

*Producing Small Fruit Berry Crops in
Mild Winter Climates*

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Small fruit "Berry" crops

- Blueberry



- Blackberry



- Raspberry



Blueberry nutraceutical value

BLUEBERRIES A Handful of Health

Plump, juicy, and sweet, with vibrant colors ranging from deep purple-blue to blue-black and highlighted by a silvery sheen called a bloom, blueberries are one of nature's great treasures. Though miniature in size, they are also proof that, when it comes to health benefits, good things really do come in small packages.



BLUEBERRIES ARE...

LOW IN FAT.

A one-cup serving contains only **80 calories** and virtually no fat.

FULL OF PHYTONUTRIENTS.

Research suggests that the phytonutrients in blueberries, called polyphenols, have antioxidant and anti-inflammatory properties that may help lessen the inflammatory process associated with chronic conditions such as cardiovascular disease, cancer, and other age-related diseases.^{5,6,7}

FULL OF DIETARY FIBER.

A handful of blueberries helps satisfy recommended daily fiber intake.²

Fiber helps keep the body regular, the heart healthy, and cholesterol in check.³

PACKED WITH VITAMIN C.

One serving delivers almost **25%** of one's daily requirement of vitamin C.²

Vitamin C aids collagen formation and helps maintain healthy gums and capillaries and a healthy immune system.³

AN EXCELLENT SOURCE OF MANGANESE.

Manganese plays an important role in bone development and in converting proteins, carbohydrates, and fats into energy.⁴



NORTH AMERICAN BLUEBERRY CONSUMPTION

With blueberry production increasing to match rising levels of consumption, it's clear that more Americans are discovering just how good these Little Blue Dynamos are!

Total

283
million lbs.

349
million lbs.

414
million lbs.

749
million lbs.

853
million lbs.



15.5 oz.

17.8 oz.

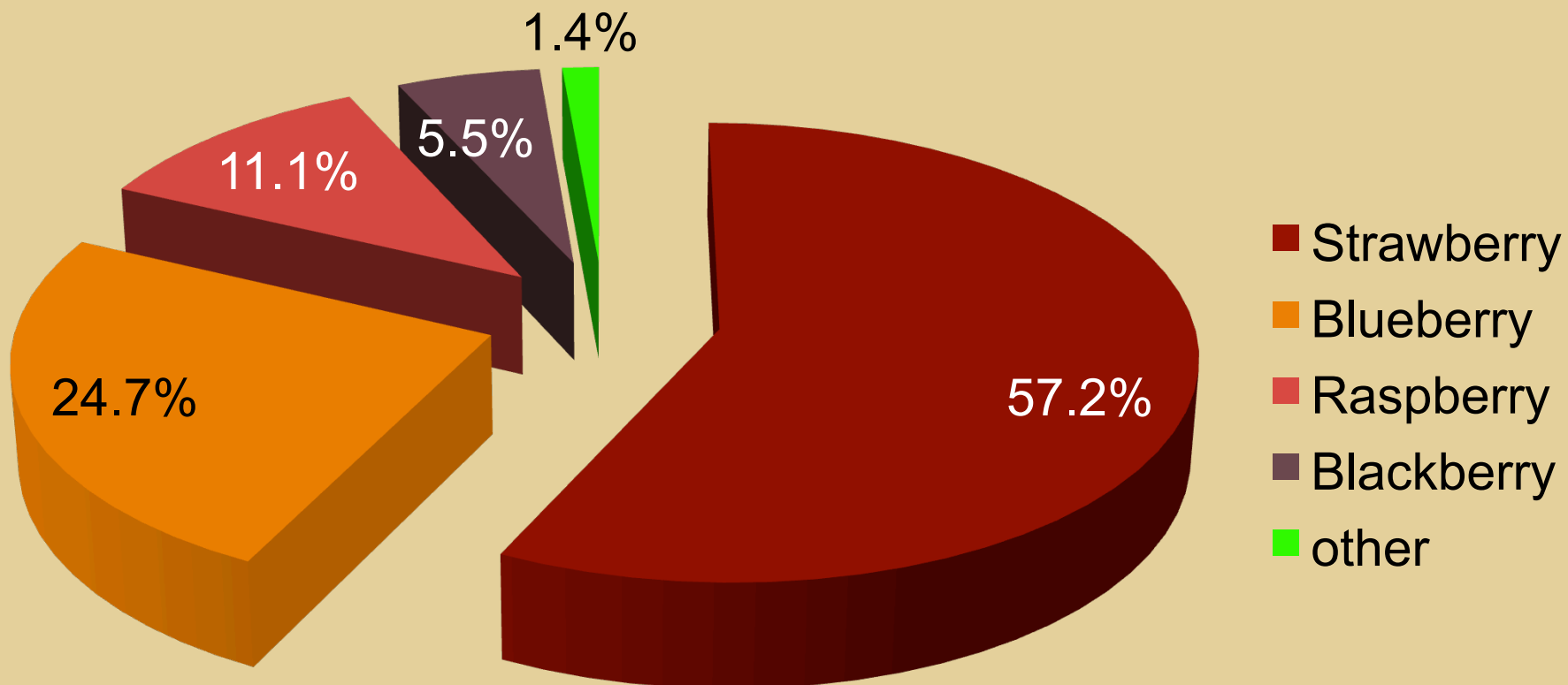
20.2 oz.

