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"Impact of Climate Change on Arabica Coffee in Papua New Guinea"

By

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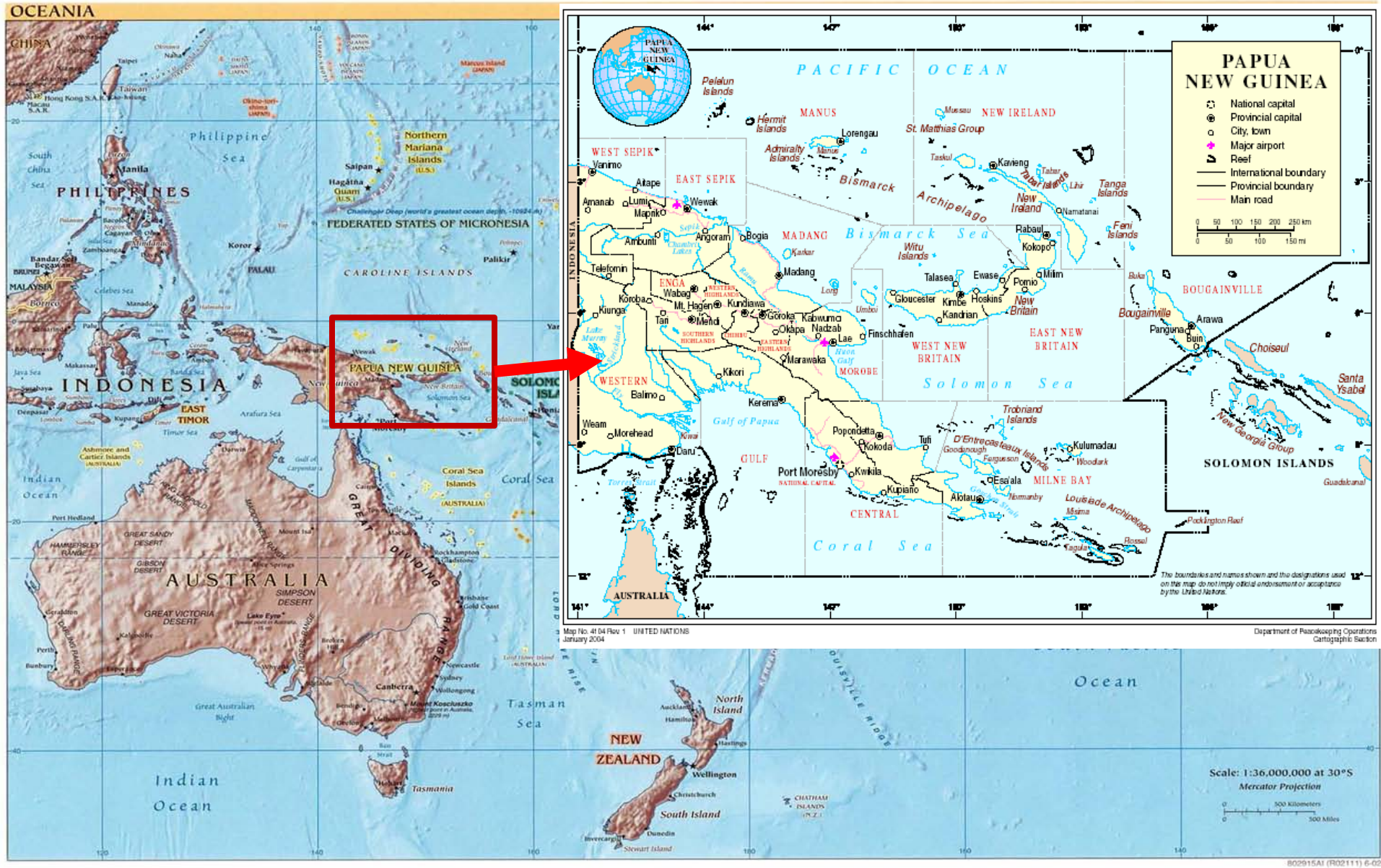
PRESENTATION OUTLINE:

a) Introduction and Background Information
b) Objective
c) Study area
d) Data Set
e) Analysis
f) Results
g) Summary & Conclusion
h) Way Forward

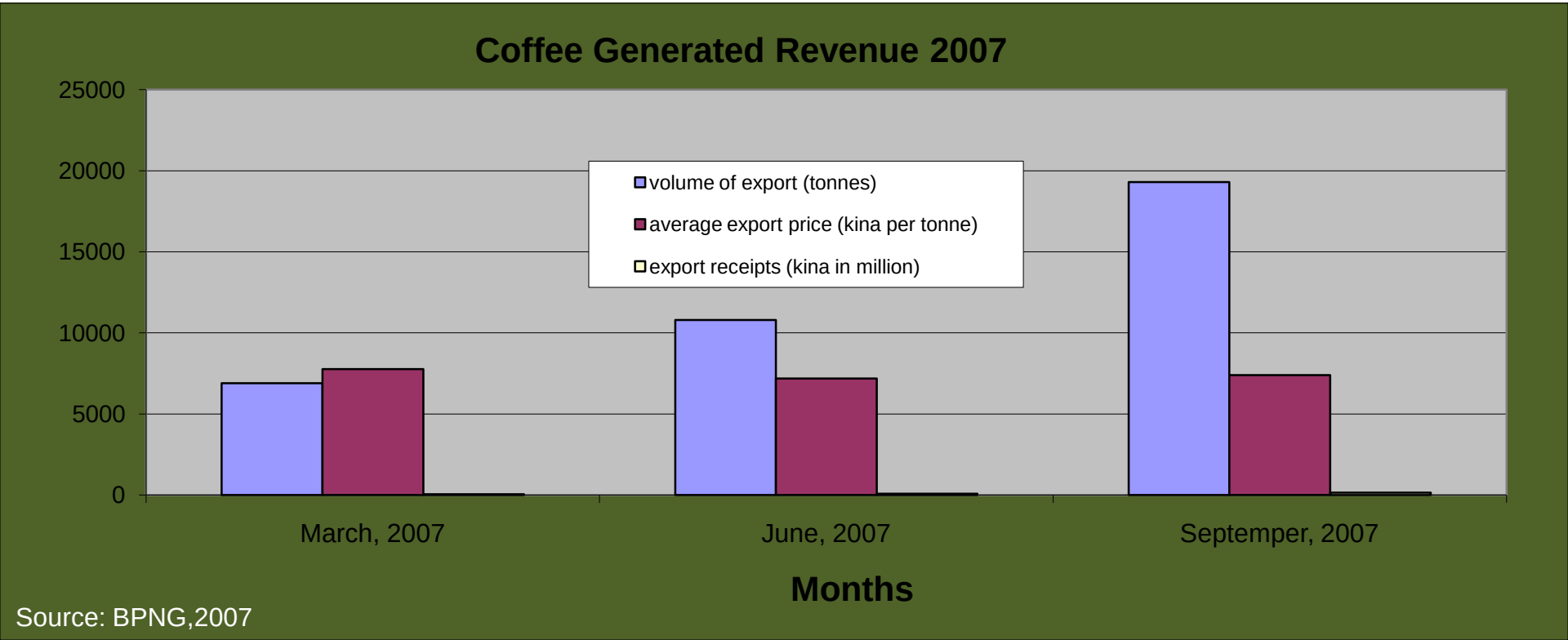
INTRODUCTION and BACKGROUND INFORMATION



Research Problem

- Decline in coffee export quantity.
  (BPNG, 2007).

