

iGenDec: A tool for web-based sire selection

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Situation

- The global Animal Breeding and Genetics community has done a tremendous job at increasing scientific knowledge, developing selection tools, and delivering these tools to the US Beef Industry.
- Despite these advancements, technology adoption is embarrassingly poor.
 - < 30% of producers use EPD (Weaber et al., 2014)



Thesis

- Poor technology adoption is related to the sum of many underlying issues:
 - Genetic prediction seems opaque
 - Consultancy is often from sources other than what might be preferred
 - Commercial producers do not have the needed time to excel in all areas, and focus on day-to-day animal and financial management
 - Combining all partial solutions is a very cumbersome task
 - Breeding objective
 - Breeding system
 - Breed choice
 - Trait emphasis
 - Sire selection
 - And all need to contemplate that which is economical and possible given environmental constraints



Background

- USDA Funded CARE Grant
- Aim is to develop a web-based tool to aid in genetic selection decisions
- Initiated with an industry-wide survey in 2018
- Advisory board of producers (commercial and seedstock), extension faculty, breed association staff

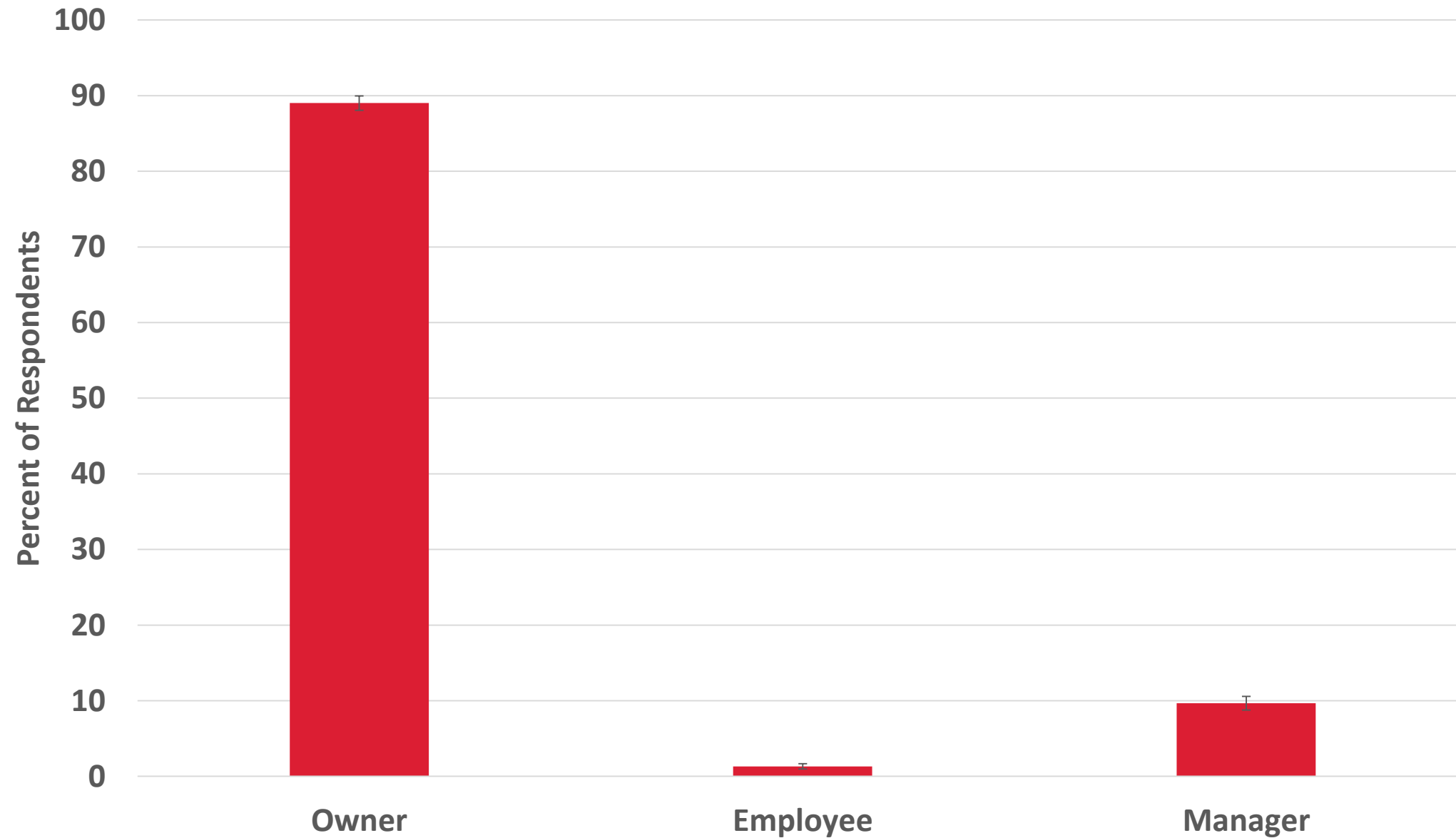


Survey structure

- Online Survey of Beef Producers
- Fall/winter 2018-2019
- 1,530 respondents
 - Self selected
 - Nationally publicized (Breed Assn., NCBA, Extension lists, etc.)
- 1,161 completed survey

