



Dynamic Systems Model for a Flower Garden

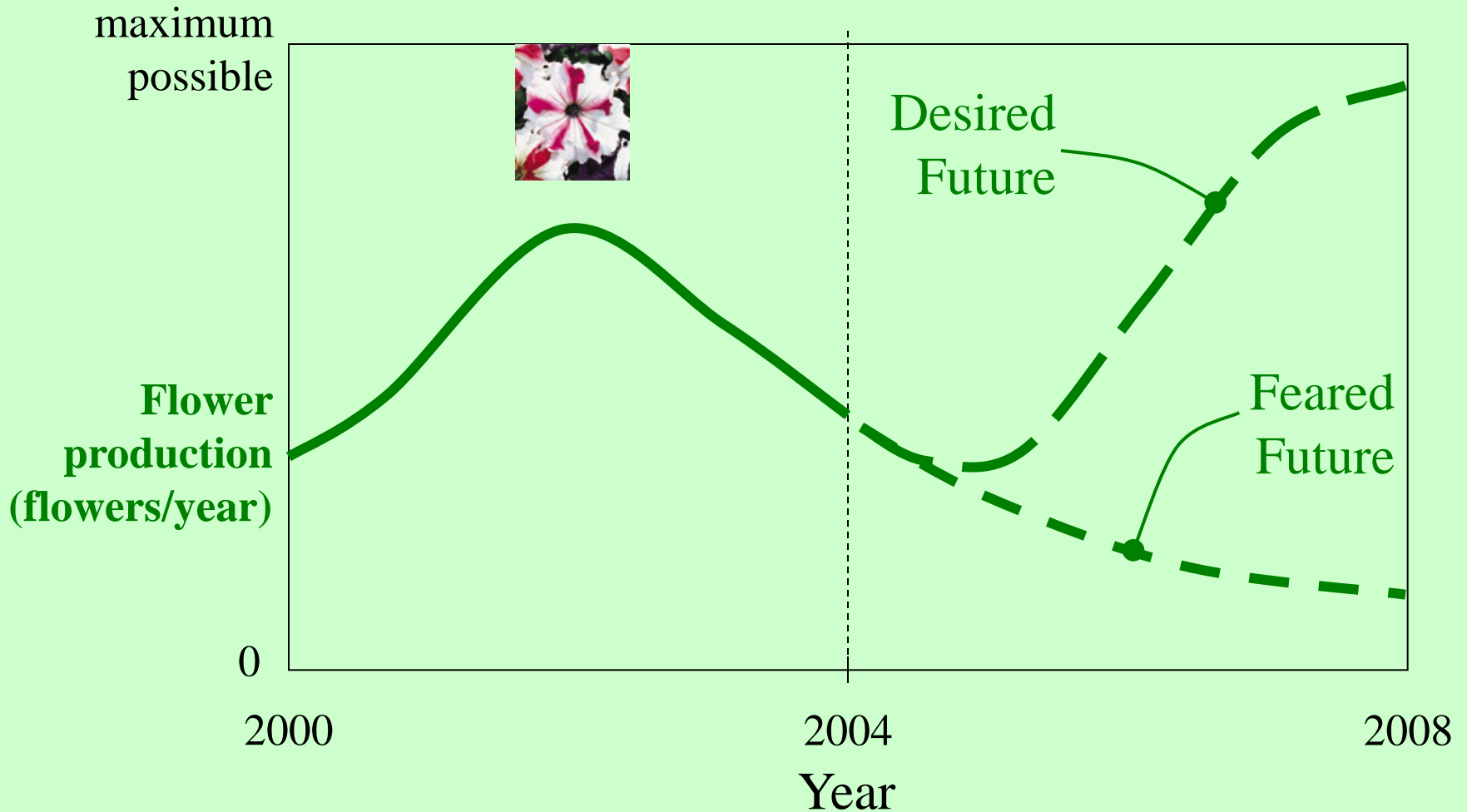
Created by

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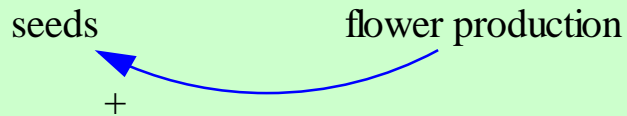
Slightly modified by John Gerber for UMass Ag Systems Thinking Class

Behavior-Over-Time-Graph (BOTG)

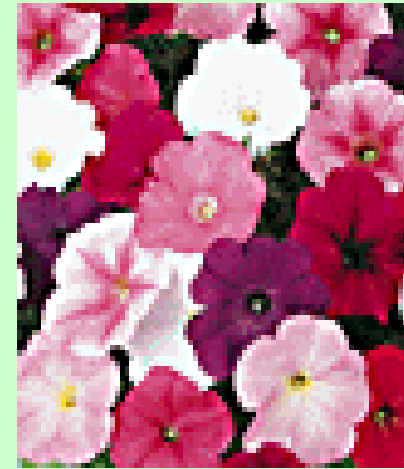
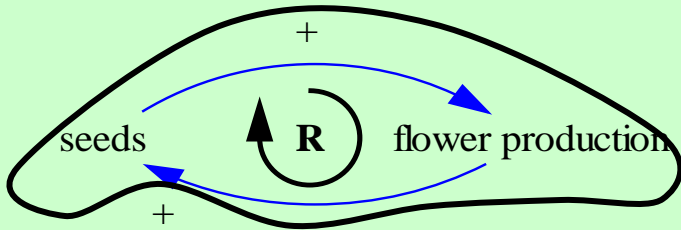


Student Problem Statement: **What can we do to create the desired future?**

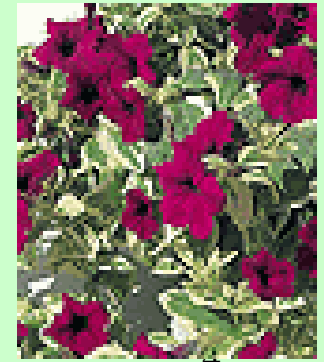
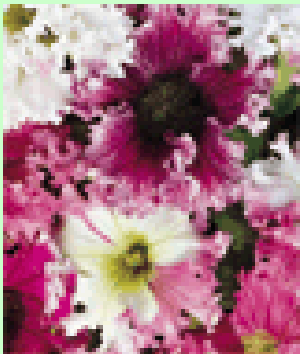
So, let's develop a hypothesis for growth and decline in flower production using dynamic systems..... Like this...