34.9 oz.

39.5 oz.

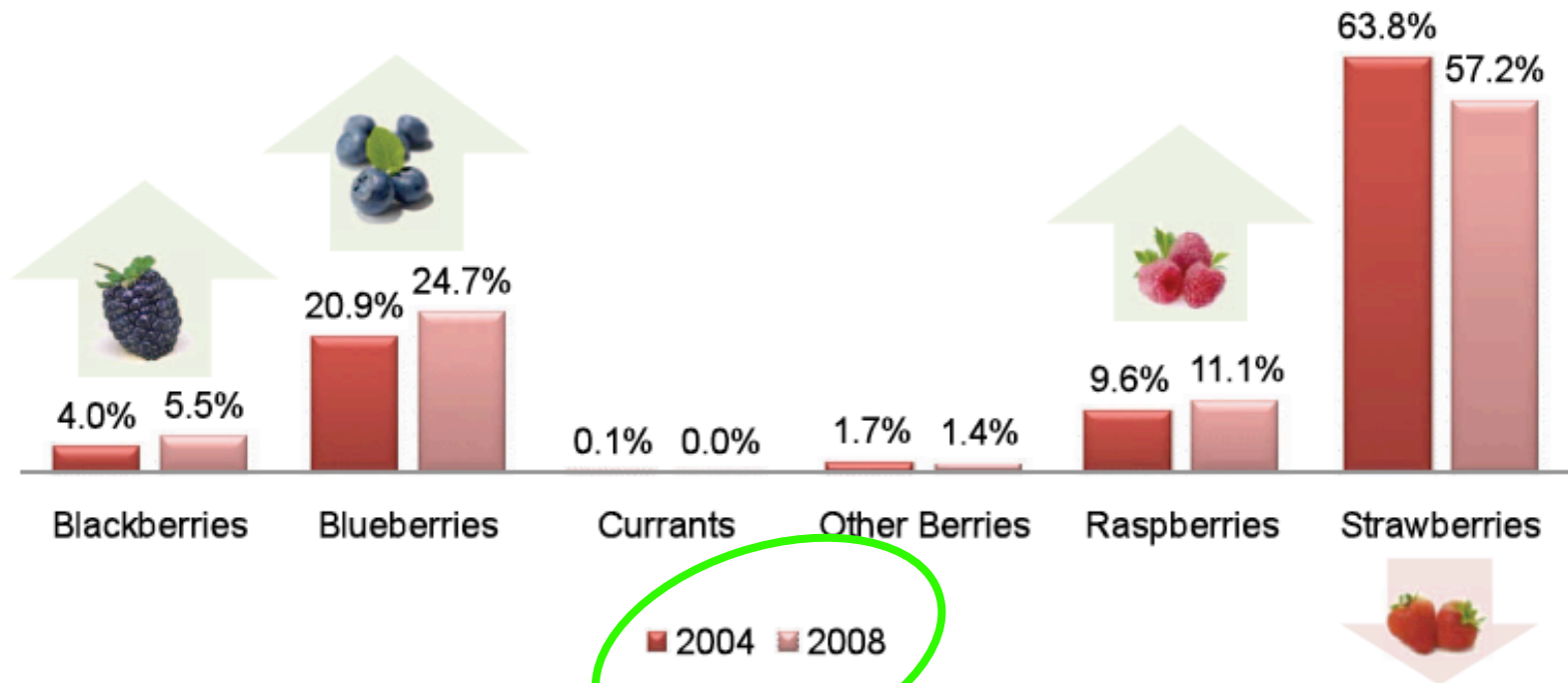
Per Capita

U.S. sales of small fruits - 2008



Consumer demand for small fruits - US

**Subcategory Contribution to Total Berries
2004 vs 2008**



Environmental factors affecting production

- *Temperature*
- *Moisture vs relative humidity*
- *Wind*
- *Soil environment*
- *Frost threat*



Temperature

- *Overall adaptation VS problems*
- *Frost, freeze threat*
- *Heat unit accumulation; timing*
- *Night VS day*
- *Soil temperature*
- *Fruit quality VS vegetative growth*

Environmental factors affecting production

- *Temperature*
- *Moisture VS relative humidity*
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Moisture VS relative humidity

- *Rainfall*
 - *soil moisture*
 - *salinity?*
 - *dust, mites, whitefly*
- *Relative humidity*
 - *disease incidence*
 - *fruit quality*



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Wind

- *Moisture loss*
 - *evapotranspiration (ET)*
 - *irrigation management*

- *Physical effects*
 - *cane breakage*
 - *fruit scarring*
 - *sand, soil abrasion*
 - *manage protected structures*

Environmental factors

- *Temperature*
- *Moisture VS relative humidity*
- *Wind*
- *Soil environment*
- *Freeze threat*