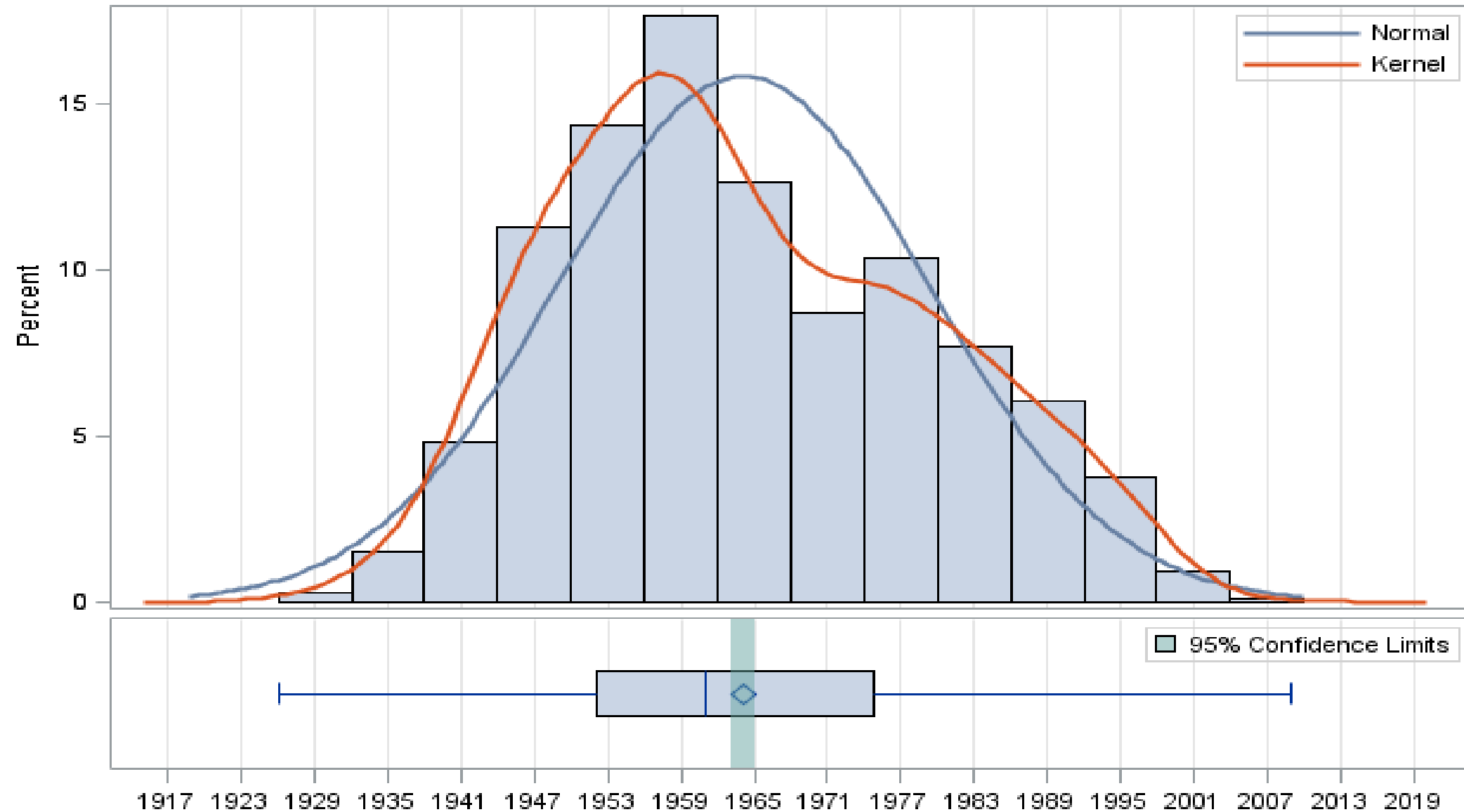


What is your primary position on your beef cattle operation?