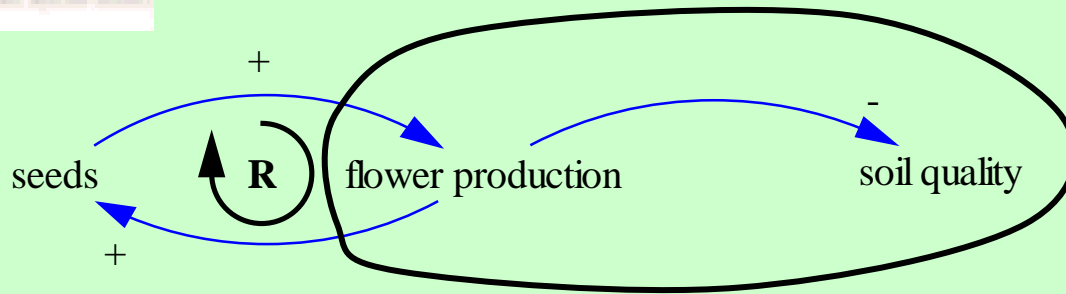


1. The more flowers produced per year, the more seeds are produced...

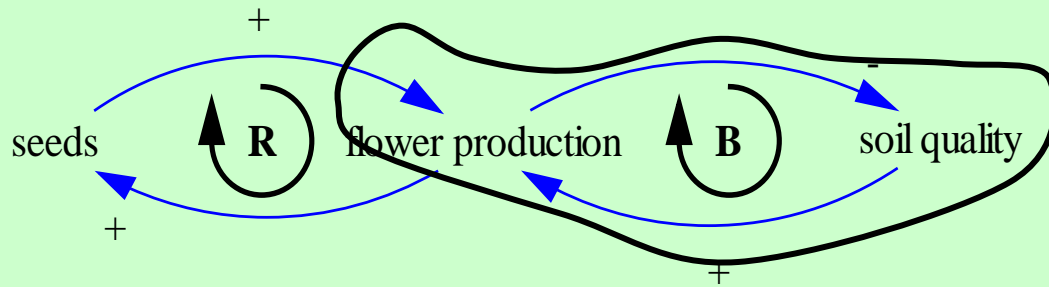


2. And the more seeds, the more flowers are produced. $R = + +$



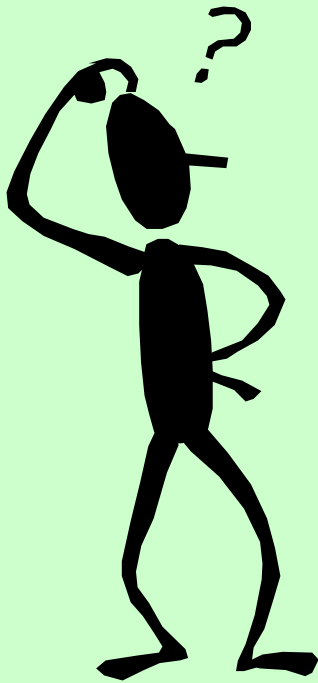


3. But more *flower production*, over time, also acts to decrease soil quality...

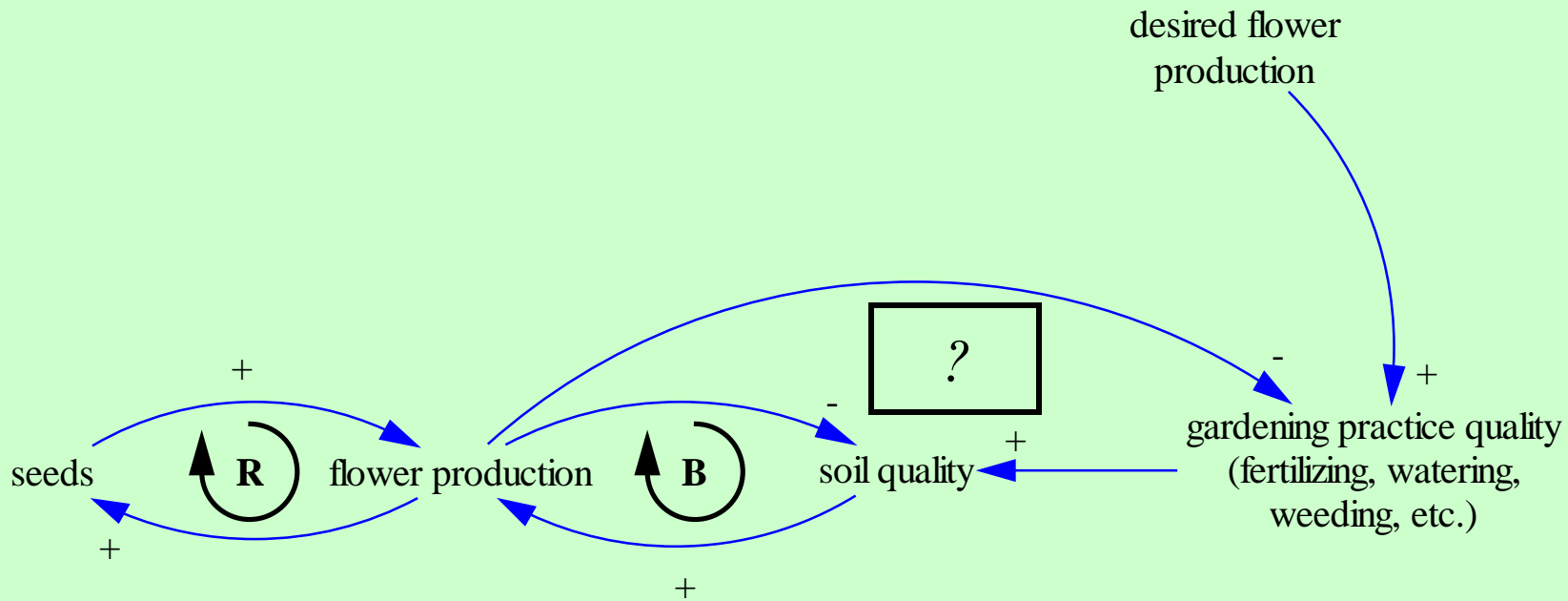


4. Reductions in *soil quality* cause corresponding reductions in *flower production*. **B** = + -

So, what can be done to reverse the trend
in decline of soil quality?