Soil environments

- *Physical properties*
- *Chemical properties*
- *Biological properties*



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Frost protection

- *Short-term losses*
 - *flower, fruit abortion*
 - *fruit damage*
 - *loss of market, production, price*
- *Plant little effected*
- *Protection*
 - *irrigation ~ 3-4° F.*
 - *wind machines > air mixing ~2-3° F*



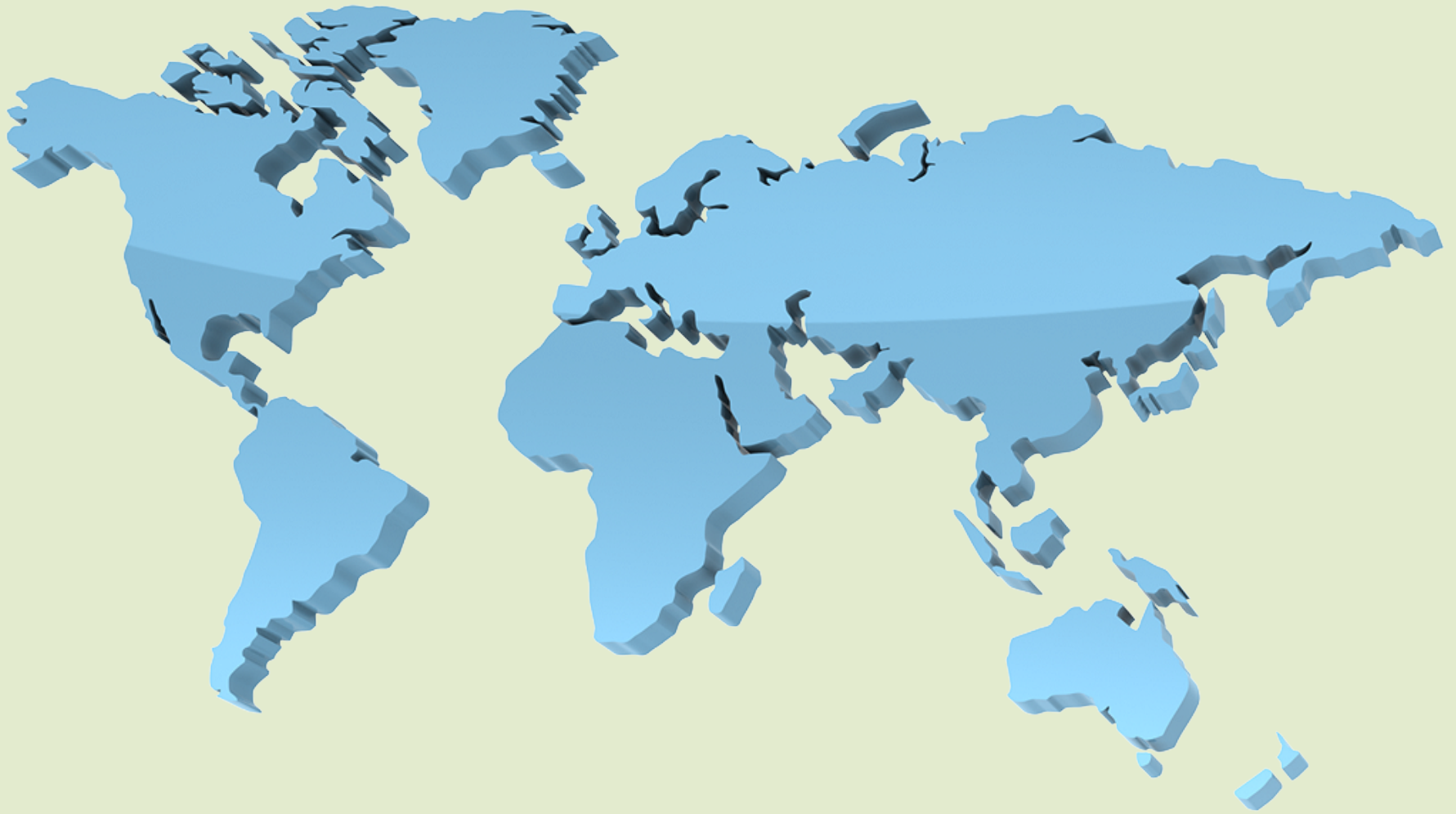
Climates dictate environmental conditions

- *Macroclimate*
 - geographic positions > marine vs continental*
 - latitude*
 - altitude*

