ANALISIS SEBARAN DEBU JATUH DAN PENGARUHNYA TERHADAP PRODUKTIVITAS PERTANIAN DI DAERAH SEKITAR *PADANG INDUSTRIAL PARK* (PIP)

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ABSTRAK

Aktivitas industri berpotensi menghasilkan emisi partikulat berupa debu jatuh (*dustfall*) yang dapat memengaruhi kualitas lingkungan dan produktivitas pertanian di sekitarnya. Penelitian ini bertujuan menganalisis sebaran debu jatuh serta pengaruhnya terhadap produktivitas padi di sekitar *Padang Industrial Park* (PIP), Kabupaten Padang Pariaman, Sumatera Barat. Pengambilan sampel debu dilakukan pada sembilan titik pengamatan dalam radius 100–400 m dari kawasan industri menggunakan metode gravimetri dengan *dustfall canister*. Pengukuran dilakukan selama 14 hari pada pukul 09.00–12.00 WIB dan 13.00–16.00 WIB untuk mengamati pengaruh kondisi meteorologis terhadap distribusi debu. Data sebaran debu diolah dan dipetakan menggunakan ArcGIS, sedangkan data produktivitas padi diperoleh melalui survei dan wawancara petani. Analisis statistik menggunakan uji normalitas *Shapiro–Wilk* dan *Independent Samples t-Test*. Hasil penelitian menunjukkan konsentrasi debu jatuh tertinggi mencapai 8,1592 ton/km²/bulan pada pagi hari dan 7,6307 ton/km²/bulan pada sore hari. Sebaran debu dipengaruhi oleh arah dan kecepatan angin, dengan konsentrasi tertinggi cenderung berada di bagian barat kawasan PIP. Meskipun konsentrasi debu masih berada di bawah baku mutu, produktivitas padi di sekitar PIP (3,67–4,35 ton/ha) lebih rendah dibandingkan wilayah pembanding (4,56–4,95

ton/ha). Hasil uji *Shapiro–Wilk* menunjukkan seluruh data berdistribusi normal ($p > 0,05$), sedangkan *Independent Samples t-Test* menunjukkan perbedaan produktivitas yang signifikan antara wilayah PIP dan luar PIP ($t = -5,054$; $p < 0,001$). Hasil penelitian mengindikasikan bahwa paparan debu industri berkontribusi terhadap penurunan produktivitas padi di sekitar kawasan industri.

Kata kunci: debu jatuh (*dustfall*), *Padang Industrial Park* (PIP), sebaran debu, produktivitas padi, pencemaran udara.

ANALYSIS OF DUSTFALL DISTRIBUTION AND ITS EFFECT ON AGRICULTURAL PRODUCTIVITY AROUND *PADANG INDUSTRIAL PARK*(PIP)

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ABSTRACT

Industrial activities can generate particulate emissions in the form of dustfall, potentially affecting environmental quality and agricultural productivity in surrounding areas. This study aimed to analyze dustfall distribution and its effect on rice productivity around Padang Industrial Park (PIP), Padang Pariaman Regency, West Sumatra, Indonesia. Dustfall samples were collected at nine observation points within a radius of 100–400 m from the industrial area using the gravimetric method with dustfall canisters. Sampling was conducted for 14 days during 09:00–12:00 WIB and 13:00–16:00 WIB to examine the influence of meteorological conditions on dust distribution. Dustfall data were processed and mapped using ArcGIS, while rice productivity data were obtained through field surveys and farmer interviews. Statistical analysis included the Shapiro–Wilk normality test and Independent Samples t-Test. The results showed that the highest dustfall concentration reached 8.1592 tons/km²/month in the morning and 7.6307 tons/km²/month in the afternoon. Dustfall distribution was influenced by wind direction and speed, with the highest concentrations generally observed west of the PIP area. Although dustfall concentrations remained below the applicable air quality standard, rice productivity around PIP (3.67–4.35 tons/ha) was lower than in the reference area (4.56–4.95 tons/ha). The Shapiro–Wilk test

indicated normal data distribution ($p > 0.05$), while the Independent Samples t-Test showed a significant difference in rice productivity between PIP and non-PIP areas ($t = -5.054$; $p < 0.001$). These findings suggest that industrial dust exposure contributes to reduced rice productivity around the industrial area.

Keywords: dustfall, Padang Industrial Park (PIP), dust distribution, rice productivity, air pollution.