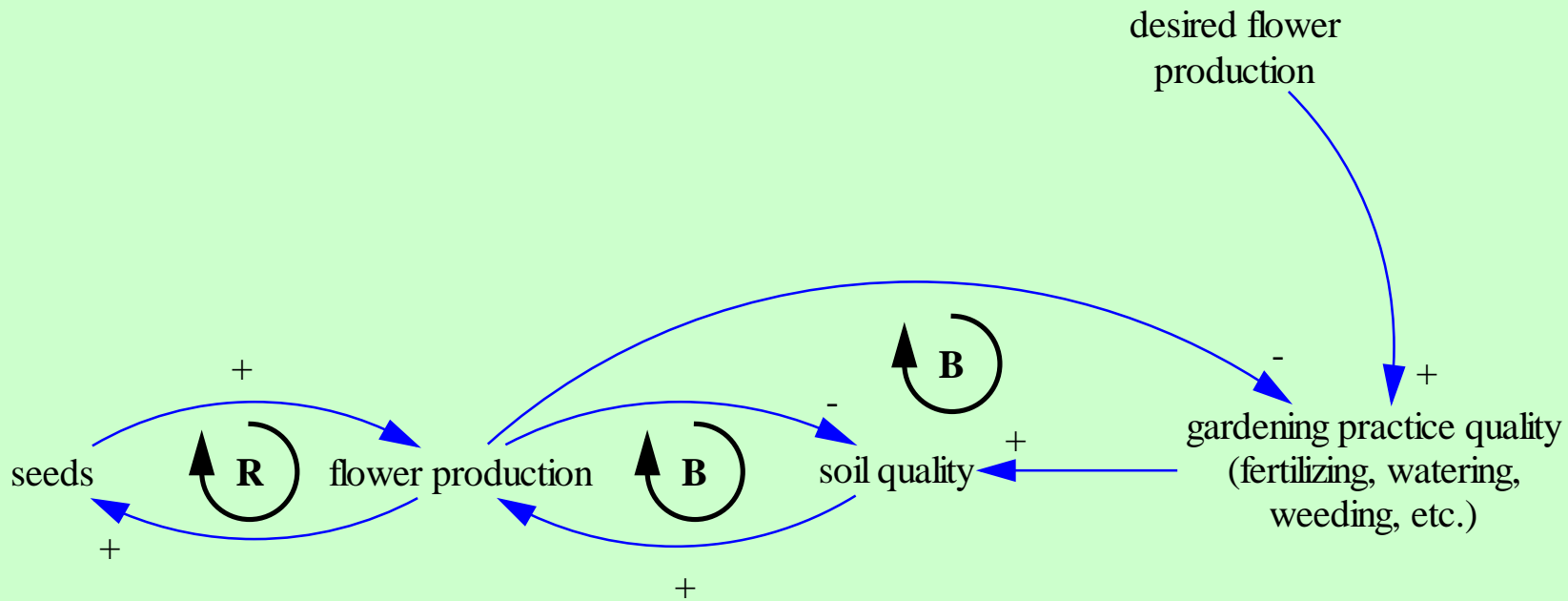


1. *xxx...*
2. *yyy...*
3. *zzz...*
4. *What else?*



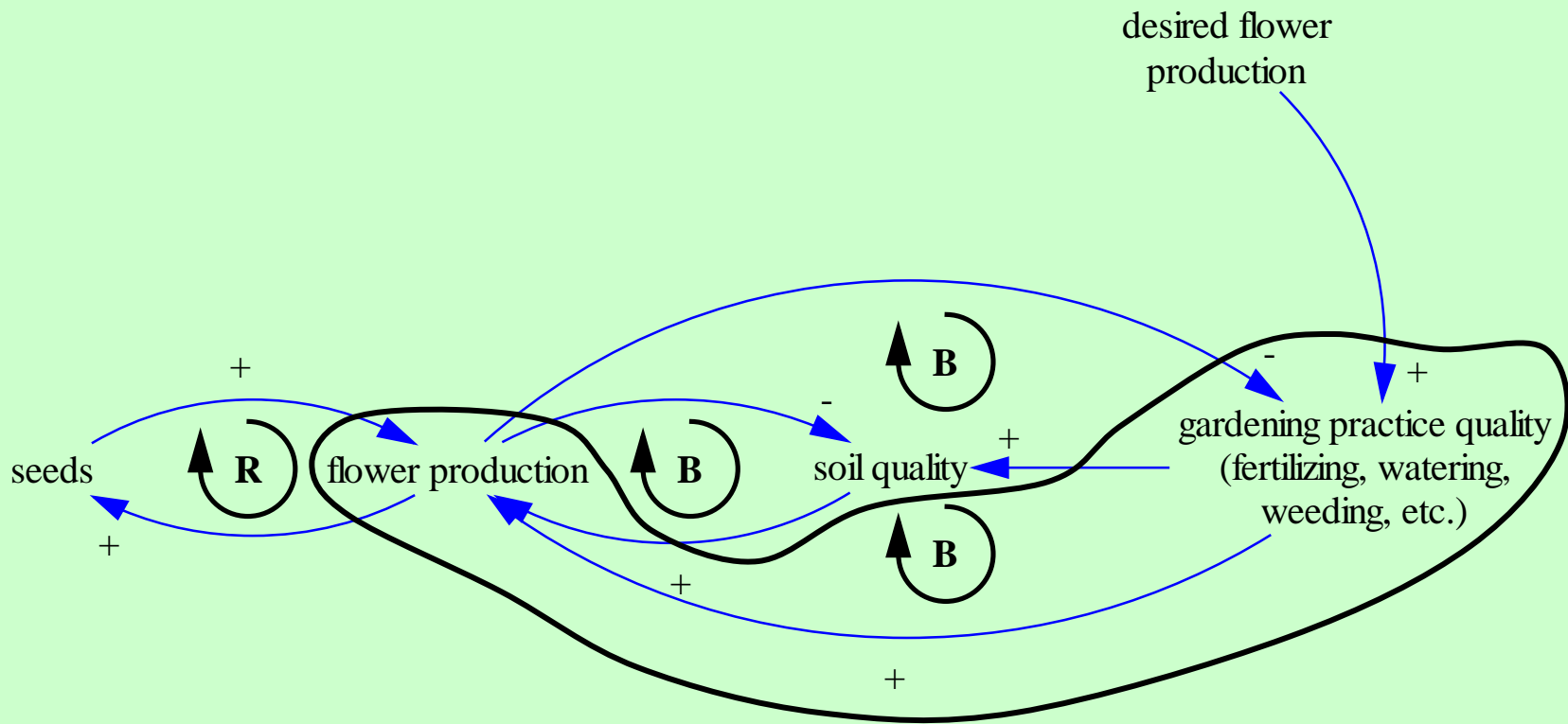
5. As flower production goes down, a desire for flower production goes up and causes an increase in good gardening practices! If they are effective, these practices will improve soil quality.

What kind of loop forms between flower production, soil quality and gardening practices?

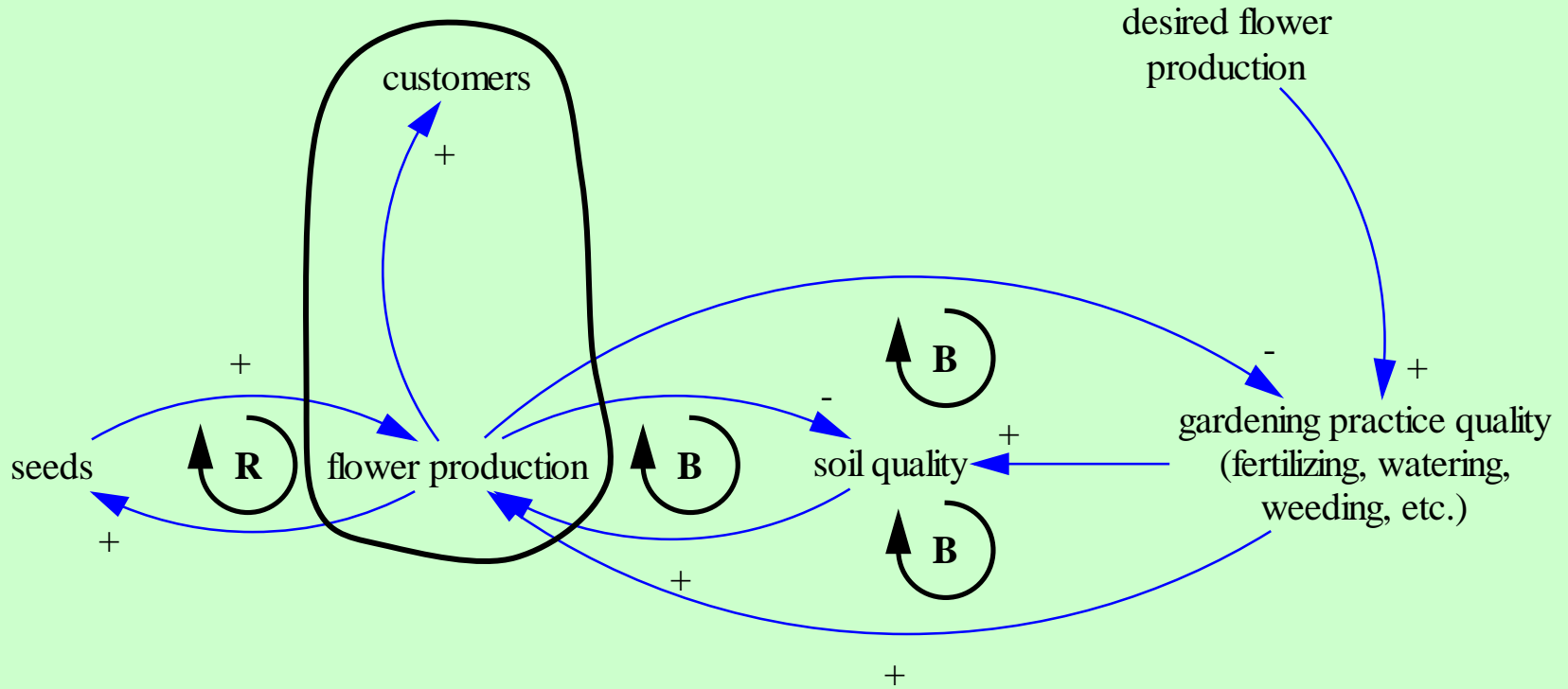


Right – a balancing loop – a decline in flower production increases good gardening practices and thus enhancing soil quality!

