

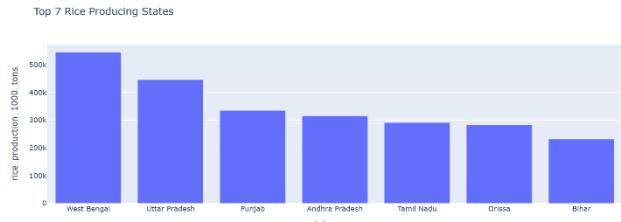
1. Top 7 Rice Producing States

💡 Visualization Title:

Top 7 Rice Producing States – Bar Plot

💻 Code Explanation:

```
rice_states =  
df.groupby("state_name")["rice_production_1000_tons"].sum().nlargest(7).reset_index()  
  
fig1 = px.bar(rice_states, x="state_name", y="rice_production_1000_tons", title="Top 7 Rice  
Producing States")  
  
fig1.show()
```



- The dataset is grouped by state and summed for rice production.
- .nlargest(7) selects the top 7 states.
- A bar chart is plotted using Plotly Express.

💡 Visualization Insight:

This chart highlights the **leading rice-producing states** in India. States like **West Bengal** and **Punjab** typically dominate rice production due to fertile land and suitable climate. This is crucial for policymakers targeting **food security and agricultural subsidies**.

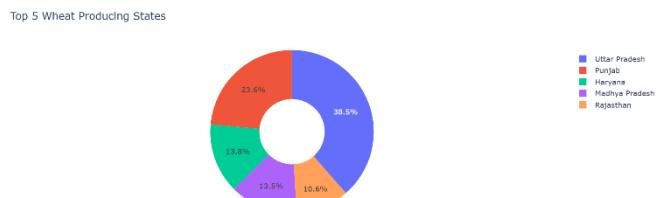
2. Top 5 Wheat Producing States

💡 Visualization Title:

Top 5 Wheat Producing States – Donut Chart

💻 Code Explanation:

```
wheat_states =  
df.groupby("state_name")["wheat_production_1000_tons"].sum().nlargest(5).reset_index()  
  
fig2 = px.pie(wheat_states, names="state_name", values="wheat_production_1000_tons",  
title="Top 5 Wheat Producing States", hole=0.4)  
  
fig2.show()
```



- Wheat data is grouped by state and top 5 are extracted.
- px.pie is used with a hole=0.4 to create a donut chart.

💡 Visualization Insight:

The donut chart offers a **visual proportion** of wheat production among the top states. **Uttar Pradesh** usually stands out, showing its dominance in wheat farming.

3. Wheat Production % (Pie)

Wheat Production Share



Visualization Title:

Wheat Production Share – Pie Chart

Code Explanation:

```
fig3 = px.pie(wheat_states, values="wheat_production_1000_tons", names="state_name",  
title="Wheat Production Share")
```

```
fig3.show()
```

- Uses the same wheat_states data.
- Traditional pie chart to show **proportional comparison**.

Visualization Insight:

This chart shows **percentage contribution** of top states in wheat production. Helpful for **resource allocation and investment decisions**.

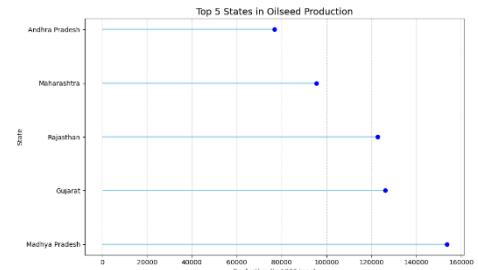
4. Top 5 Oilseed Producing States

Visualization Title:

Top 5 States in Oilseed Production – Lollipop Chart

Code Explanation:

```
top_oilseed =  
df.groupby("state_name")["oilseeds_production_1000_tons"].sum().nlargest(5)  
  
plt.figure(figsize=(10,6))  
  
plt.hlines(y=top_oilseed.index, xmin=0, xmax=top_oilseed.values, color='skyblue')  
  
plt.plot(top_oilseed.values, top_oilseed.index, "o", color ="blue")
```



- Grouped and sorted to get top 5 oilseed states.
- Horizontal lines and dots create a **lollipop chart**.

Visualization Insight:

Lollipop charts are great for **ranking comparisons**. This clearly shows the production strengths of states like **Madhya Pradesh** in oilseeds.