- Changing weather pattern.



Source: BPNG,2007

Factors that affect production and export quantity of Coffee in Papua New Guinea

- ✓World supply and demand
- ✓Social and development trend
- ✓Coffee management practices

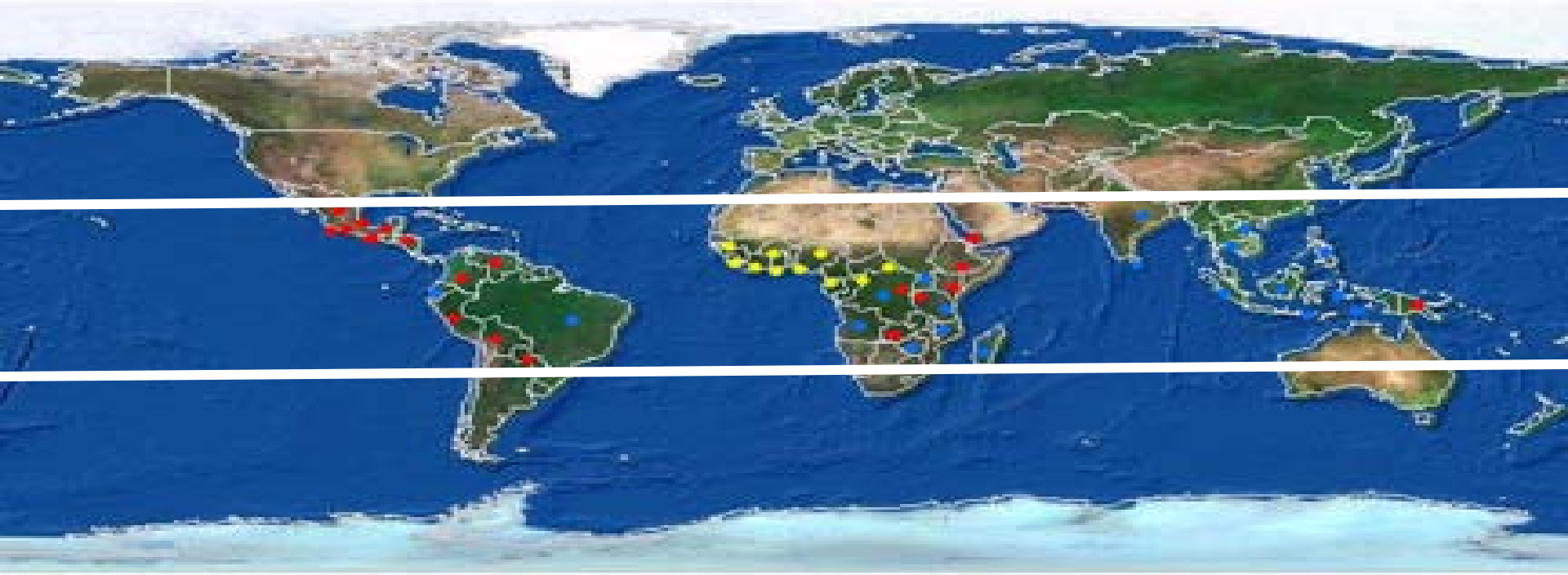
(CIC, 1998)

Coffee

There are four types ; arabica, canephora, liberica and excelsa.

Arabica Coffee

- ✓ 80% of total world production
- ✓ grows from equator to 25°N and 25°S
- ✓ temperature ranges 15 to 25°C with plenty of rainfall
- ✓ grows between 1000 to 2200 metres



Arabica Coffee in Papua New Guinea

- ✓First introduced to PNG in early 18th century by Dutch sailors
- ✓ Contribute 6.6% of GDP for agricultural sector.
- ✓ Arabica coffee grows mainly in the highlands and high altitude areas
- ✓More then 200 varieties
- ✓Only 6 are commercially viable
  - ❖ Catura, Catimor, Arusa, Mundo Novo, Typica and Burbon

✓Temperature; <15ºC die of frost or no crop (C_3)
>25ºC reduced photosynthesis rate
>30^{0}C leaf begin to suffer damage

✓Rainfall: high rainfall - encourage fungal diseases and flowering abnormalities
(flowering is induced by rain only following water stress)

low rainfall - encourage maturity of cherries
prolonged water stress will effect yield and plant dies.