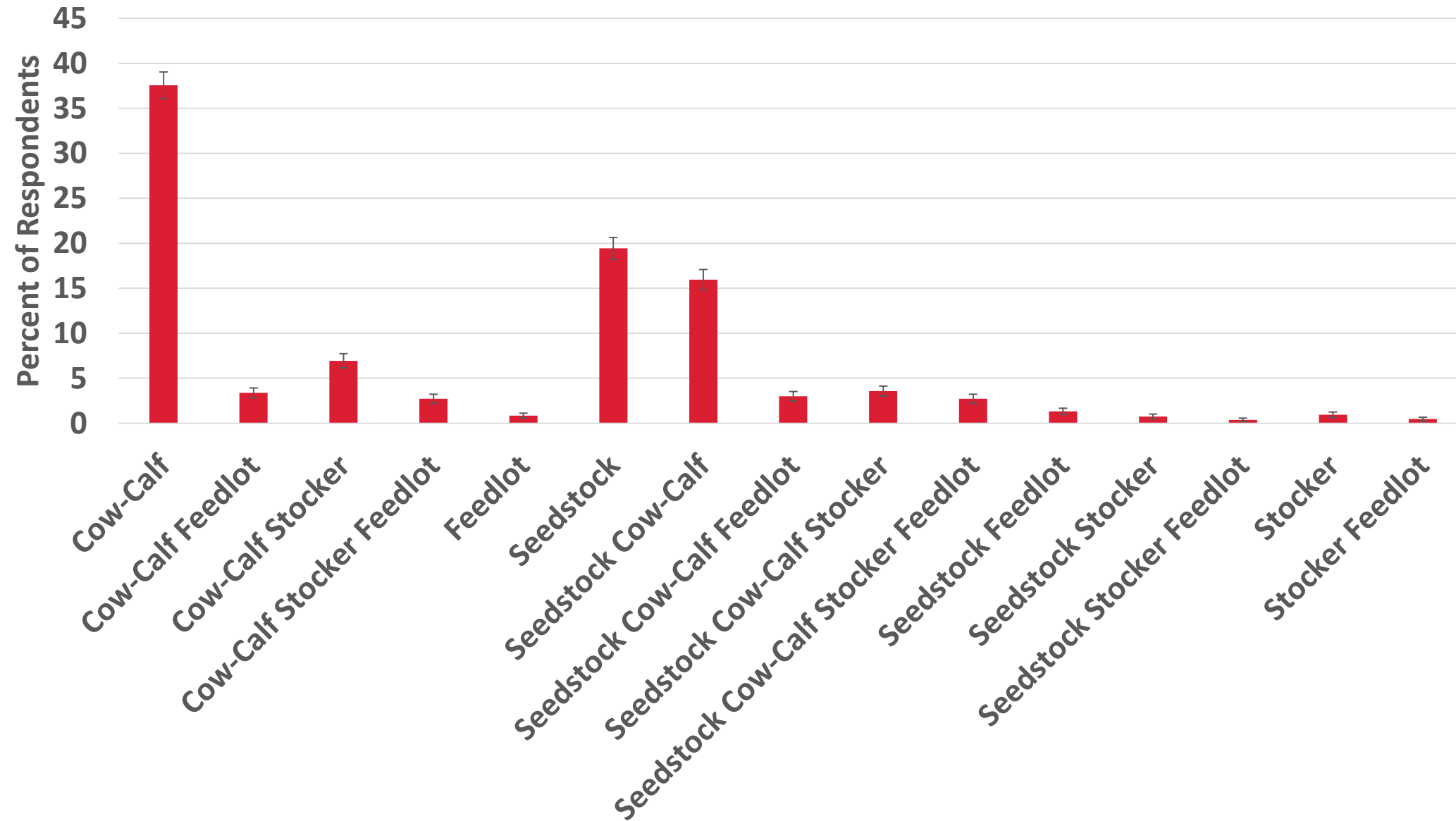


Age of respondents



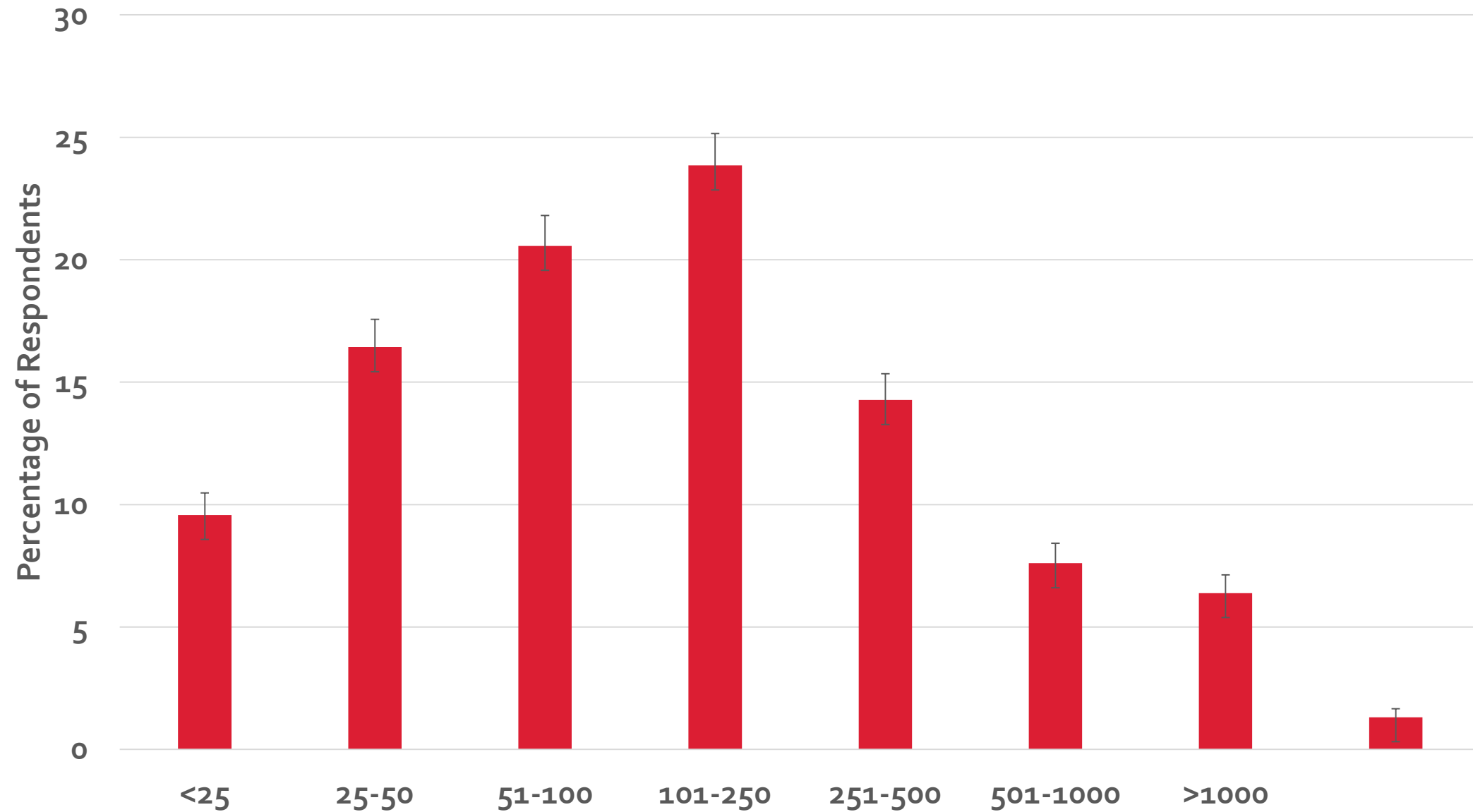


In what kind of operation are you involved?