5. Top 7 Sunflower Producing States



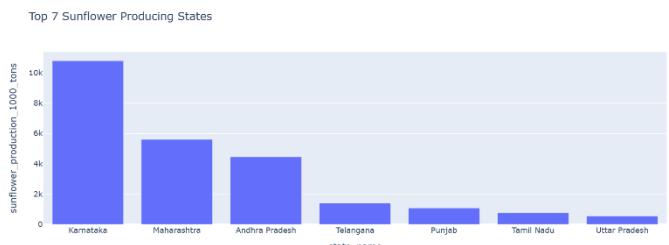
Visualization Title:

Sunflower Production – Bar Plot



Code Explanation:

```
sunflower_states =  
df.groupby("state_name")["sunflower_production_1000_tons"].sum().nlargest(7).reset_index()  
  
fig5 = px.bar(sunflower_states, x="state_name", y="sunflower_production_1000_tons",  
title="Top 7 Sunflower Producing States")  
  
fig5.show()
```



- Aggregates sunflower production.
- Visualized using bar chart.



Visualization Insight:

Highlights the best-performing states in **sunflower crop cultivation**, useful for identifying regions to expand **edible oil production**.

6. India's Sugarcane Production Over Last 50 Years



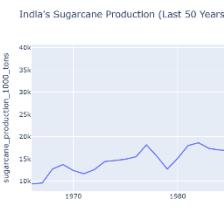
Visualization Title:

Sugarcane Production Trend – Line Plot



Code Explanation:

```
sugarcane_trend =  
df.groupby("year")["sugarcane_production_1000_tons"].sum().reset_index()  
  
fig6 = px.line(sugarcane_trend, x="year", y="sugarcane_production_1000_tons",  
title="India's Sugarcane Production (Last 50 Years)")  
  
fig6.show()
```



- Sugarcane production is grouped yearly.
- A line plot shows trends over time.



Visualization Insight:

A **clear trendline** of sugarcane production in India. **Peaks and dips** highlight climate effects or policy changes. Supports long-term **crop planning**.

7. Rice vs. Wheat Production – Last 50 Years

💡 Visualization Title:

Rice vs Wheat Production Trend – Line Plot

💻 Code Explanation:

```
rice_wheat = df.groupby("year") [["rice_production_1000_tons",
 "wheat_production_1000_tons"]].sum().reset_index()

fig7 = px.line(rice_wheat, x="year", y=["rice_production_1000_tons",
 "wheat_production_1000_tons"], title="Rice vs Wheat Production Over 50 Years")

fig7.show()
```



- Compares yearly data of both crops.
- Dual-line plot shows both trends on the same scale.

💡 Visualization Insight:

Offers insight into how **rice and wheat production have evolved** over time. Important for **crop substitution strategy**.

8. Rice Production by Districts in West Bengal

💡 Visualization Title:

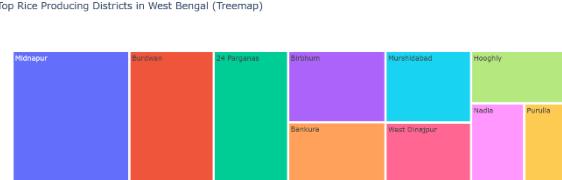
Top Rice Producing Districts in West Bengal – Treemap

💻 Code Explanation:

```
wb_rice = df[df["state_name"] == "West
Bengal"].groupby("district_name") ["rice_production_1000_tons"].sum().nlargest(10).reset_i
ndex()

fig8 = px.treemap(wb_rice, path=["district_name"], values="rice_production_1000_tons",
title="Top Rice Producing Districts in West Bengal")

fig8.show()
```



- Filters rice data for West Bengal.
- Groups by district and plots top 10 using a treemap.

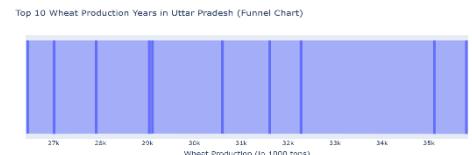
💡 Visualization Insight:

This treemap reveals the **major rice-producing districts in West Bengal**. Useful for regional planning, resource allocation, and identifying best-performing zones.