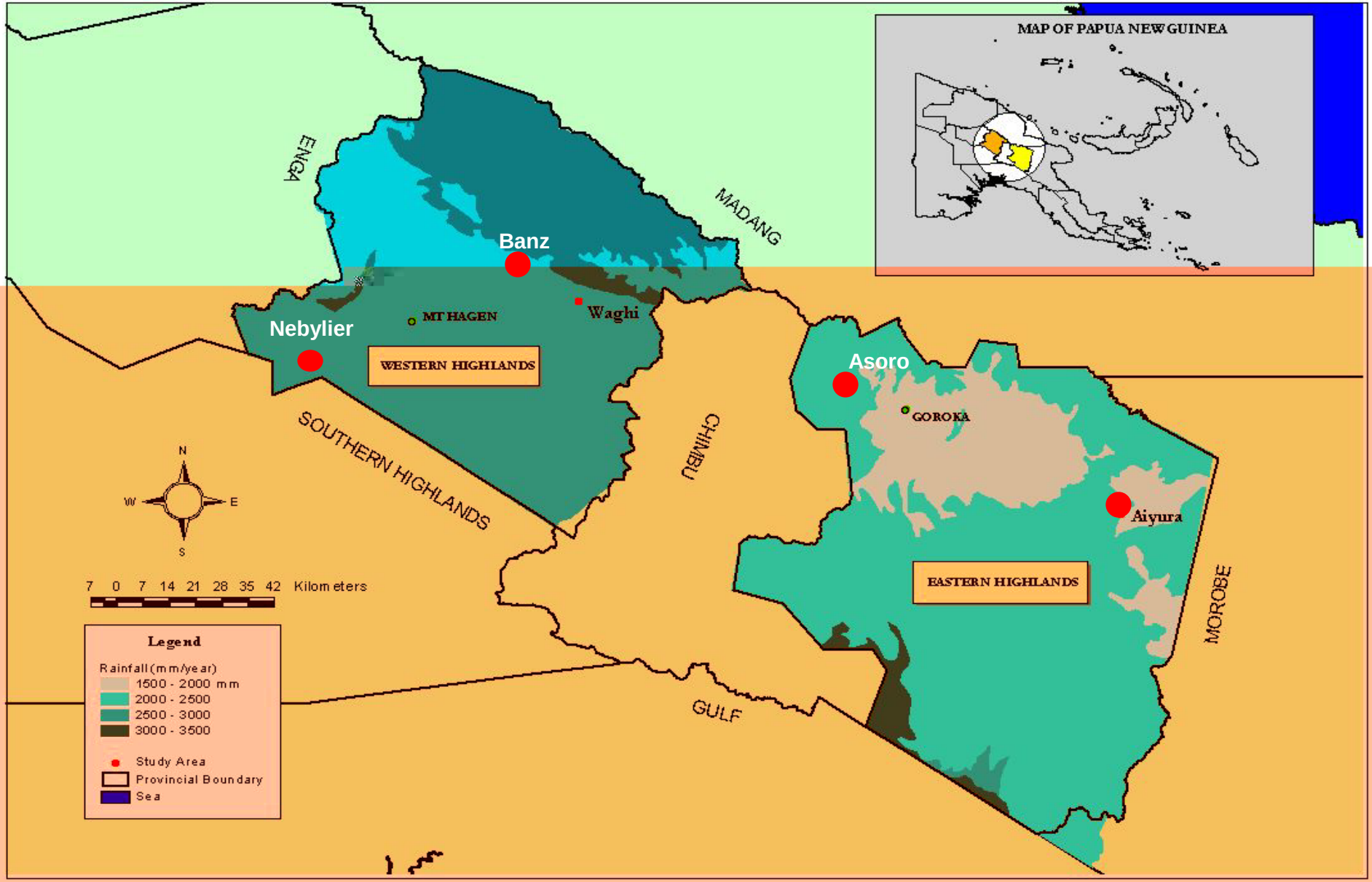
STUDY OBJECTIVE

The research therefore is trying to find out whether;

1) ***there are different effect of climate change in different arabica growing areas of the highlands region which has contributed to the daily weather pattern and thus decline in export quantity;***

2) the highlands region does have a clear wet and dry season as other coastal and the island areas of the country

STUDY AREA


MAP OF PAPUA NEW GUINEA
ENGA
MADANG
Banz
MT HAGEN
Waghi
Nebylier
WESTERN HIGHLANDS
SOUTHERN HIGHLANDS
CHIMBU
Asoro
GOROKA
Aiyura
EASTERN HIGHLANDS
MOROBE
GULF
N
W
E
S
7 0 7 14 21 28 35 42 Kilometers
Legend
Rainfall (mm/year)
1500 - 2000 mm
2000 - 2500
2500 - 3000
3000 - 3500
Study Area
Provincial Boundary
Sea

DATA SETS

There are three methods used for this research.

A.Interactive discussion survey with sample of population.

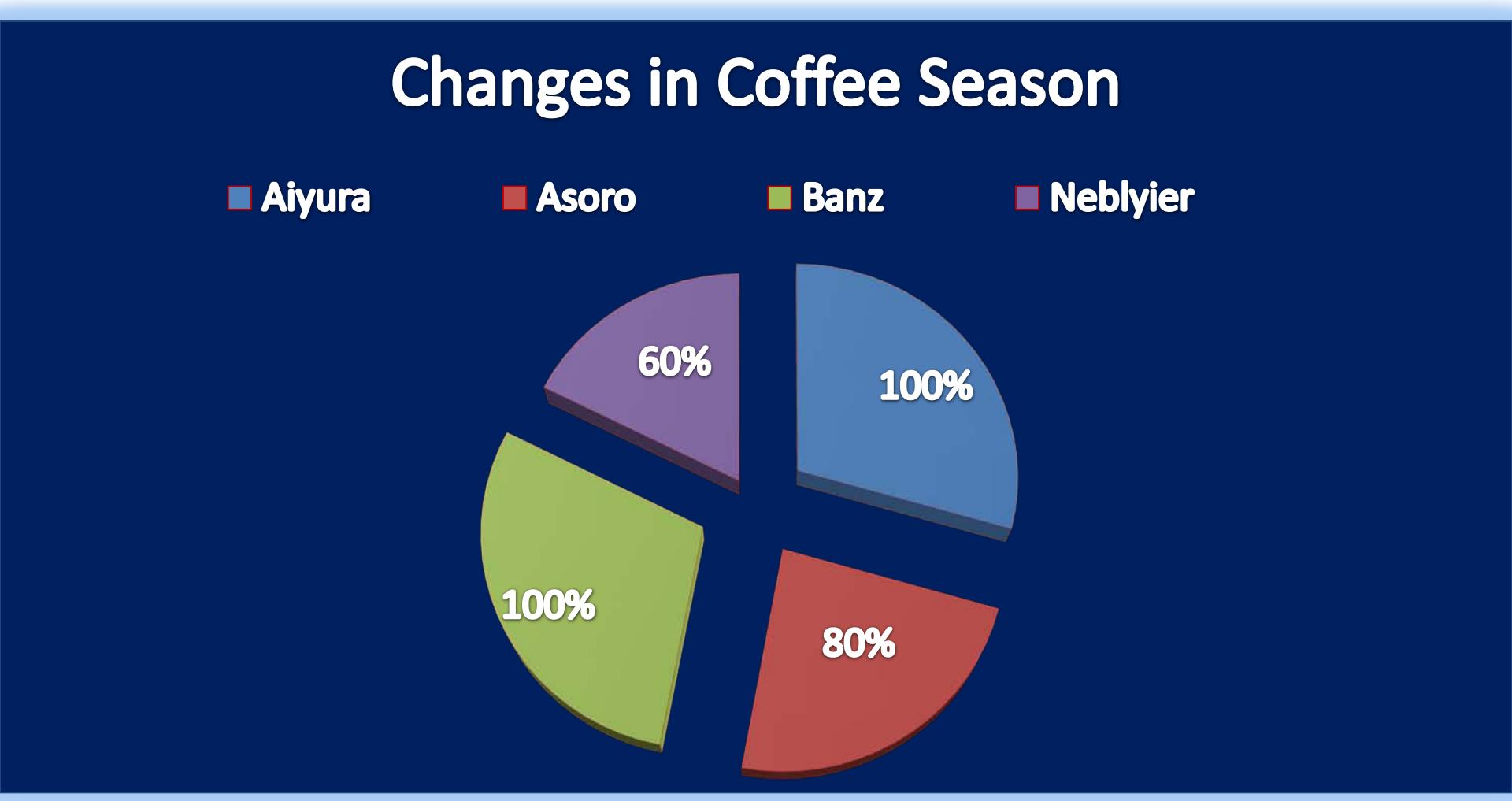
B.Rainfall and Max/Min Temperature from Goroka and Aiyura.