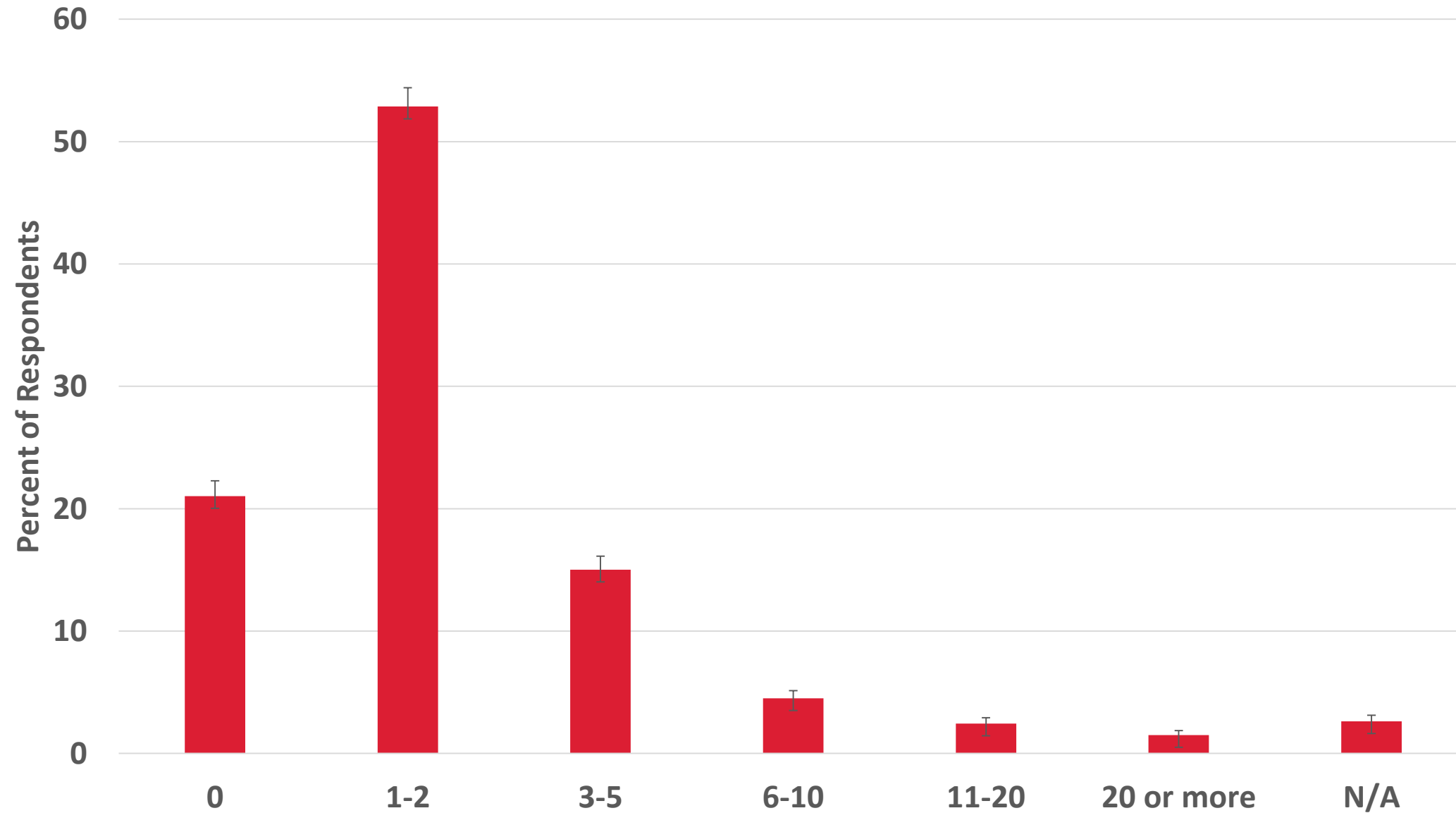


How many cows/heifers will you breed in 2018-2019?