Follow the link lines..... (an odd number of - signs)

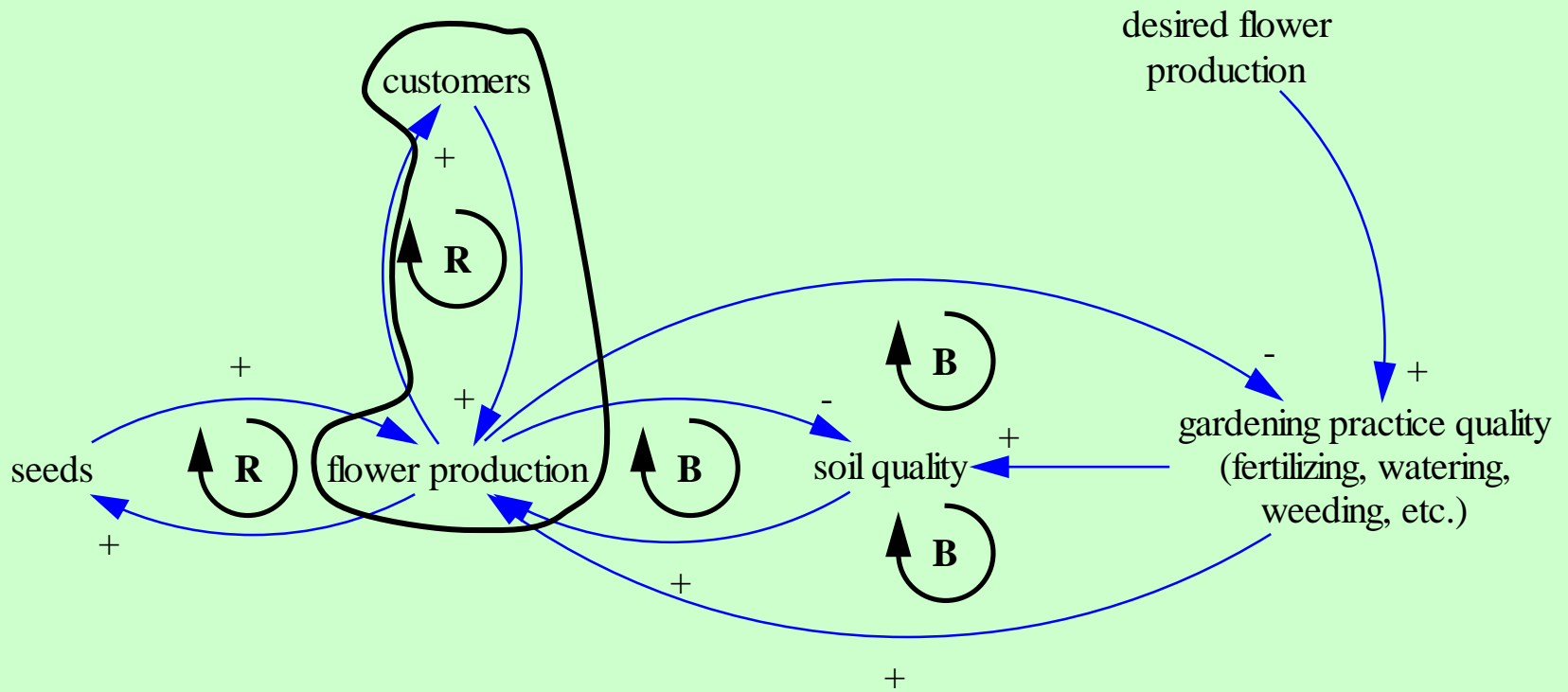


As soil quality improves, flower production will slowly improve too!



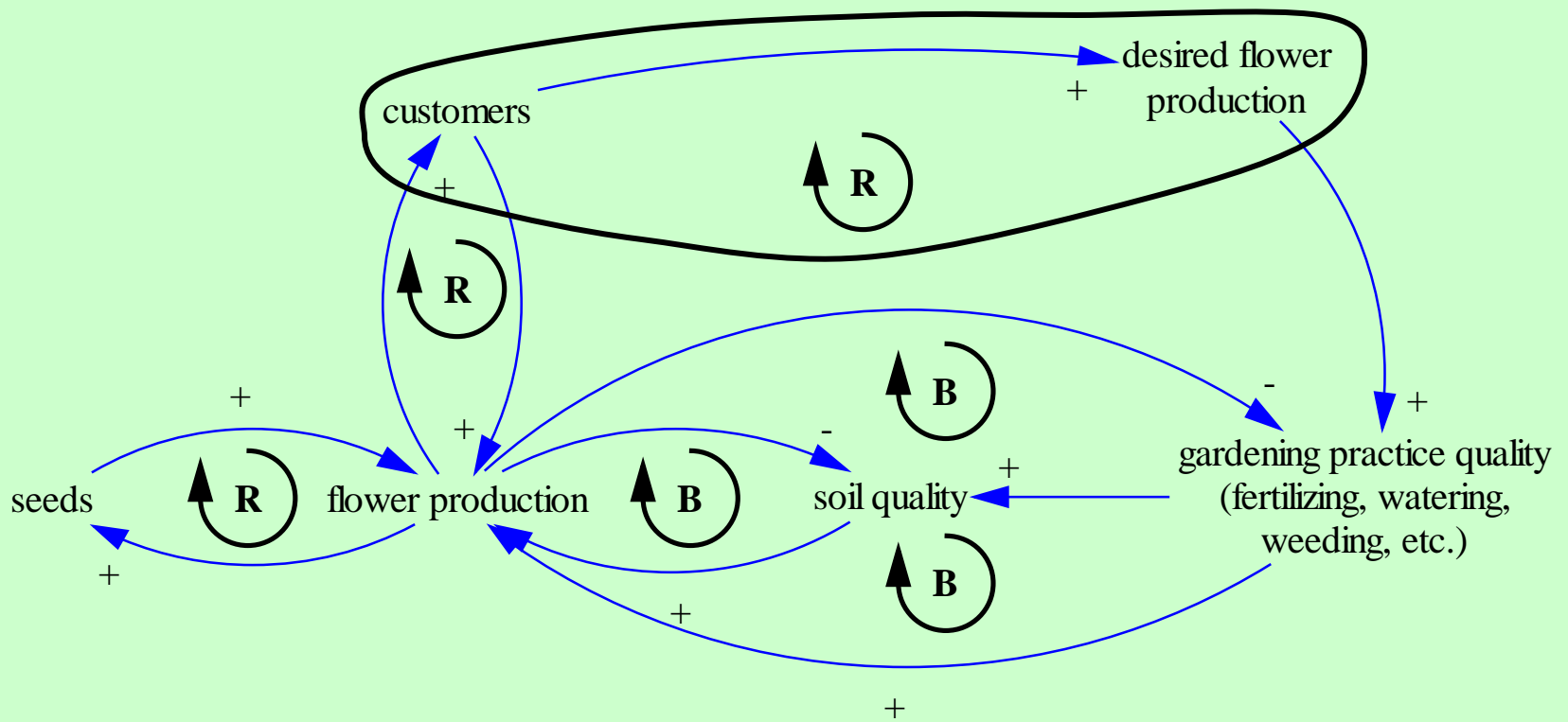
More Feedback Loops

The more *flower production*, the more customers may be solicited to purchase them, and therefore the more *customers*.