C.Annual coffee export data

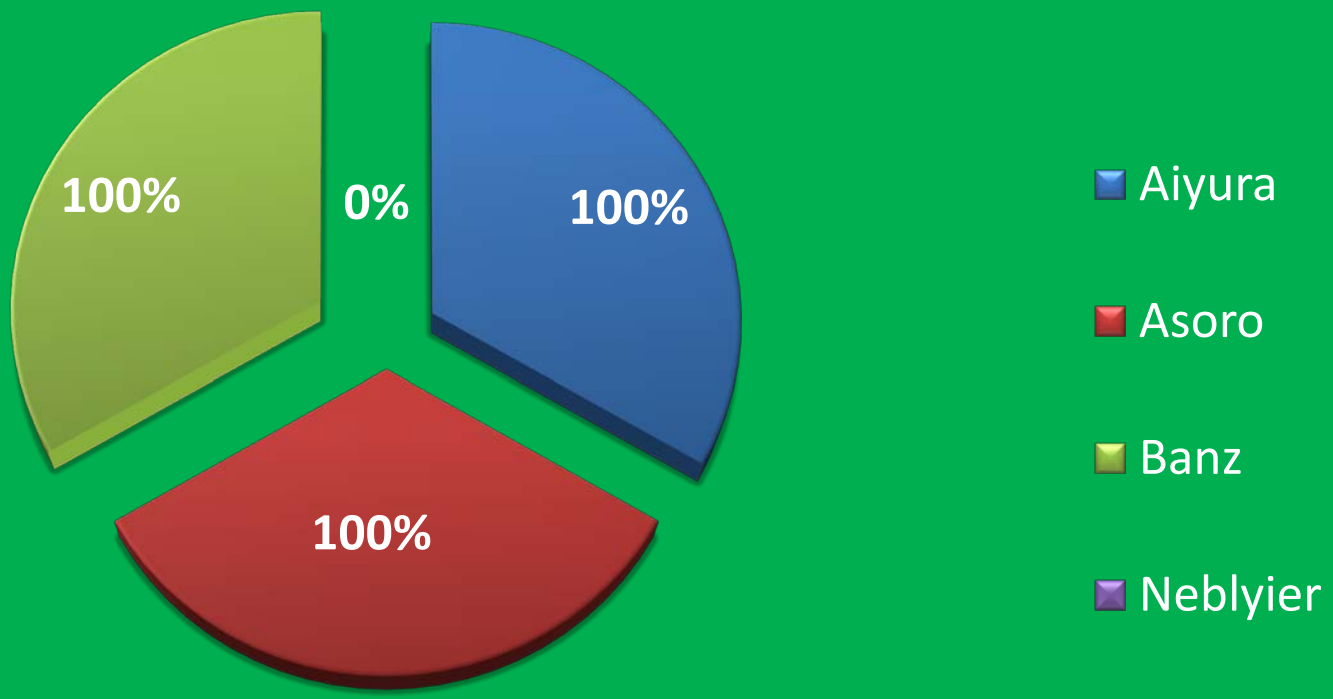
RESULTS

Survey

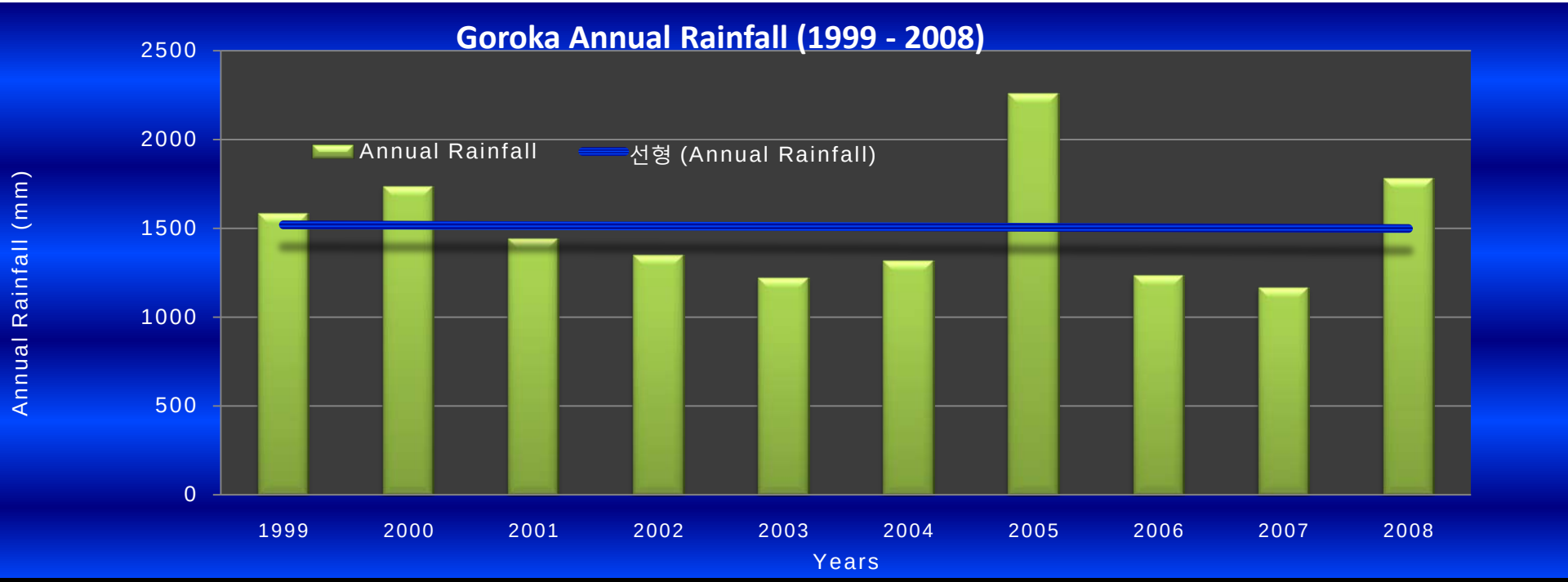
The survey analysis demonstrated that the arabica coffee did not flower and produce bean according to its normal cycle, instead, it flowered and produced the crop all year around.