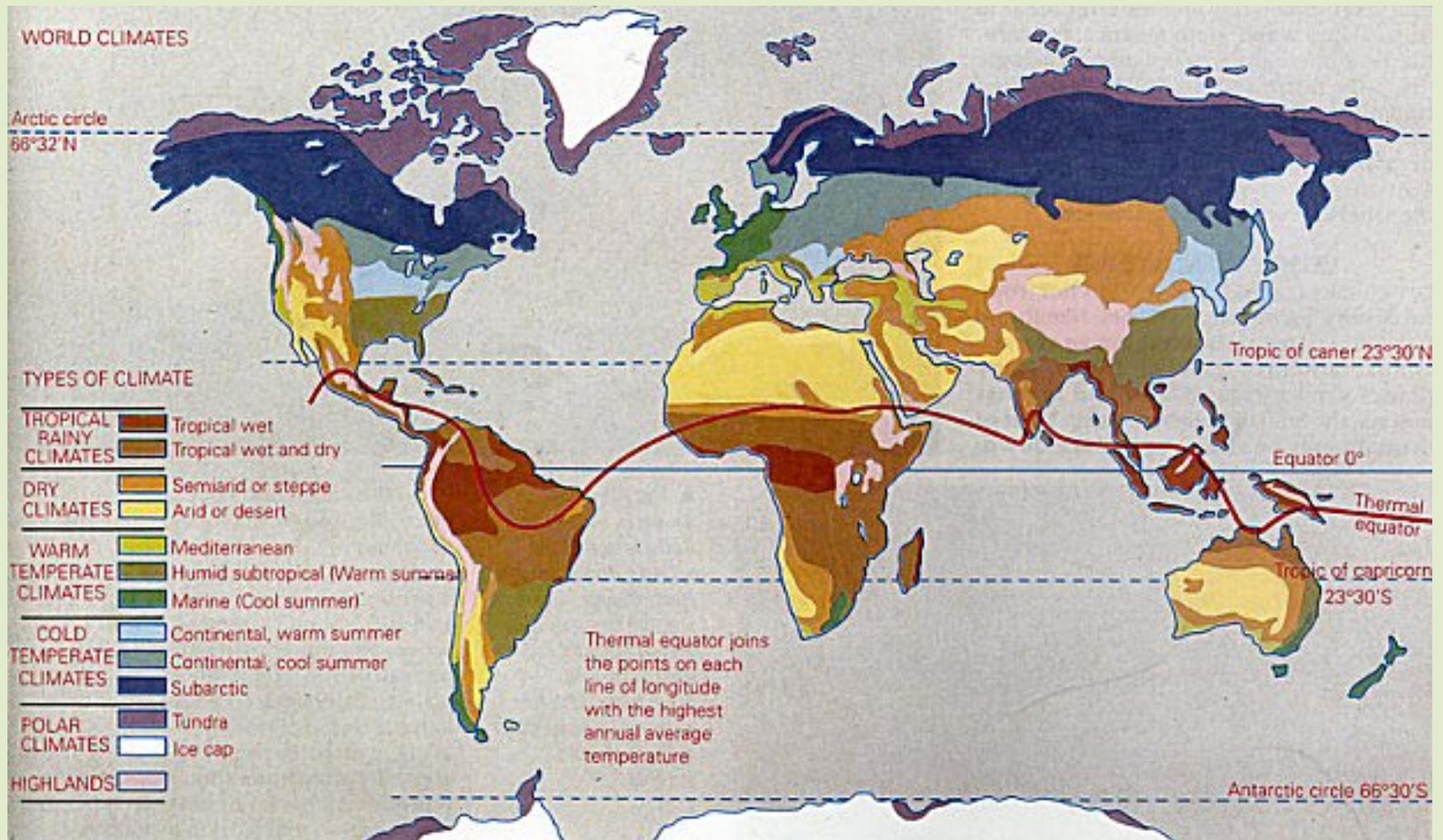
- *Microclimate*
 - plant canopy*
 - soil surface*
 - soil environment*