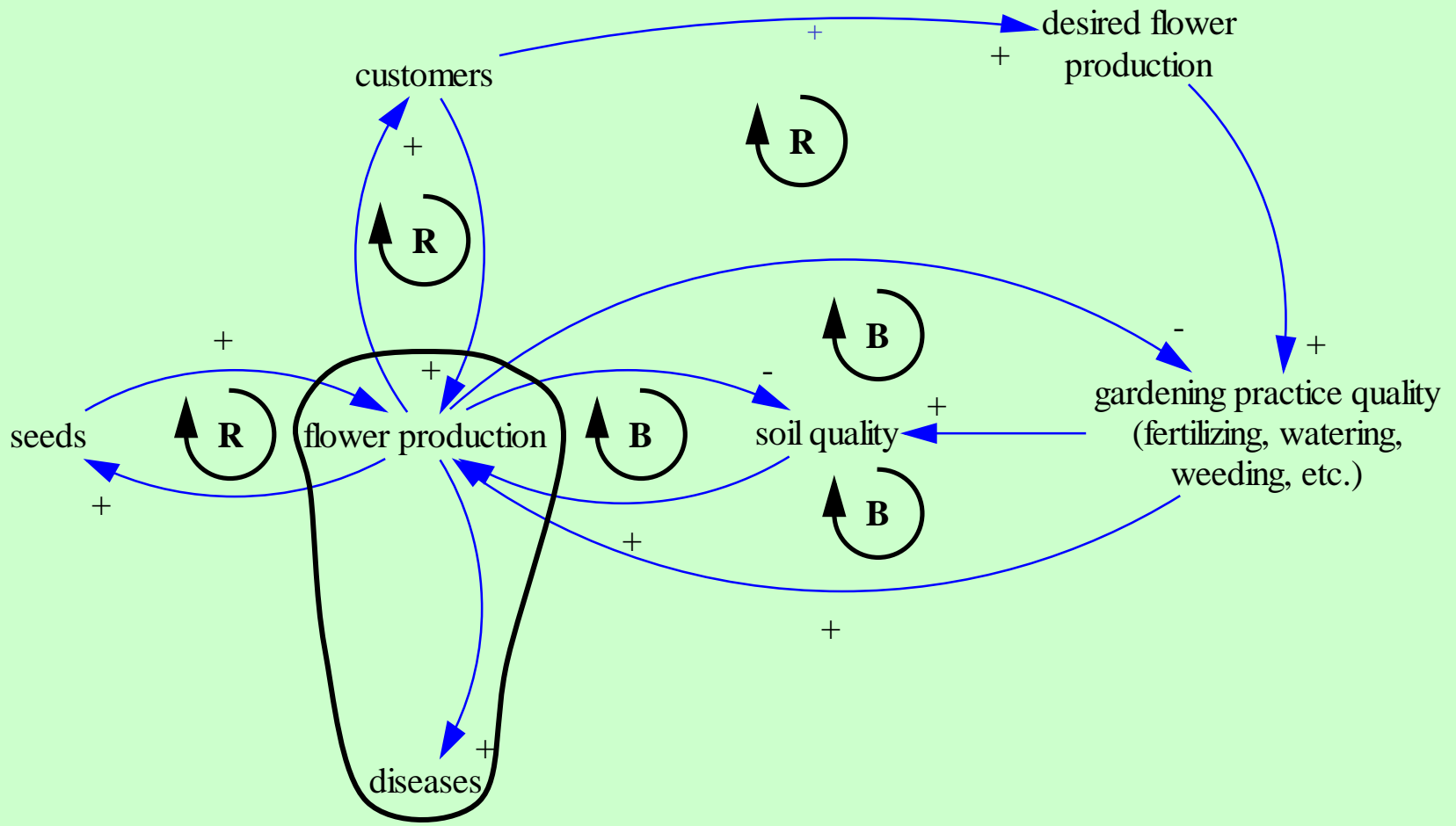
More Feedback Loops

And more customers stimulates the production of more flower production.



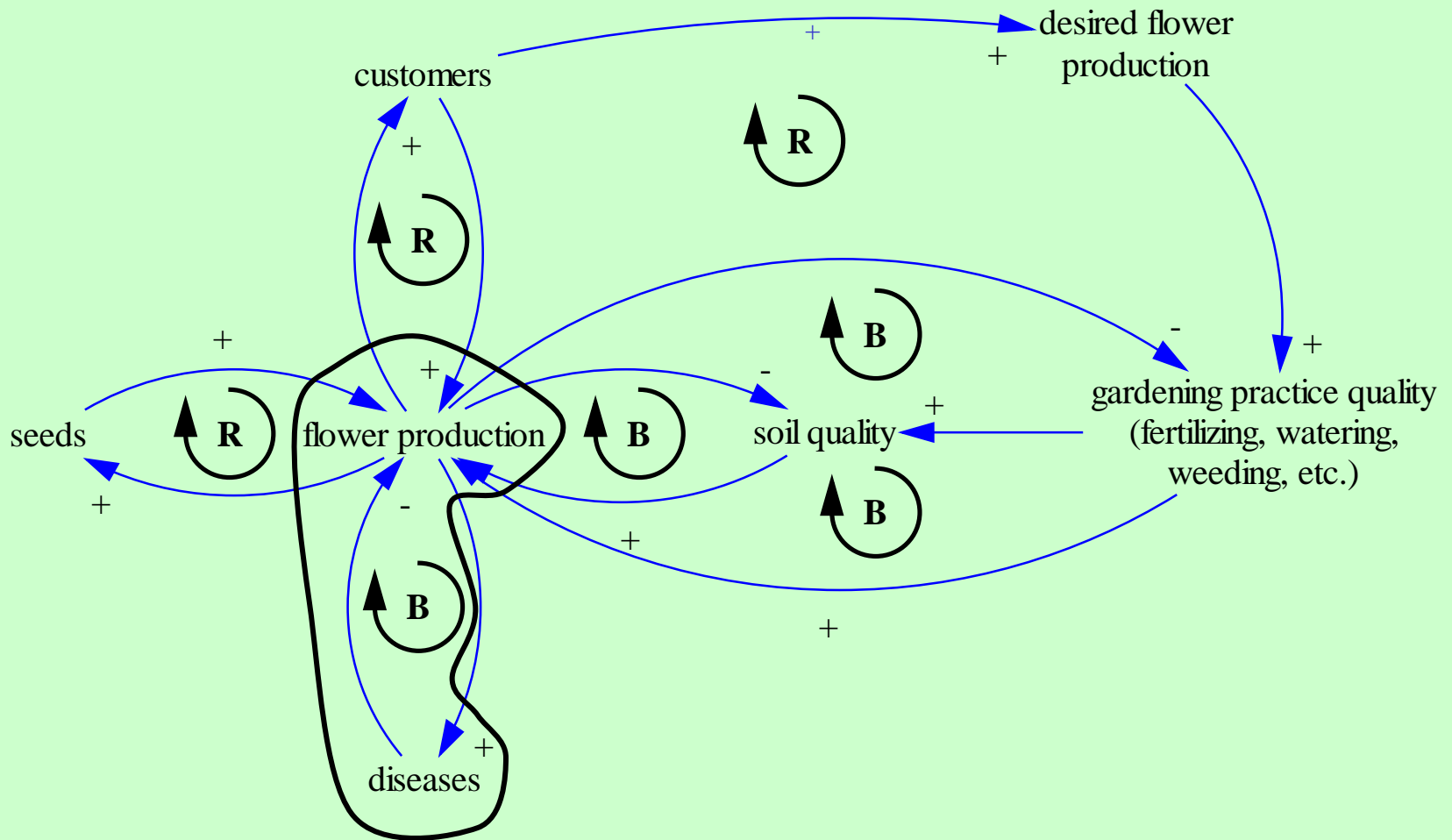
More Feedback Loops

And more customers increases the desire for flower production!