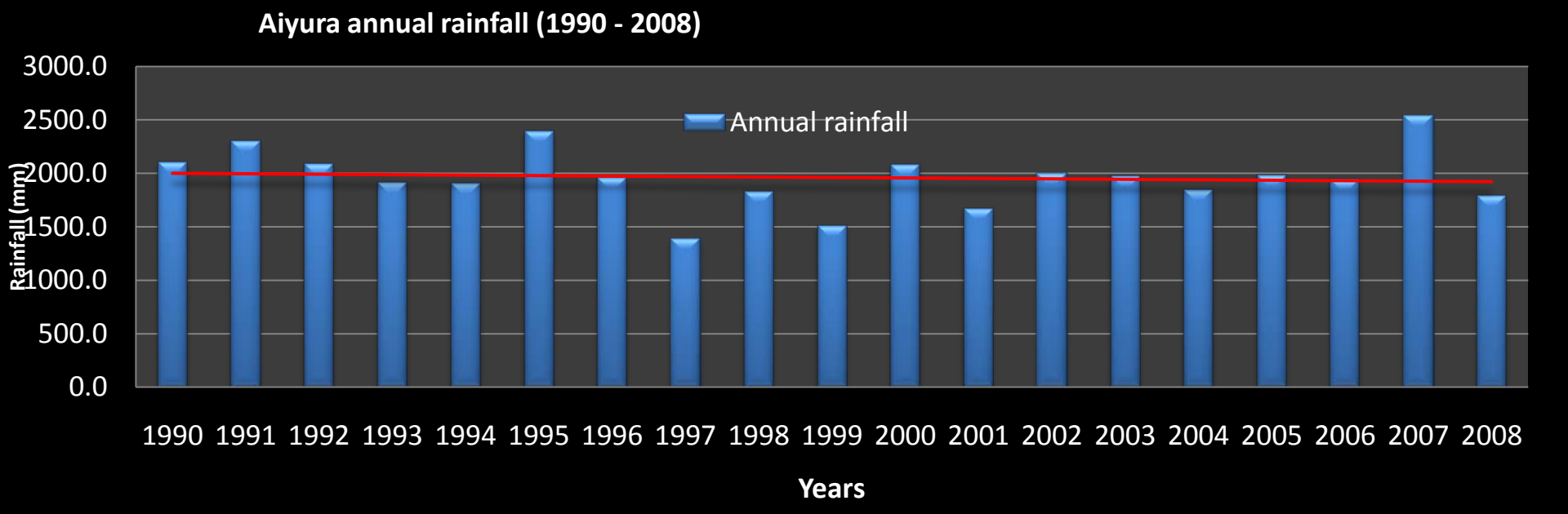


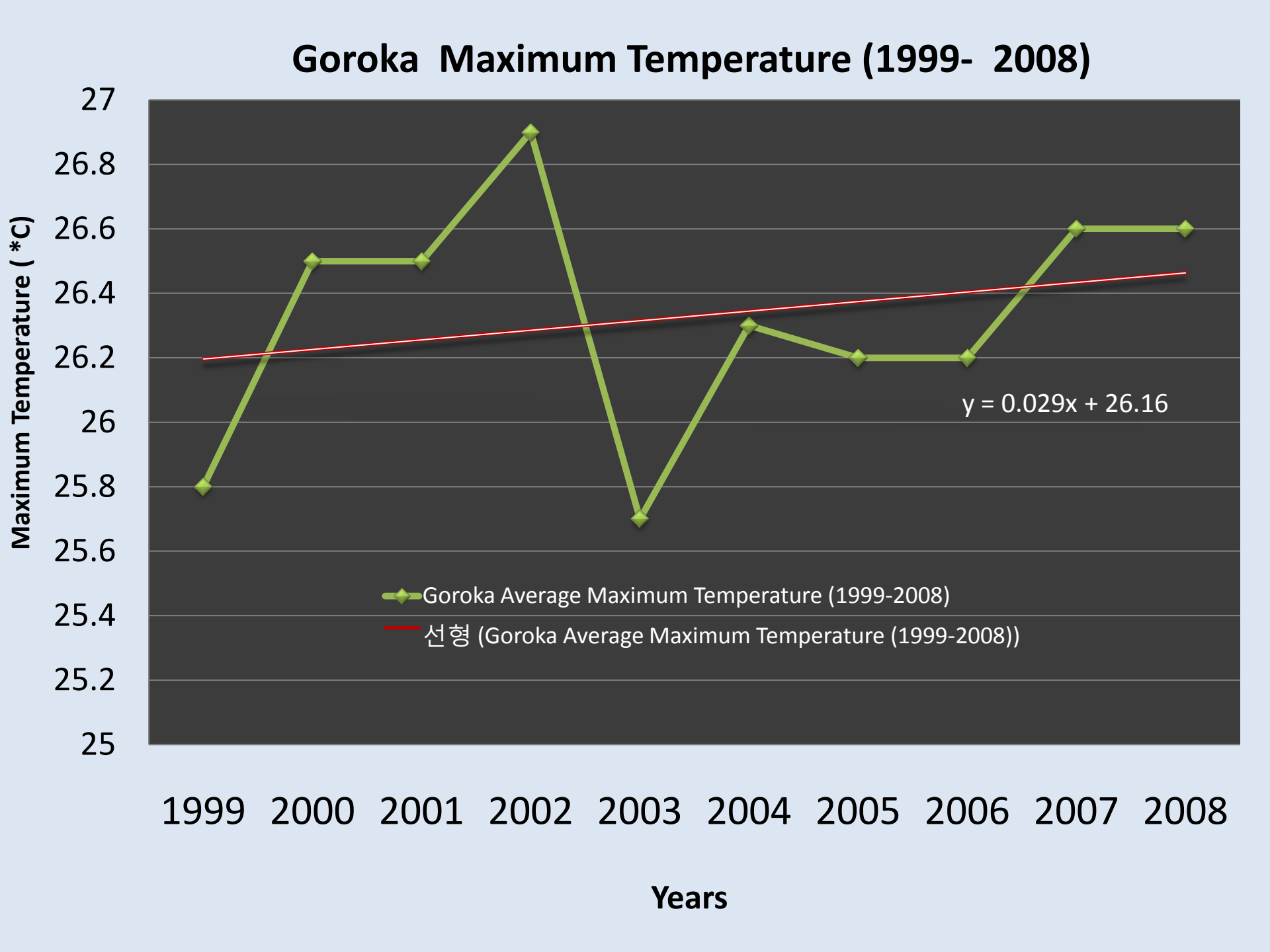
New Coffee Gardens

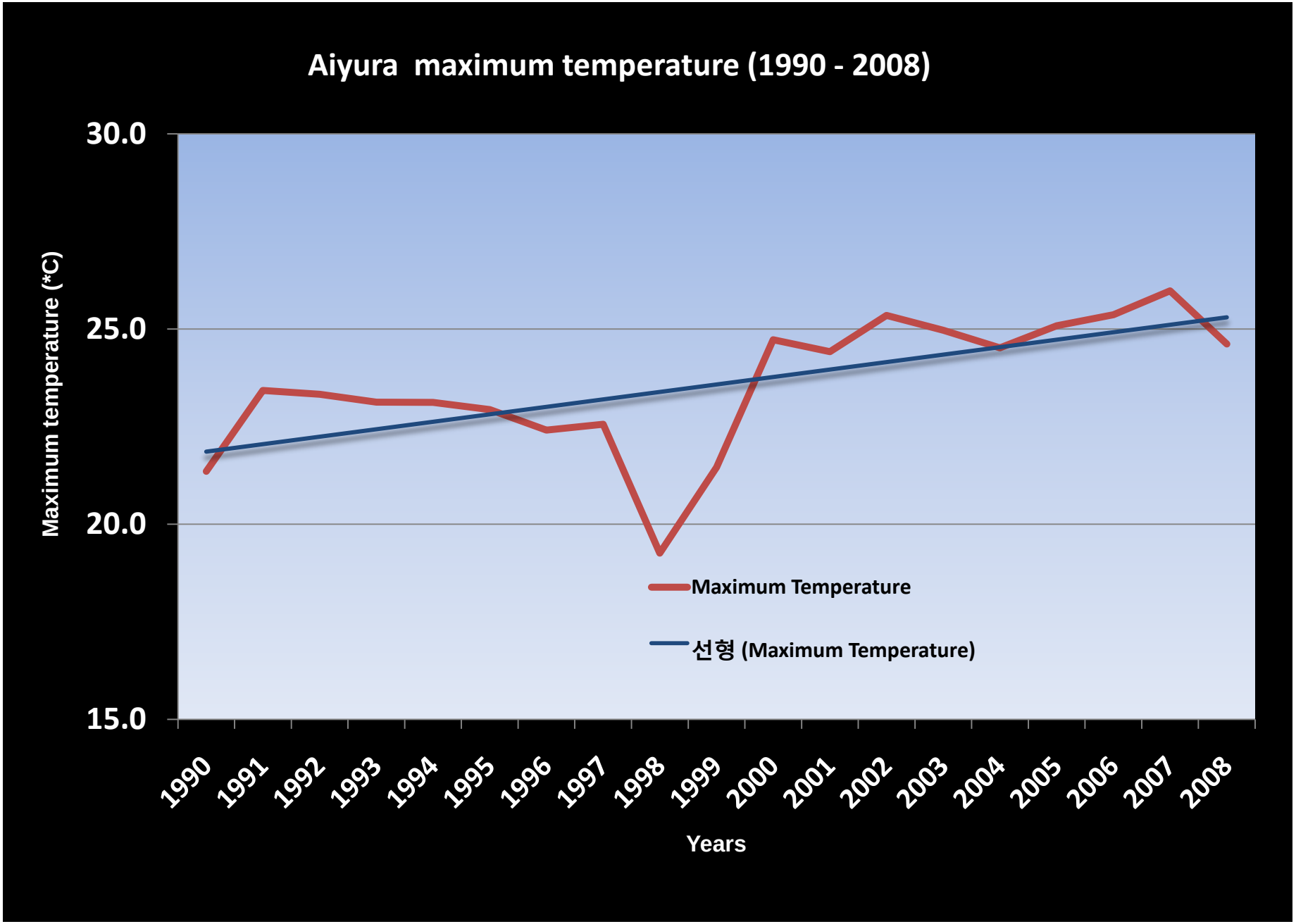


Weather & Climate

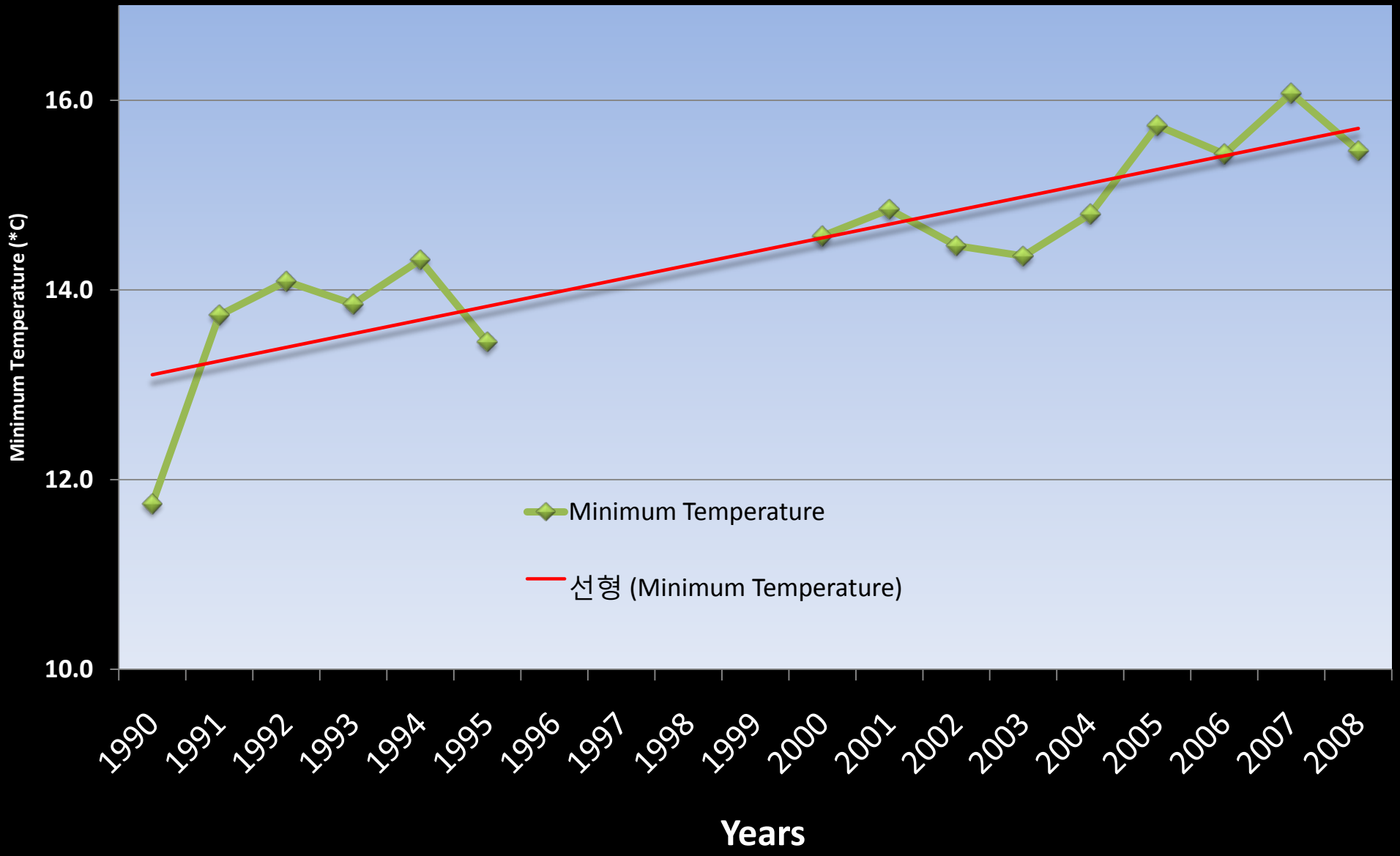




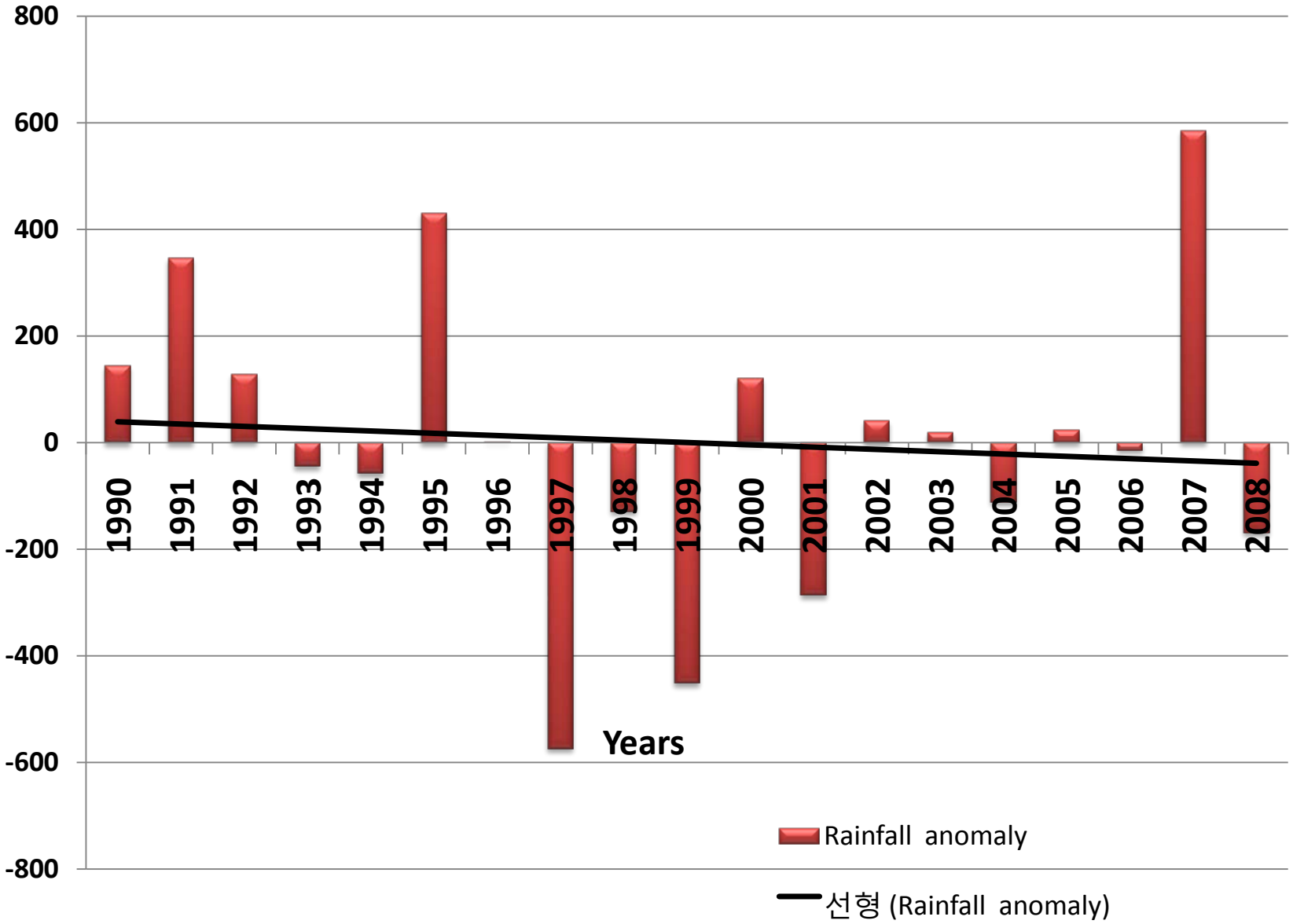

Goroka Maximum Temperature (1999- 2008)
