy involved the use of climate-resistant seeds combined with diversified cropping patterns within a single plot (41.43%). These findings indicate that vegetable farmers in Enrekang Regency were relatively adaptive and responsive to climate-related risks. However, constraints such as limited access to technological innovations, inadequate farm-level resources, and the low participation of younger generations in agriculture continue to pose challenges for the long-term sustainability of horticultural farming systems.

Overall, the study underscores the urgent need for strengthened institutional support, improved climate information services, and more inclusive policies aimed at enhancing farmers' resilience to climate change.

### **Policy Recommendations**

1. Enhance the intensity and quality of climate-smart agricultural extension services, focusing on climate-based decision-making, pest forecasting, and sustainable land and water management practices.
2. Expand and institutionalize climate field school programs to accelerate farmers' adoption of effective mitigation and adaptation technologies, particularly for smallholder horticultural farmers.
3. Invest in the construction and rehabilitation of simple irrigation infrastructure, such as small reservoirs, water pumps, and shallow wells, to ensure reliable water availability during prolonged dry periods.
4. Develop and operationalize a digital-based early warning system, integrating real-time climate data, rainfall forecasts, and pest/disease alerts to support timely and informed farming decisions.

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# SURAT PERNYATAAN TANGGUNG JAWAB BELANJA

Yang bertanda tangan di bawah ini :

Nama : Dr NURHAPSA S.P, M.Si

Alamat :-

berdasarkan Surat Keputusan Nomor 0070/C3/AL.04/2025 dan Perjanjian / Kontrak Nomor 130/C3/DT.05.00/PL/2025, Nomor kontrak LLDIKTI IX Sultanbatara: 684/LL9/PG/2025, dan Nomor kontrak UM Parepare: 0233/II.3.AU/F/2025 mendapatkan Anggaran Penelitian Perubahan iklim dan dinamika risiko produksi usahatani sayuran di Kabupaten Enrekang: Kajian adaptasi dan mitigasi Sebesar Rp. 67.550.000

Dengan ini menyatakan bahwa :

1. Biaya kegiatan Penelitian di bawah ini meliputi :

| No                         | Uraian                                                                                                                                                                                                                                                                             | RAB 100%       | Realisasi      |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| 1                          | <b>Bahan</b><br>1. Pembelian ATK untuk keperluan pelaksanaan penelitian<br>2. Bahan habis pakai<br>3. Foto copy dokumen pendukung penelitian, foto kuesioner                                                                                                                       | Rp. 1.092.500  | Rp. 875.000    |
| 2                          | <b>Pengumpulan Data</b><br>1. Konsumsi kegiatan penelitian, FGD<br>2. Transpor lokal pembantu lapangan, honor pembantu panneliti<br>3. Akomodasi<br>4. Dokumentasi, uang harian rapat                                                                                              | Rp. 30.650.000 | Rp. 25.520.000 |
| 3                          | <b>Analisis Data</b><br>Honor dan uang harian pengolah data                                                                                                                                                                                                                        | Rp. 2.000.000  | Rp. 1.600.000  |
| 4                          | <b>Sewa Peralatan</b><br>1. Sewa kendaraan+ BBM<br>2. Sewa kamera dan peralatan pendukung penelitian<br>3. Sewa ruangan FGD                                                                                                                                                        | Rp. 10.000.000 | Rp. 8.500.000  |
| 5                          | <b>Pelaporan Luaran Wajib</b><br>1. Biaya publikasi artikel di jurnal internasional bereputasi<br>2. Biaya pendaftaran KI<br>3. Biaya harian penyusunan laporan kemajuan dan laporan akhir<br>4. Biaya penyusunan luaran penelitian<br>5. Biaya proofreading<br>6. Biaya rapat tim | Rp. 23.807.500 | Rp. 31.055.000 |
| 6                          | <b>Lain-lain</b>                                                                                                                                                                                                                                                                   | Rp. 0          | Rp. 0          |
| <b>Realisasi ( 100 % )</b> |                                                                                                                                                                                                                                                                                    |                | Rp. 67.550.000 |

2. Jumlah uang tersebut pada angka 1, benar-benar dikeluarkan untuk pelaksanaan kegiatan Penelitian dimaksud.

Demikian surat pernyataan ini dibuat dengan sebenarnya.

Parepare, 12-12-2025, Ketua  
  
METERA TEMPEL  
9889CAMX400471415 Dr. NURHAPSA S.P, M.Si

NIP/NIPK 0912106901