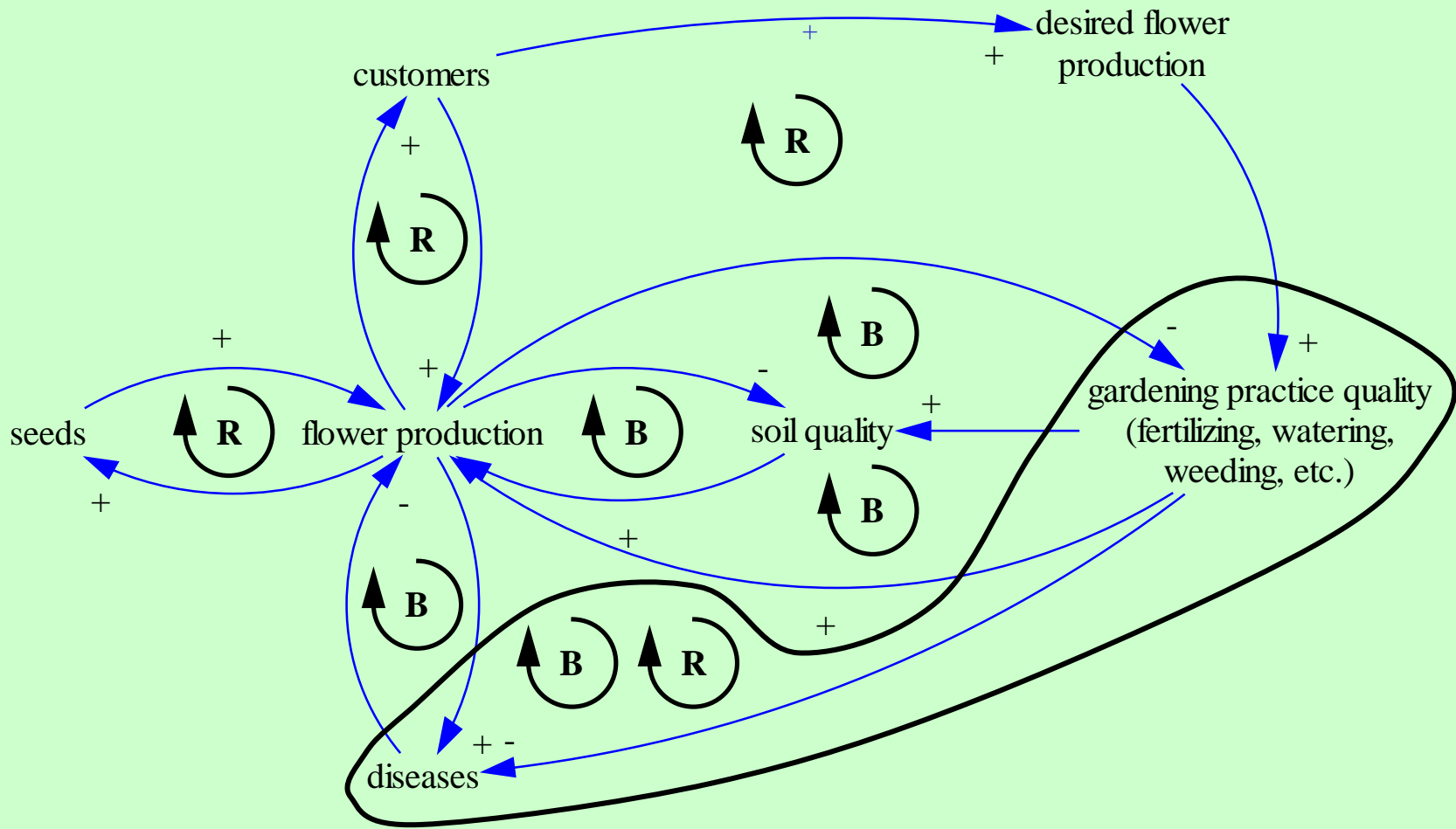
More Feedback Loops

Of course, more flower production is likely to mean more flower diseases.