Maximum Temperature (*C)
27
26.8
26.6
26.4
26.2
26
25.8
25.6
25.4
25.2
25
y = 0.029x + 26.16
Goroka Average Maximum Temperature (1999-2008)
선형 (Goroka Average Maximum Temperature (1999-2008))
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Years


Aiyura maximum temperature (1990 - 2008)
30.0
25.0
20.0
15.0
Maximum temperature (*C)
Maximum Temperature
선형 (Maximum Temperature)
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Years

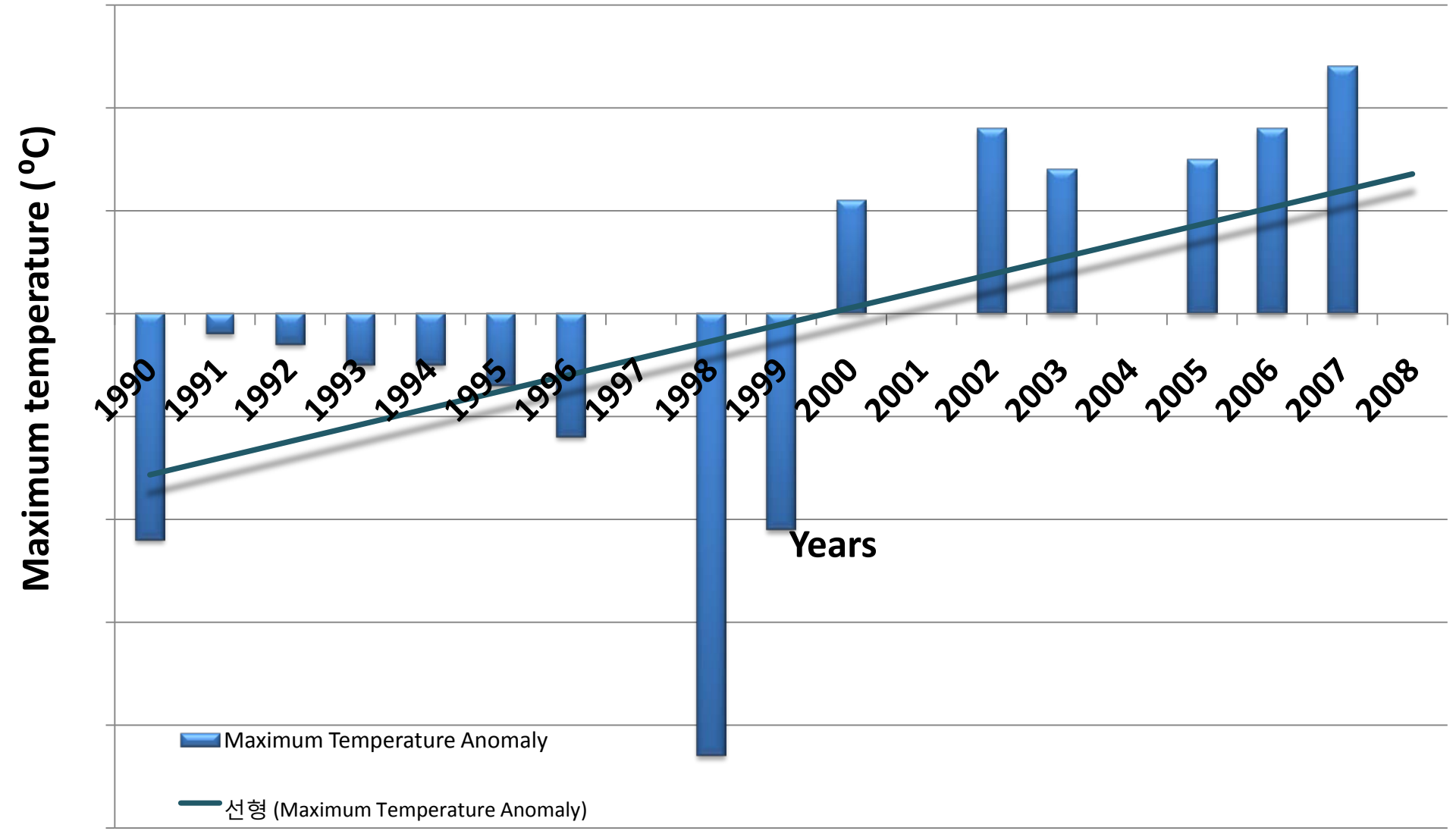
Aiyura minimum temperatures (1990 - 2008)