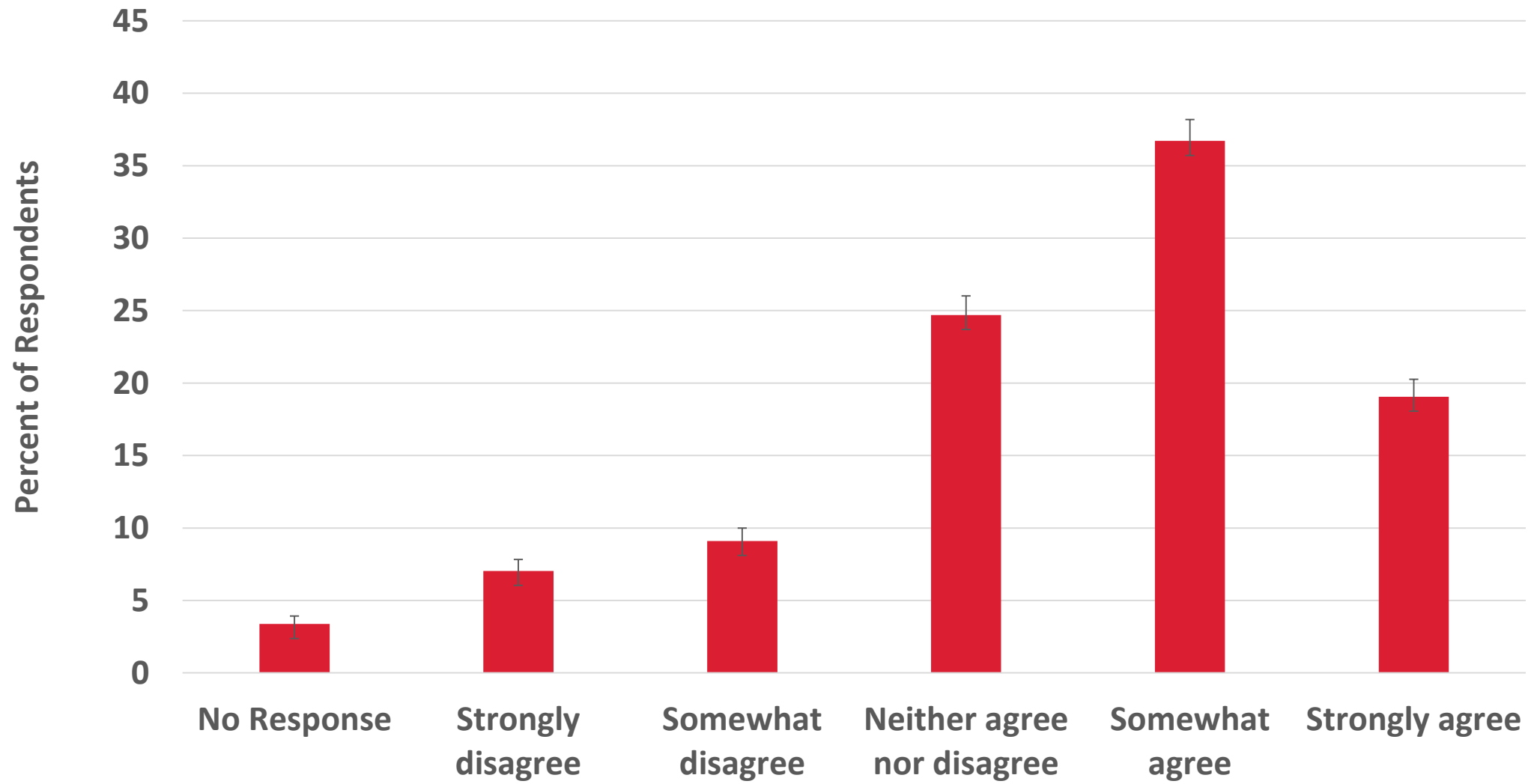


How many bulls do you purchase each year?