9. Top 10 Wheat Production Years in Uttar Pradesh

💡 Visualization Title:

Wheat Production by Year in Uttar Pradesh – Funnel Chart



💻 Code Explanation:

```
up_wheat = df[df["state_name"] == "Uttar  
Pradesh"].groupby("year")["wheat_production_1000_tons"].sum().nlargest(10).reset_index()  
  
fig9 = px.funnel(up_wheat, x="wheat_production_1000_tons", y="year", title="Top 10  
Wheat Production Years in Uttar Pradesh")  
  
fig9.show()
```

- Filters Uttar Pradesh wheat data.
- Plots top 10 production years in descending order.

📊 Visualization Insight:

Shows historical peaks in wheat production in UP. Useful to assess which years were most productive and why – policy, rainfall, or technology?

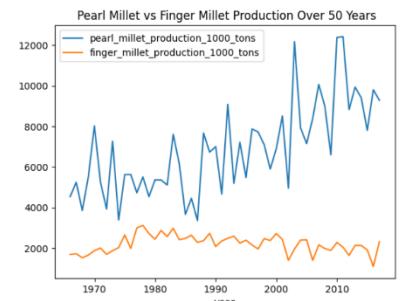
10. Millet Production Over the Last 50 Years

💡 Visualization Title:

Millet Production Trend – Line Chart

💻 Code Explanation:

```
millet = df.groupby("year")[[ "finger_millet_production_1000_tons",  
"pearl_millet_production_1000_tons"]].sum().reset_index()  
  
fig10 = px.line(millet, x="year", y=millet.columns[1:], title="Millet Production Over the  
Years")  
  
fig10.show()
```



- Groups millet production over years.
- Multi-line plot shows time trends.

📊 Visualization Insight:

Reveals how finger and pearl millet production have changed over decades. Relevant for nutrition and climate-resilient agriculture programs.

11. Rice vs Wheat Yield Across States

💡 **Visualization Title:**

Rice vs Wheat Yield by State – Horizontal Bar Chart

💻 **Code Explanation:**

```
yield_data = df.groupby("state_name")[["rice_yield_kg_per_ha",
                                         "wheat_yield_kg_per_ha"]].mean().reset_index()

fig11 = px.bar(yield_data, x="rice_yield_kg_per_ha", y="state_name", orientation="h",
                title="Rice Yield by State")

fig11.show()
```

- Compares state-wise average yields.
- Plotted in horizontal bars for better label visibility.

💡 **Visualization Insight:**

Highlights yield differences, identifying where one crop is more efficient than another. Useful for improving farming strategies.



12. Groundnut Production by Top 7 States

💡 **Visualization Title:**

Groundnut Production by State – Sunburst Plot

💻 **Code Explanation:**

```
groundnut =
df.groupby("state_name")["groundnut_production_1000_tons"].sum().nlargest(7).reset_index()

fig12 = px.sunburst(groundnut, path=["state_name"],
values="groundnut_production_1000_tons", title="Top 7 States in Groundnut Production")

fig12.show()
```

- Aggregates groundnut data by state.
- Sunburst chart highlights distribution.

Top 7 Groundnut Producing States (Sunburst Chart)



💡 **Visualization Insight:**

Shows production dominance of certain states. Useful for edible oil industries and crop diversification planning.

13. Soybean Production and Yield Efficiency

💡 Visualization Title:

Soybean Production vs Yield – Bar Chart

💻 Code Explanation:

```
soybean=df.groupby("state_name")[["soybean_production_1000_tons","soybean_yield_kg_per_ha"]].mean().nlargest(5, "soybean_production_1000_tons").reset_index()

fig13 = px.bar(soybean, x="state_name", y=["soybean_production_1000_tons", "soybean_yield_kg_per_ha"], barmode="group", title="Top Soybean States – Production vs Yield")

fig13.show()
```

- Groups by state for average production and yield.
- Dual-bar comparison.

📊 Visualization Insight:

Good way to identify states with high production and/or efficient yield. Supports decision-making in soybean procurement and support.