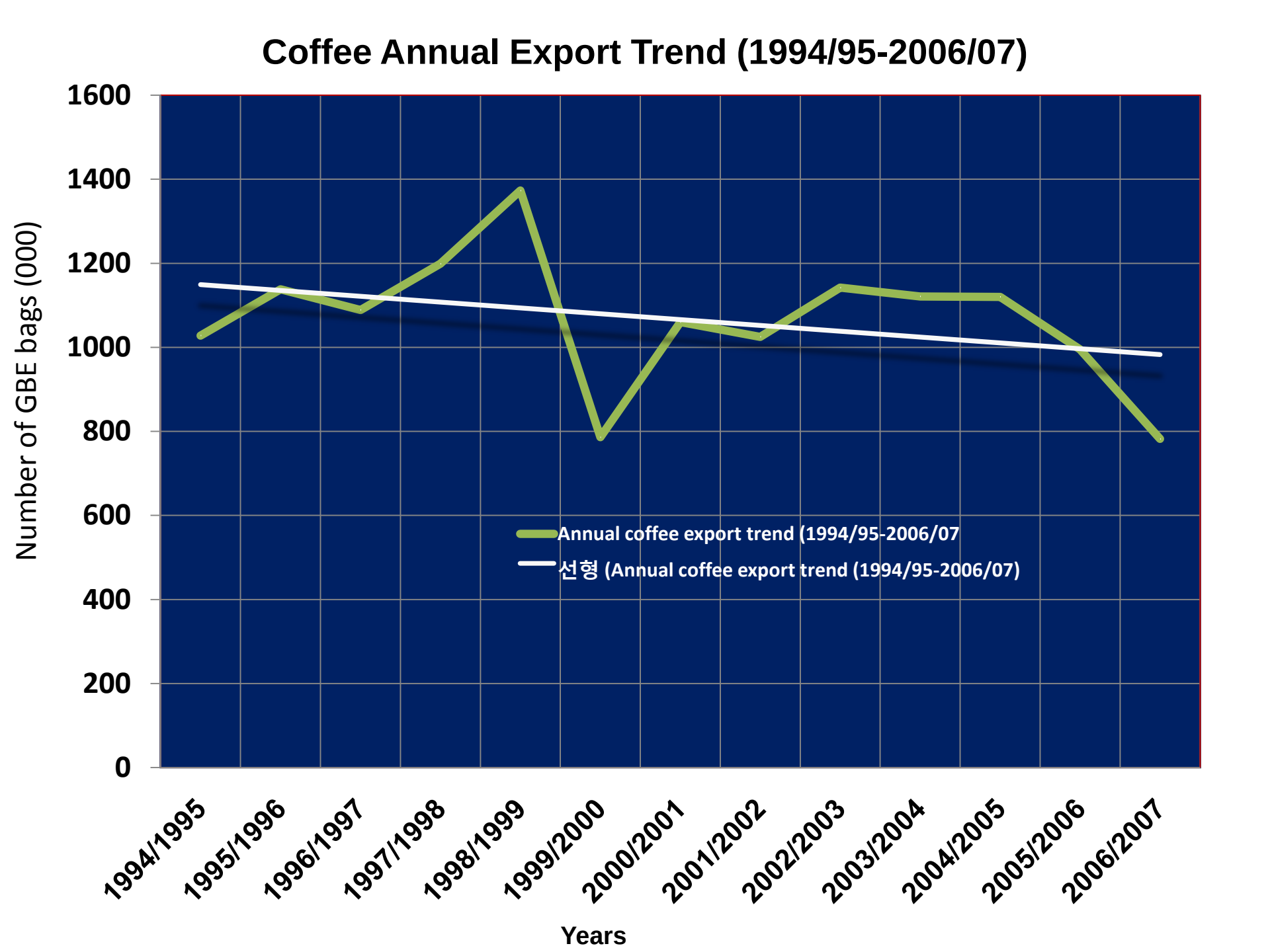


Aiyura Rainfall anomaly (1990 - 2008)



Aiyura Maximum Temperature Anomaly (1990 - 2008)




Coffee Annual Export Trend (1994/95-2006/07)
Number of GBE bags (000)
1600
1400
1200
1000
800
600
400
200
0
Annual coffee export trend (1994/95-2006/07
선형 (Annual coffee export trend (1994/95-2006/07)
1994/1995
1995/1996
1996/1997
1997/1998
1998/1999
1999/2000
2000/2001
2001/2002
2002/2003
2003/2004
2004/2005
2005/2006
2006/2007
Years

DISCUSSION

A. Survey Data

- Arabica coffee flowers and bears cherries all year around instead. of being a seasonal crop.
- Uncertainty in the upper part (west) of Western Highlands (Nebylier)
- Highlands areas do not have a defined wet and dry season.

B. Weather & Climate Data

- Rainfall is gradually decreasing in the study areas.
- The temperatures are showing generally increasing trend.

C. Coffee Export Data

- The export quantity is also showing a gradual decrease in the annual trend.

- No correlation between rainfall and temperature against coffee export data.

SUMMARY & CONCLUSION

It is evident that with the impact of climate change, highlands would be experiencing warmer conditions and less rainfall.

Coffee Industry Corporation must invest in mitigation and adaptation measures to save the industry from the adverse impact of climate change on arabica coffee.

Mitigation

- ✓ Improve farming practices
- ✓More shade
- ✓Mulching
- ✓Irrigation

Adaptation

- ✓Breed warmer condition cultivar (variety)
- ✓Innovative technology development (thin layer drier)
- ✓Move up to higher altitude areas

- Arabica coffee in PNG will be greatly affected as a result of climate change. (increase temperature, decrease rainfall trend & unseasonal flowering)

- It would be a benefit for the farmers but at the expense of less crop.

- There is a relationship between the weather/climate and coffee export trend. Therefore, weather and climate do affect the export quantity of coffee in PNG.

- Adequate adaptation and mitigative measures must be a priority to safeguard the industry and more collaborative effort among the stakeholders through research is the only way forward for the industry.

- PNG's experience would be similar to other arabica coffee growing nation of the world. Arabica coffee may be a good climate indicator

WAY FORWARD

➢ *Improve Data Collection Network*

1.Establish additional meteorological/climate stations in highlands of PNG.

2.Extend study to other sectors (energy, agriculture, water and health) to share and collect climate data.

➢ **Research**

1.Collaborative research with agriculture sector to develop cultivar with unfavourable temperature and drought tolerance trait.

2.Effect of climate change on our environment and society.

Thank you for listening!