Macroclimates

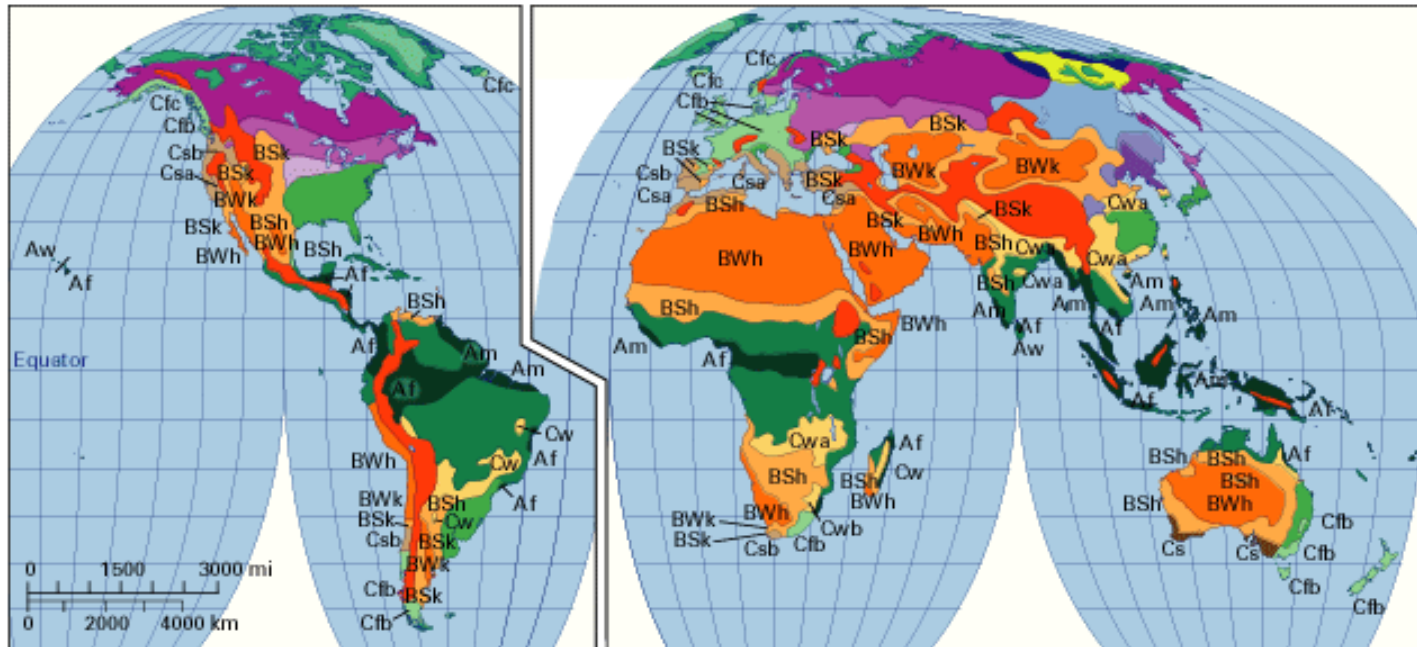


Macroclimates



Macroclimates

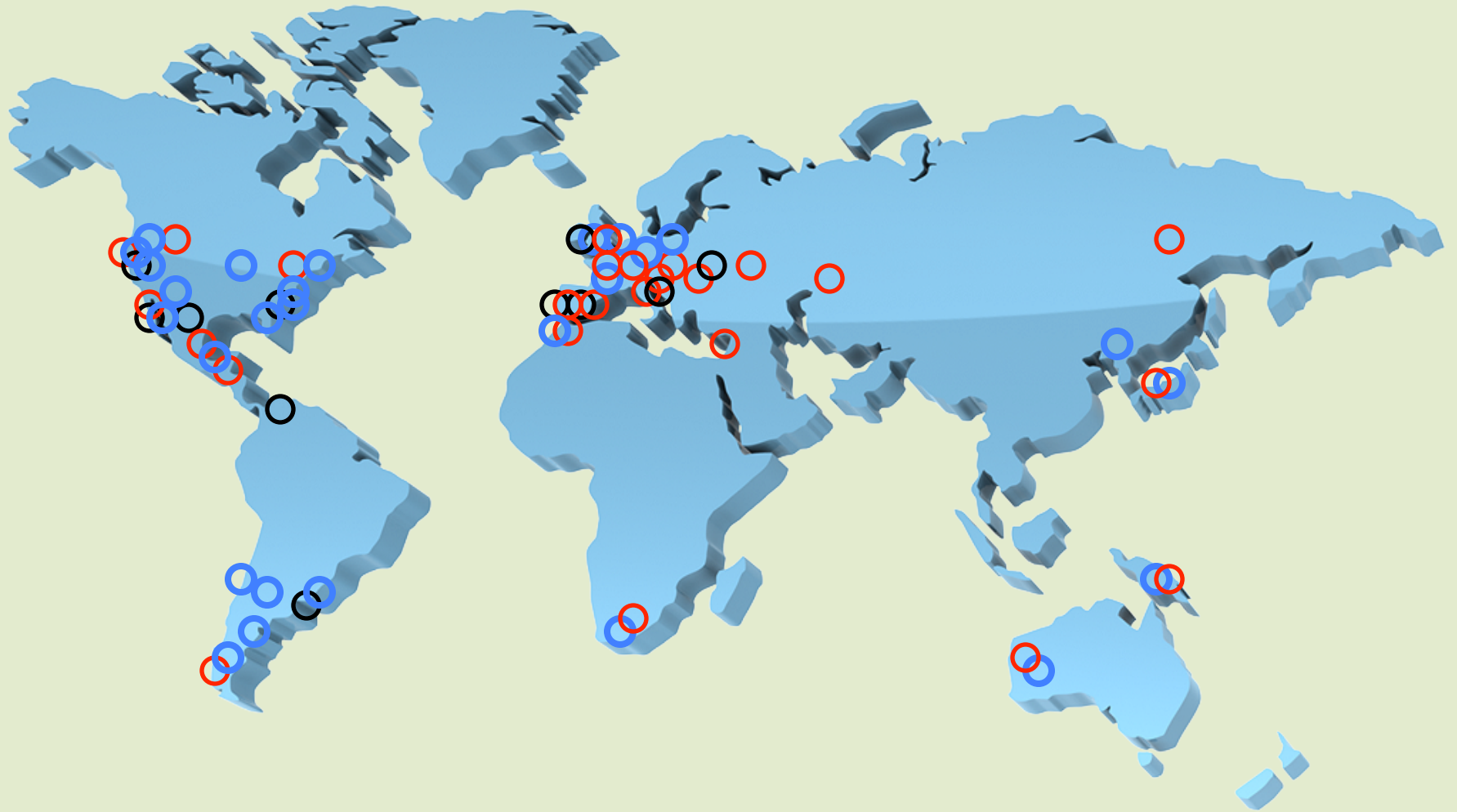
Köppen Climate Classification



Individual Climatic Zones Classified by Type

<p>Type A</p> <p>Tropical humid</p> <p>Af, Am</p> <p>Aw</p>	<p>Type B</p> <p>Dry</p> <p>BSk, BSh</p> <p>BWh, BWk</p>	<p>Type C</p> <p>Humid subtropical</p> <p>Cf</p> <p>Cfa</p> <p>Cw, Cwa, Cwb</p>	<p>Type C</p> <p>Mediterranean</p> <p>Cs</p> <p>Csa, Csb</p>	<p>Type C</p> <p>Marine west coast</p> <p>Cfb, Cfc</p>	<p>Type D</p> <p>Humid continental</p> <p>Dfa</p> <p>Dfb</p> <p>Dwa</p> <p>Dwb</p>
<p>Type D</p> <p>Continental subarctic</p> <p>Dfc</p> <p>Dfd</p> <p>Dwc</p> <p>Dwd</p>	<p>Type E, H</p> <p>Polar</p> <p>ET-Tundra</p> <p>EF-Snow and ice</p> <p>Highland</p> <p>H</p>				

Macroclimates



Small fruit berry crops

- *Small perennial shrubs or vines*



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- *Small perennial shrubs or vines.*
- *Share many production and marketing characteristics with strawberry.*
- *Historically cultivated in temperate cold areas.*
 - > now also into subtropical areas of US,*
 - Florida, California*

also Spain, Portugal, Morocco and highland tropics in Mexico and Central America

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Grown in open fields or "protected"



Blueberry

- *Historically high chill reqt., E. US, low pH soils*
- *Breeding effort began in 1970 to breed early, low-chill varieties for SE US*
- *California initiated serious R&D in late 1990s; now > 8,000 acres*
- *Chile and Argentina over-planted > California, Florida now compete for transition and early market; some beginning from MX*



Raspberry

- *Historically, processing and machine harvest.*
- *Backyard and minor fresh crop until 1980s;
CA production + exports from Chile, Central America.*
- *Driscoll's breeding since 1950's;
\ creation of major industry in California beginning in 1990s.*
- *Now 2-3rd most important crop in
Ventura and Watsonville and
industry in excess \$200 million.*
- *Based on intensive production in
tunnels and shortened crop cycle.*



Blackberry



- *Followed raspberry, processed, machine harvest.*
- *Backyard / minor fresh crop until 1980s;
CA production + exports from Chile, Central America.*
- *Breeding programs in Arkansas and Oregon; USDA
> major berry companies now have own programs.*
- *Sweeter, firmer fruit have led to growing demand and very
rapidly developing new industry.*
- *Mexico is major world supplier; US industry is strong around MX
arrivals.*