14. Sorghum Production by Season

💡 Visualization Title:

Kharif vs Rabi Sorghum Production – Bar Chart

💻 Code Explanation:

```
sorghum = df.groupby(["state_name"])[["kharif_sorghum_1000_tons", "rabi_sorghum_1000_tons"]].sum().nlargest(10, "kharif_sorghum_1000_tons").reset_index()

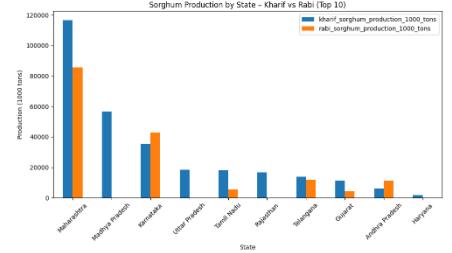
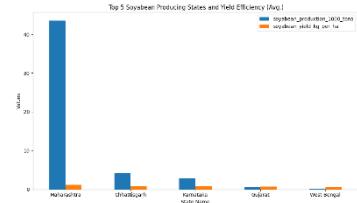
fig14 = px.bar(sorghum, x="state_name", y=["kharif_sorghum_1000_tons", "rabi_sorghum_1000_tons"], barmode="group", title="Top Sorghum States – Kharif vs Rabi")

fig14.show()
```

- Dual-season sorghum data.
- Grouped bar chart for comparison.

📊 Visualization Insight:

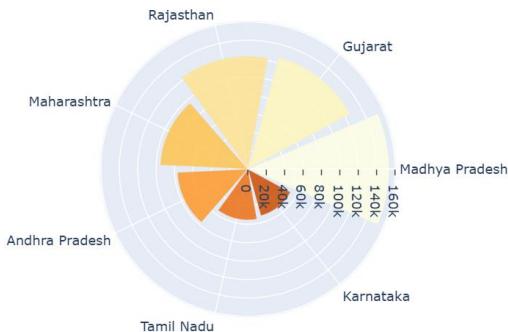
Illustrates which season is more dominant in each state. Valuable for season-wise agricultural strategy.



15. Oilseed Production – Polar Area Chart

💡 Visualization Title:

Top Oilseed Producing States – Polar Area Chart



Top 7 Oilseed Producing States – Polar Area Chart

💻 Code Explanation:

```
top_oilseed_states = df.groupby("state_name")["oilseeds_production_1000_tons"] \  
    .sum().nlargest(7).reset_index()  
  
fig15 = go.Figure(go.Barpolar(  
  
    r=top_oilseed_states["oilseeds_production_1000_tons"],  
    theta=top_oilseed_states["state_name"],  
    marker_color=px.colors.sequential.YIOrBr,  
    opacity=0.85  
  
))  
  
fig15.update_layout(title="Top 7 Oilseed Producing States - Polar Area Chart")  
fig15.show()
```

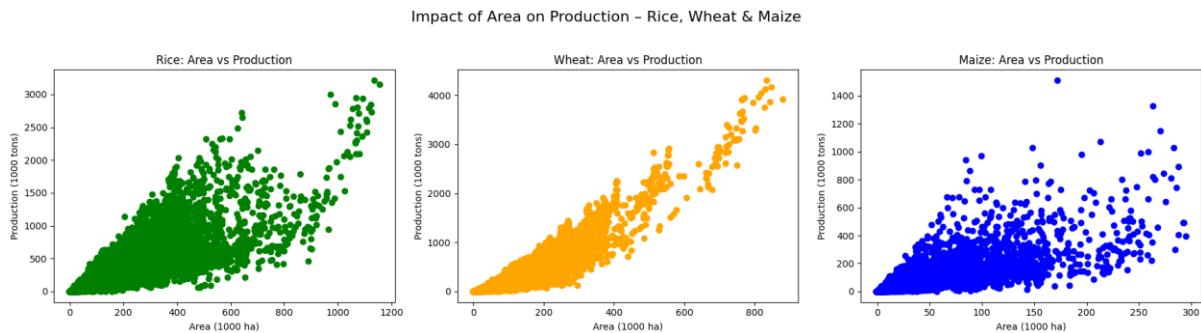
- Uses Plotly's Barpolar for circular chart.
- Compares top states for oilseed production.

📊 Visualization Insight:

Effective for showcasing **proportional production** in a **radial layout**. Appeals visually in presentations.

16. Impact of Area Cultivated on Production

💡 Visualization Title:



Area vs Production for Major Crops – Scatter Plot

💻 Code Explanation:

```
fig16 = px.scatter(df, x="rice_area_1000_ha", y="rice_production_1000_tons",
color="state_name", size="rice_yield_kg_per_ha", title="Area vs Production with Yield Efficiency")
```

```
fig16.show()
```

- X-axis: Area
- Y-axis: Production
- Size: Yield

📊 Visualization Insight:

Displays correlation between cultivated area and crop output. Useful to assess **land utilization efficiency** and **yield anomalies**.