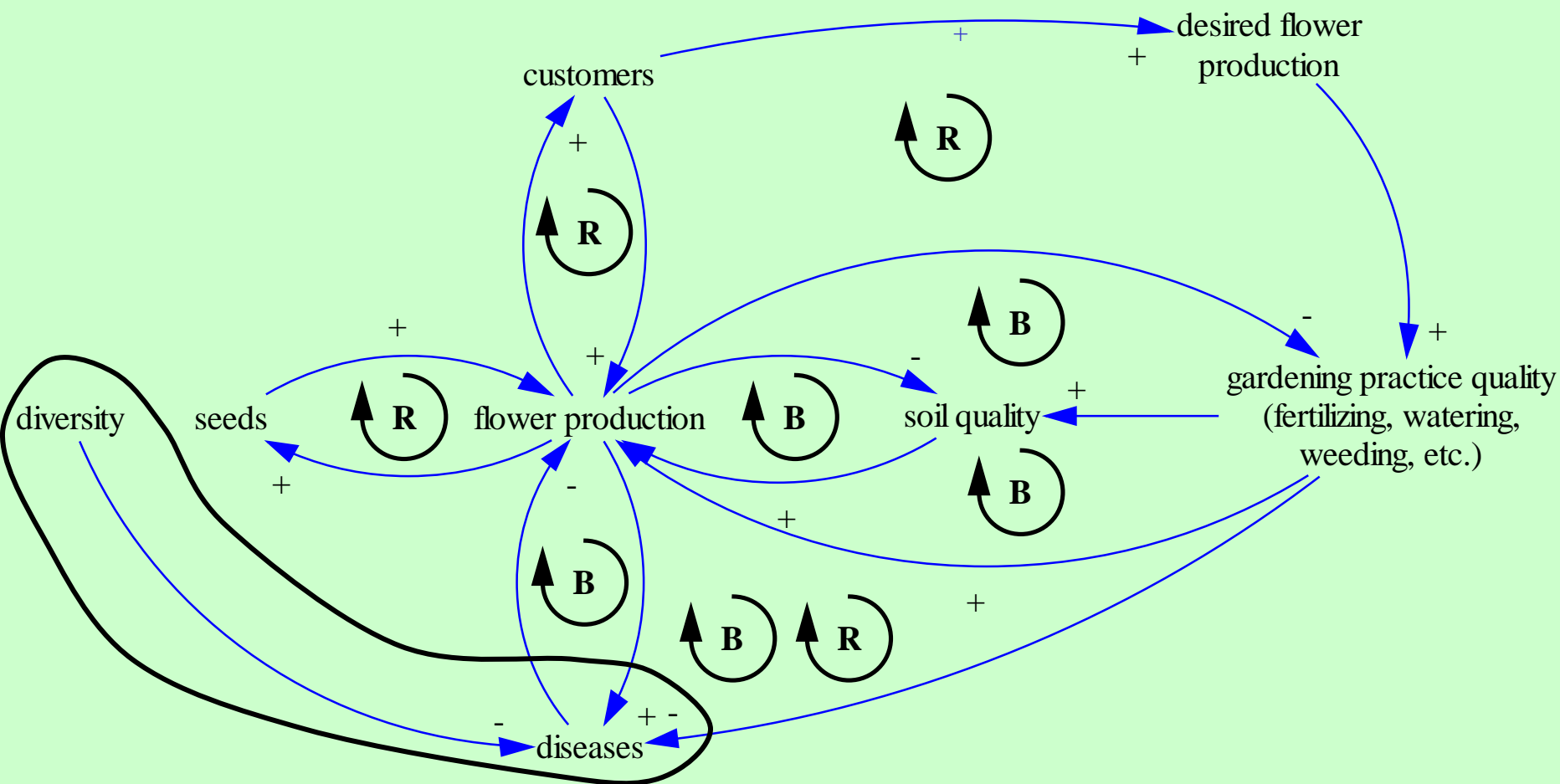
More Feedback Loops

And diseases will mean a decline in production.



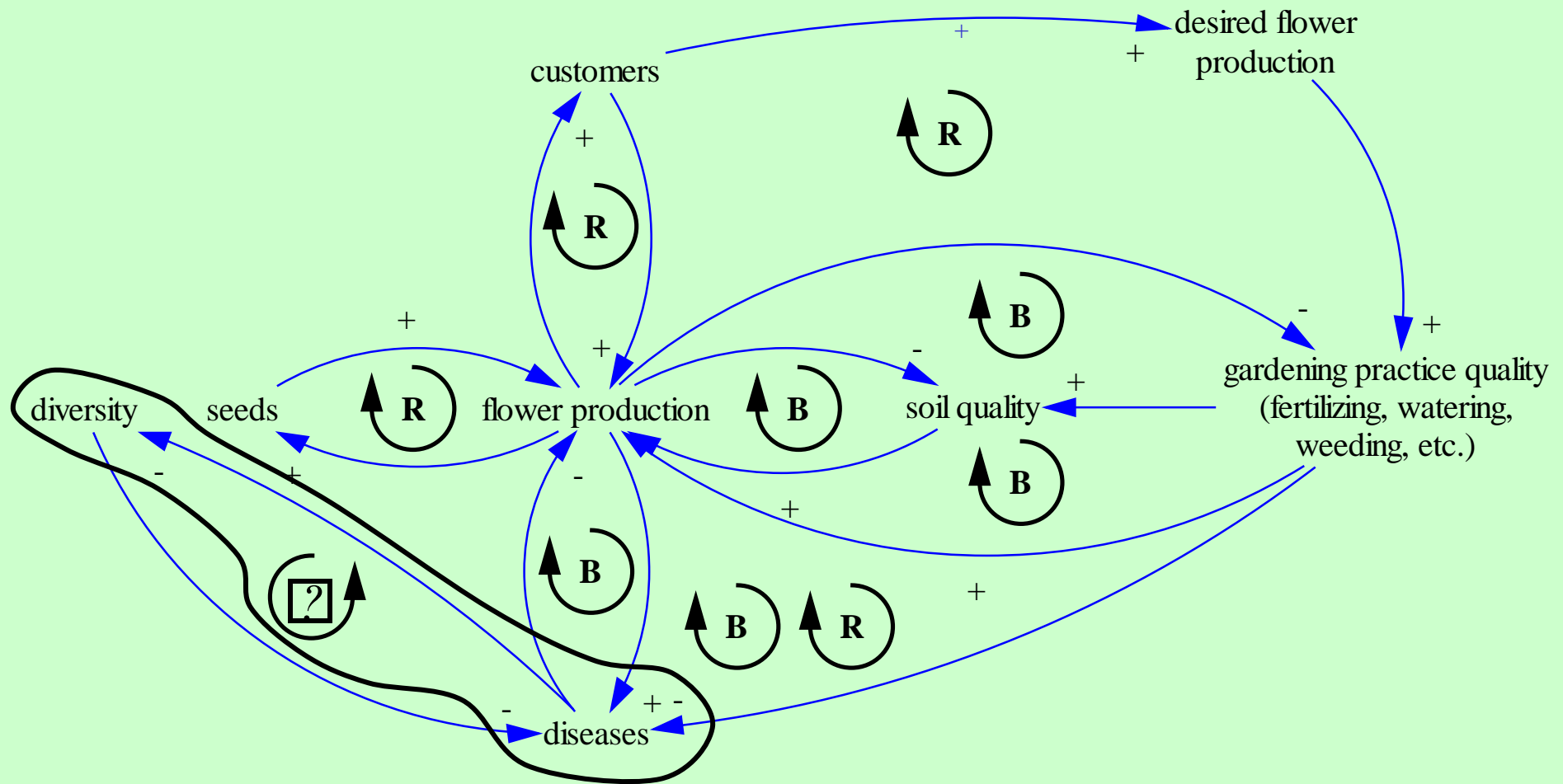
More Feedback Loops

And more diseases is likely to mean an increase in gardening practices to prevent disease.