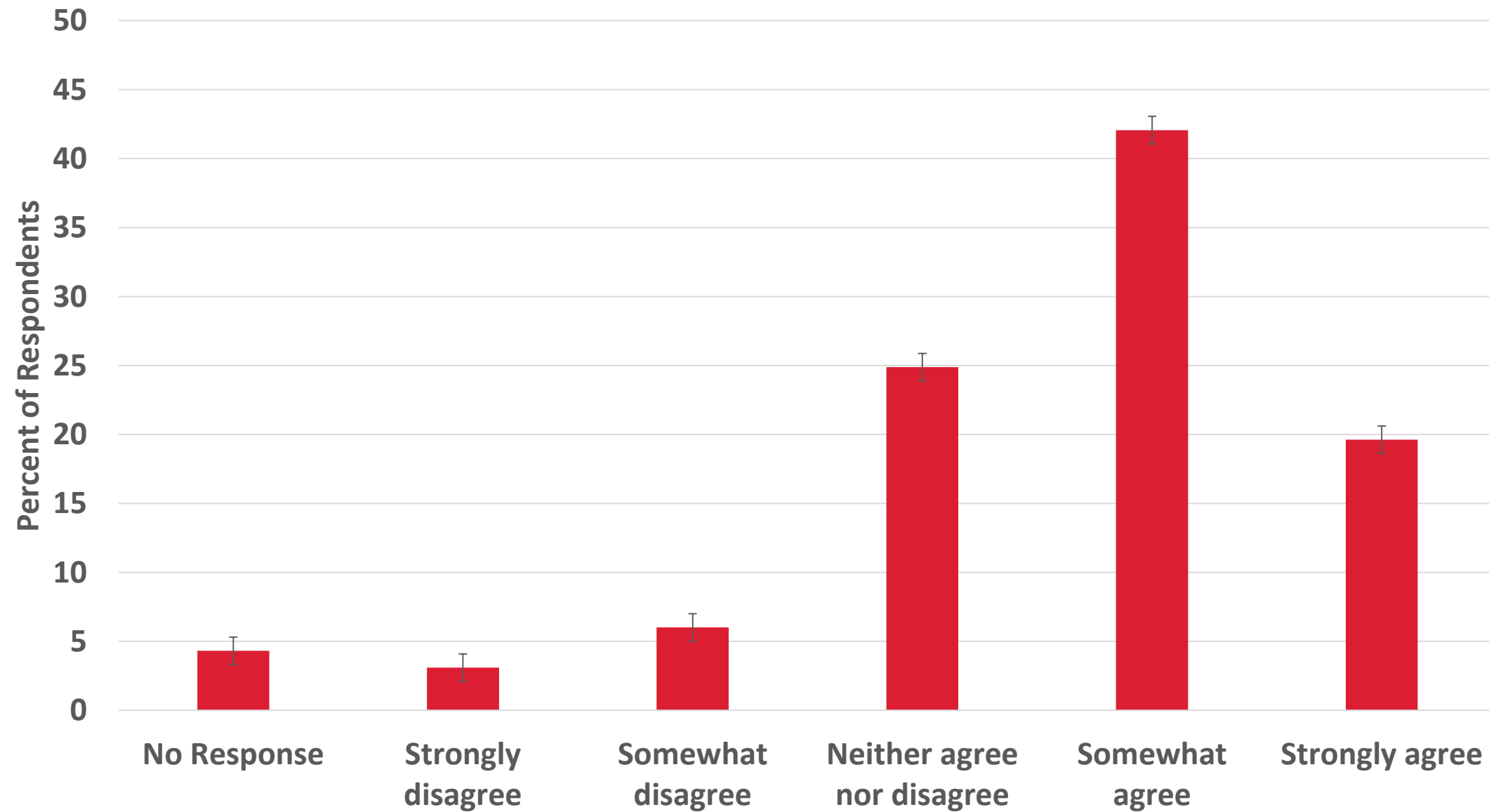


State or Univ. extension specialist valuable source of genetics info?