Production AND Fruit Quality

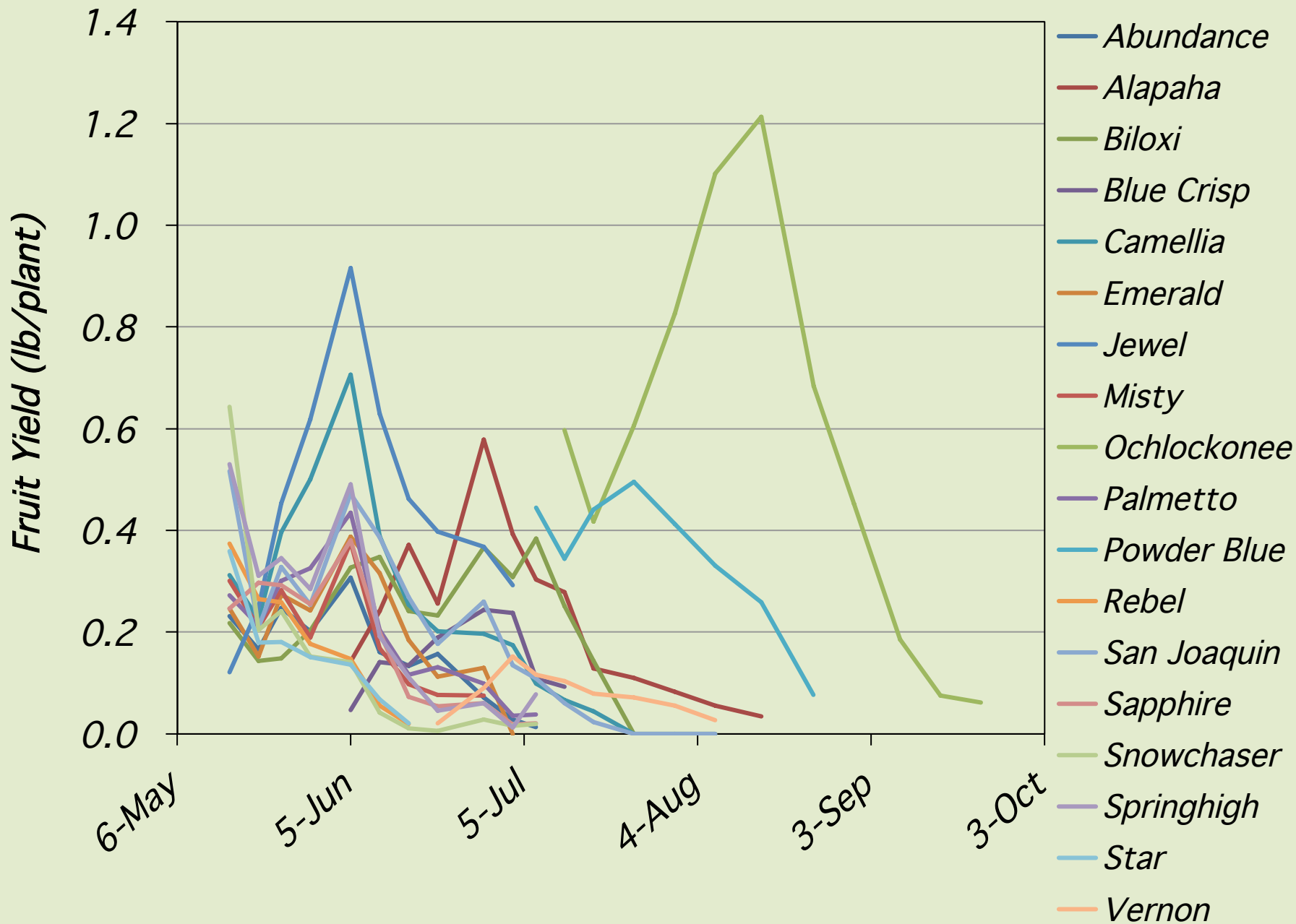


Berry crop environments

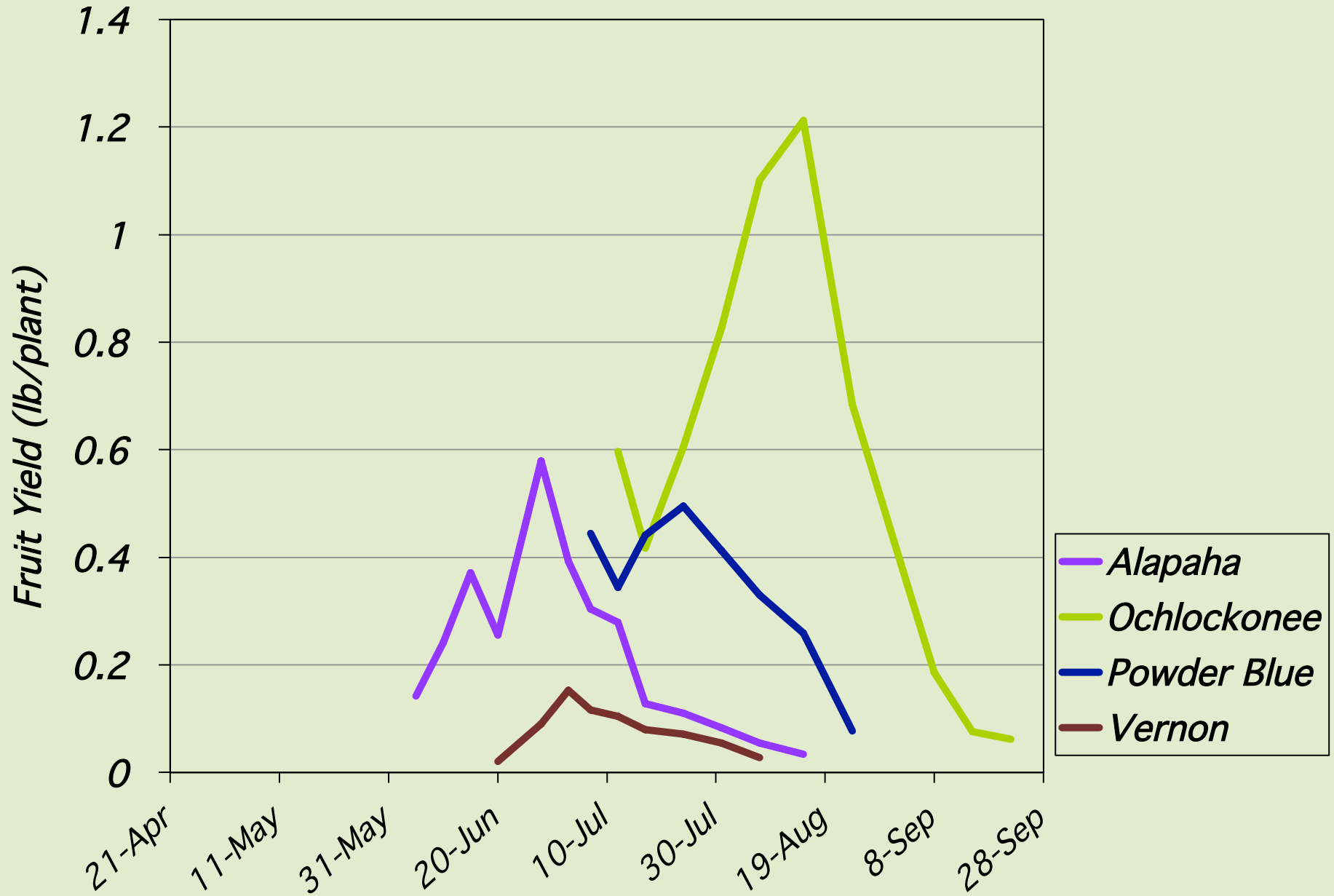


- *Temperature*
- *Moisture VS. relative humidity*
- *Wind*
- *Soil environment*

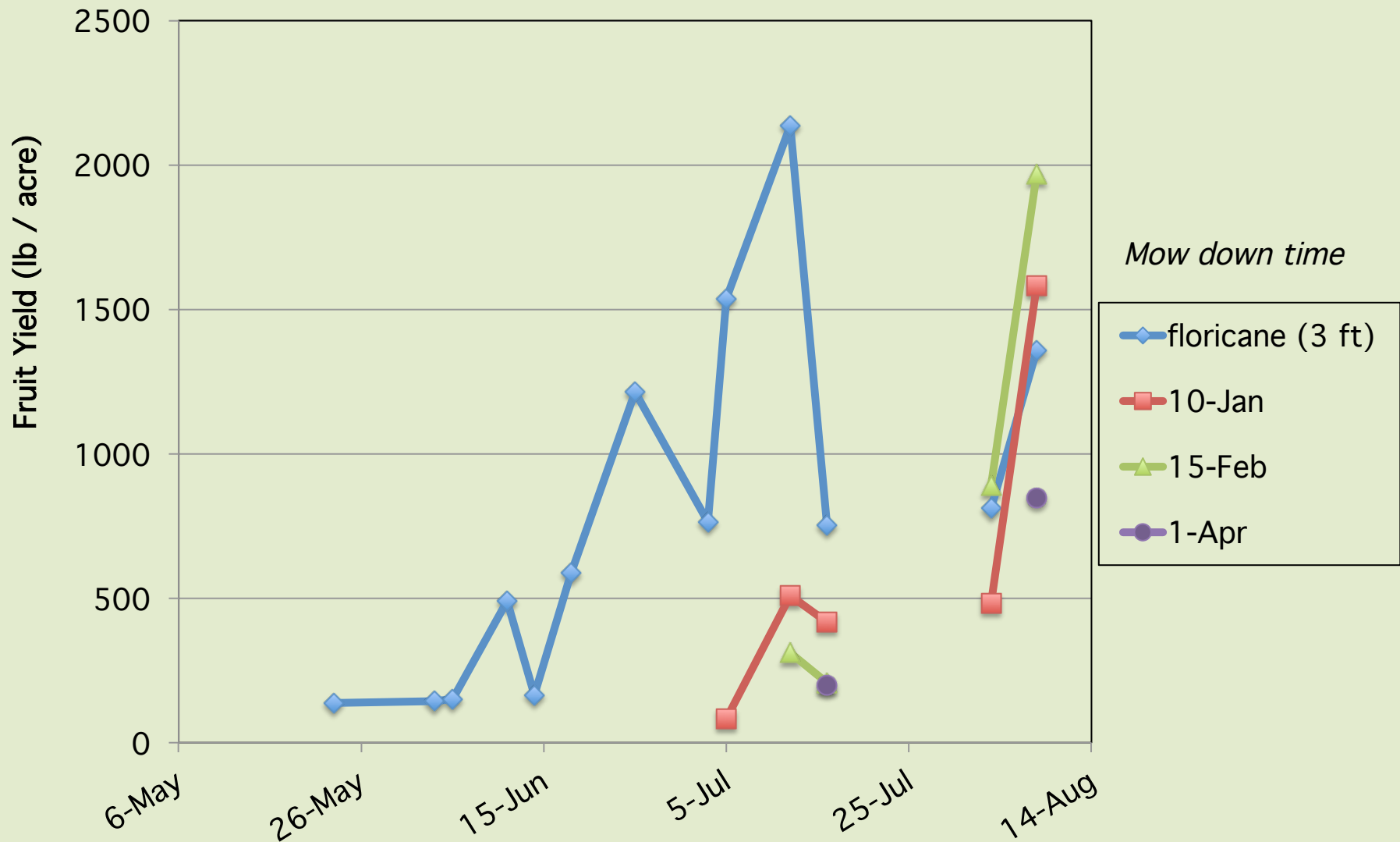
+ latitude, proximity to markets, labor, infrastructure?



Rabbiteye varieties for late season



Pruning primocane blackberries – Los Alamos, CA 2013



Organic Berry Production

- *Growing demand in North America, Europe, Asia
> more specialized market with premium prices*
- *Higher costs of production and more demanding management
> specialized skills and special research needs*
- *Very different soil environment – nutrient availability*
- *Very different pest management regimes
- managing weeds, insect pests are more challenging*

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