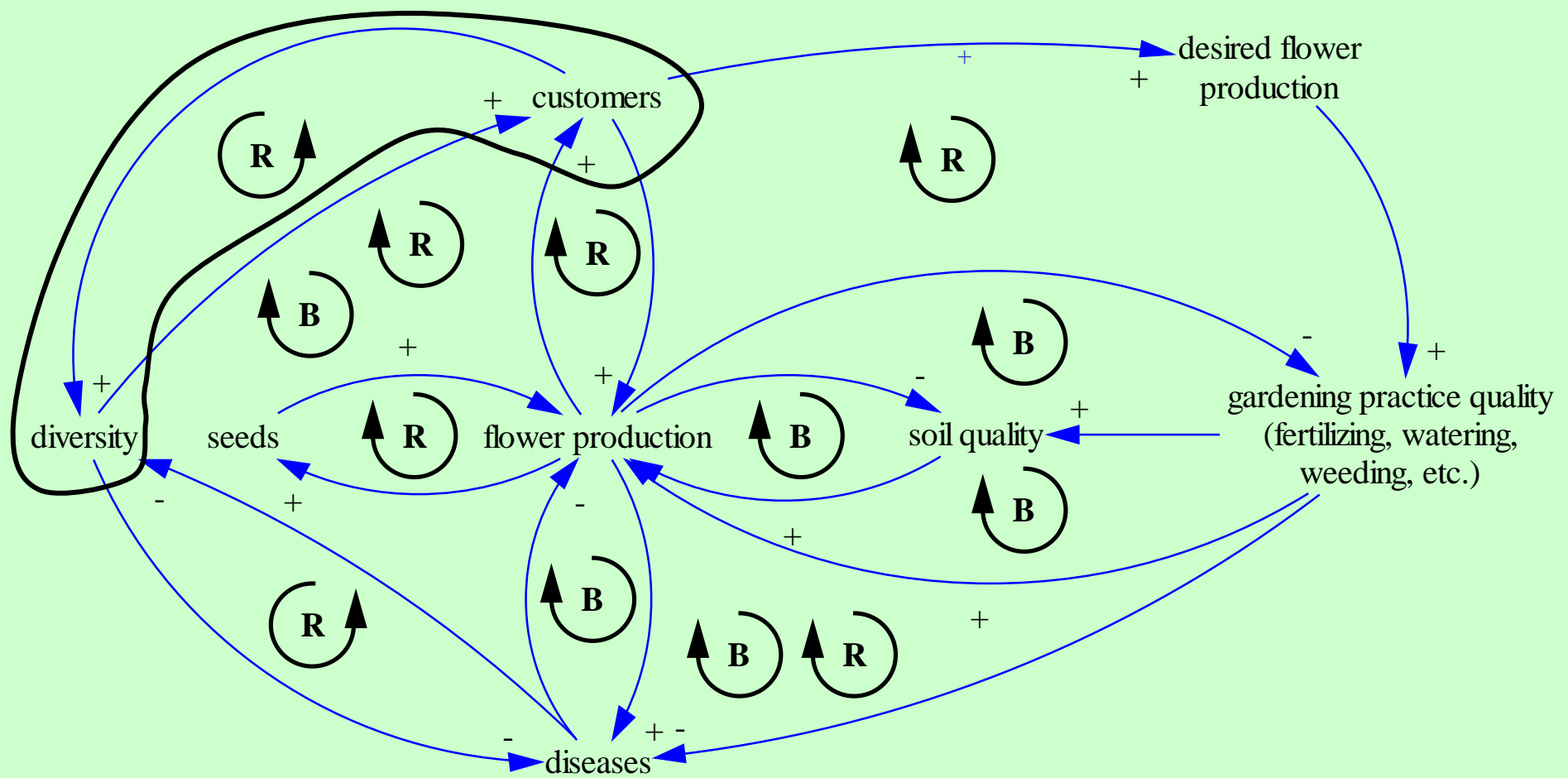
More Feedback Loops

Rather than relying exclusively on practices (like pesticides), what if you increase the diversity of types of flowers produced?



More Feedback Loops

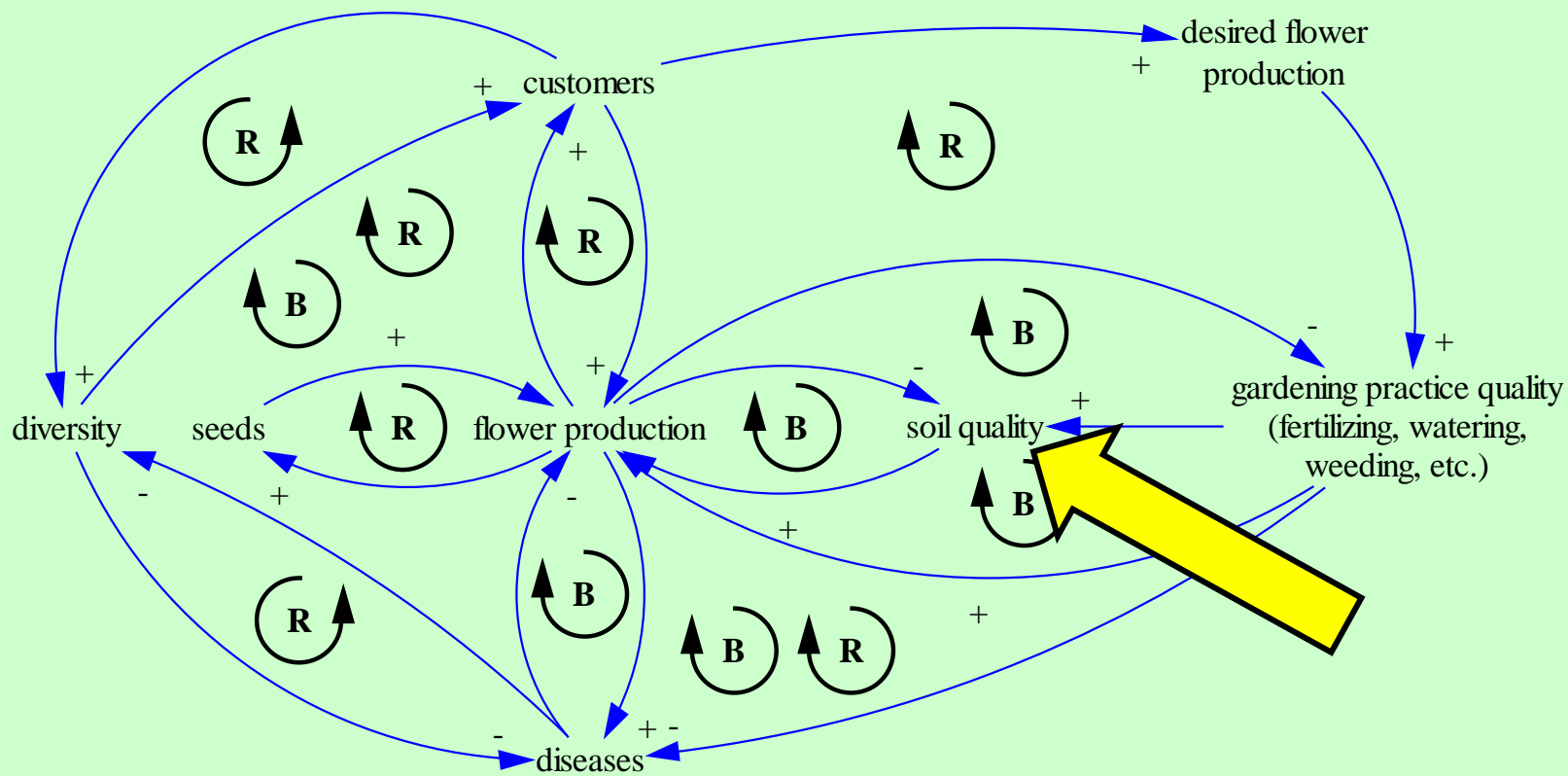
Diversity decreases disease, without pesticides.

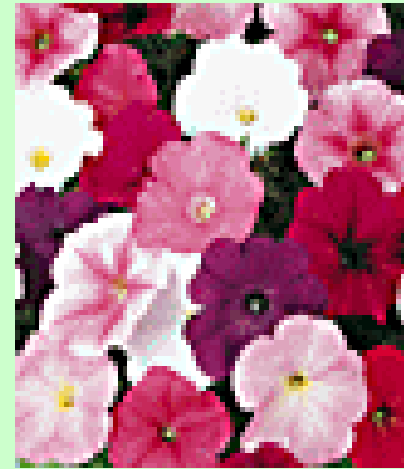
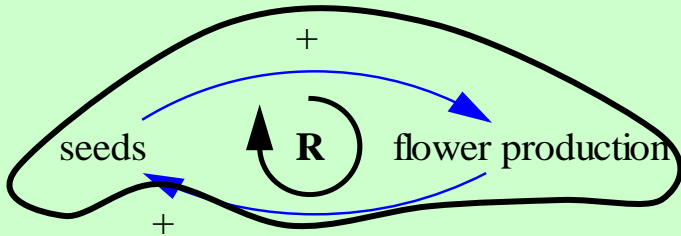


More Feedback Loops

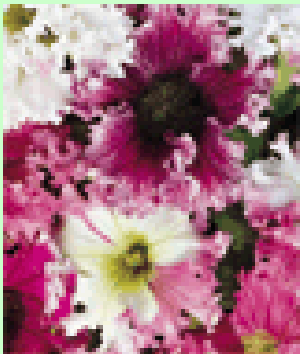
And with more diversity, customers are not only possible but needed!

What else can be done to keep this system sustainable?





Well, we've come a long way – haven't we?



Dynamic Systems Modeling