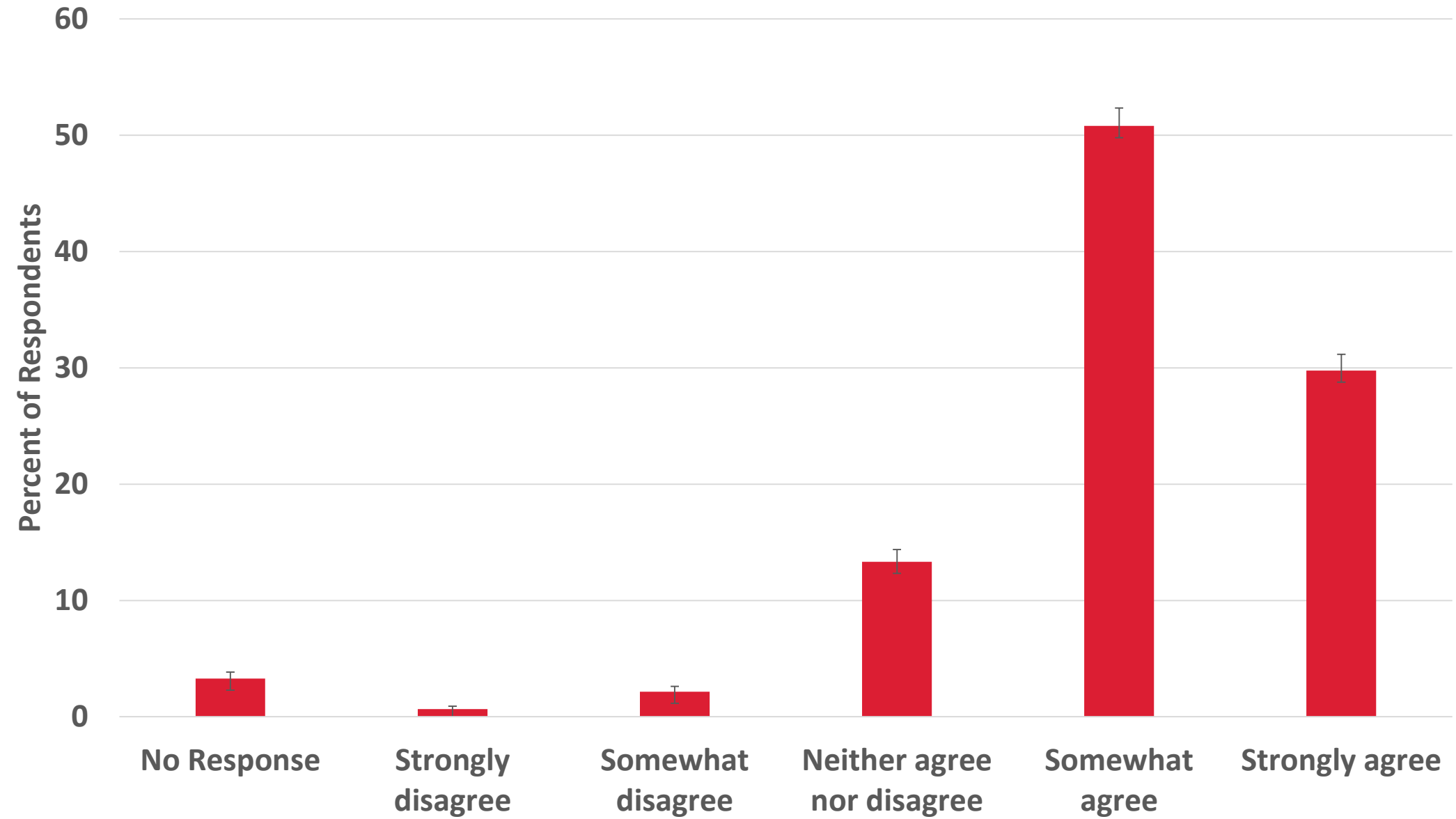


Breed association valuable source of genetics info?



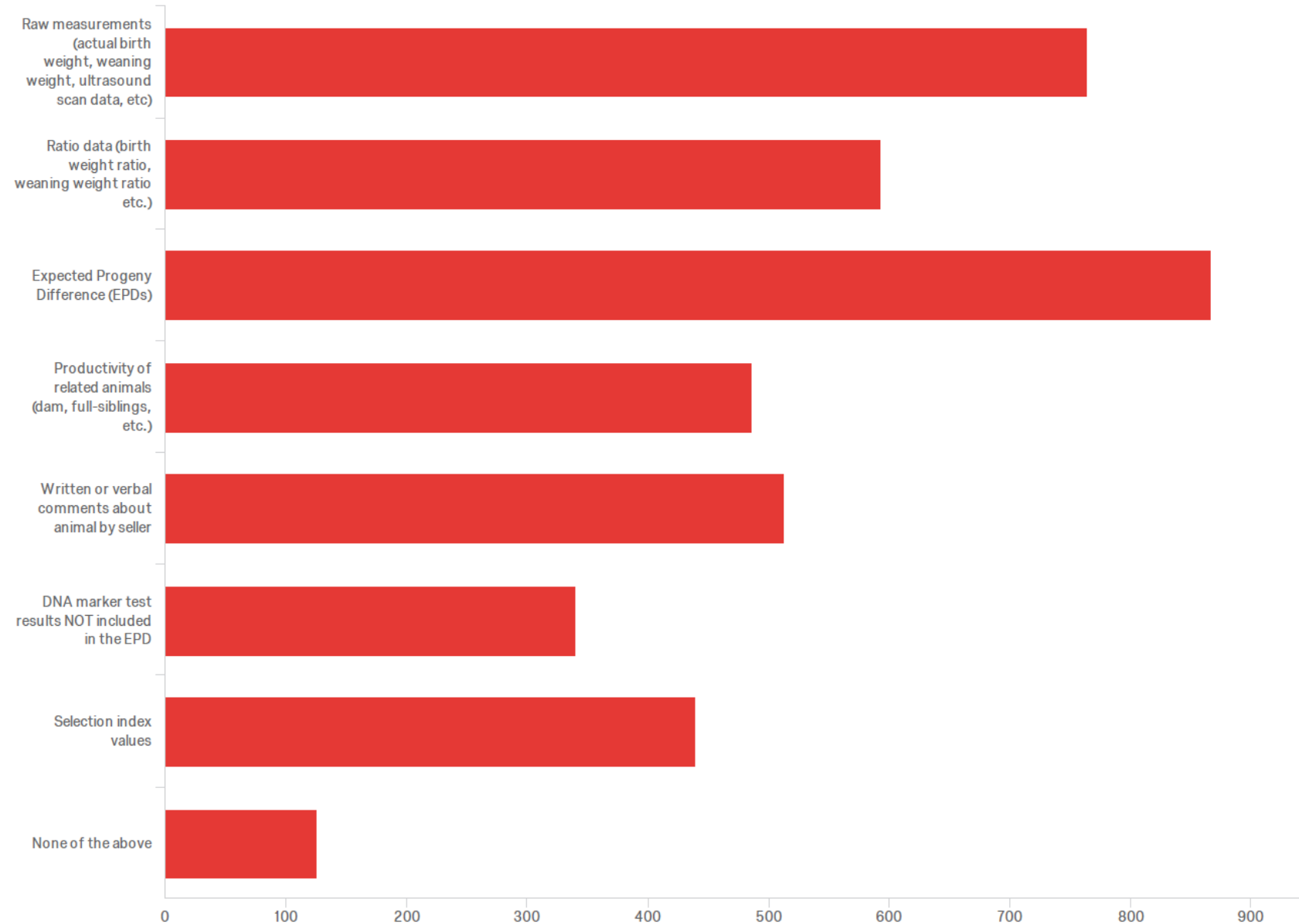


Seedstock supplier a valuable source of genetics info?



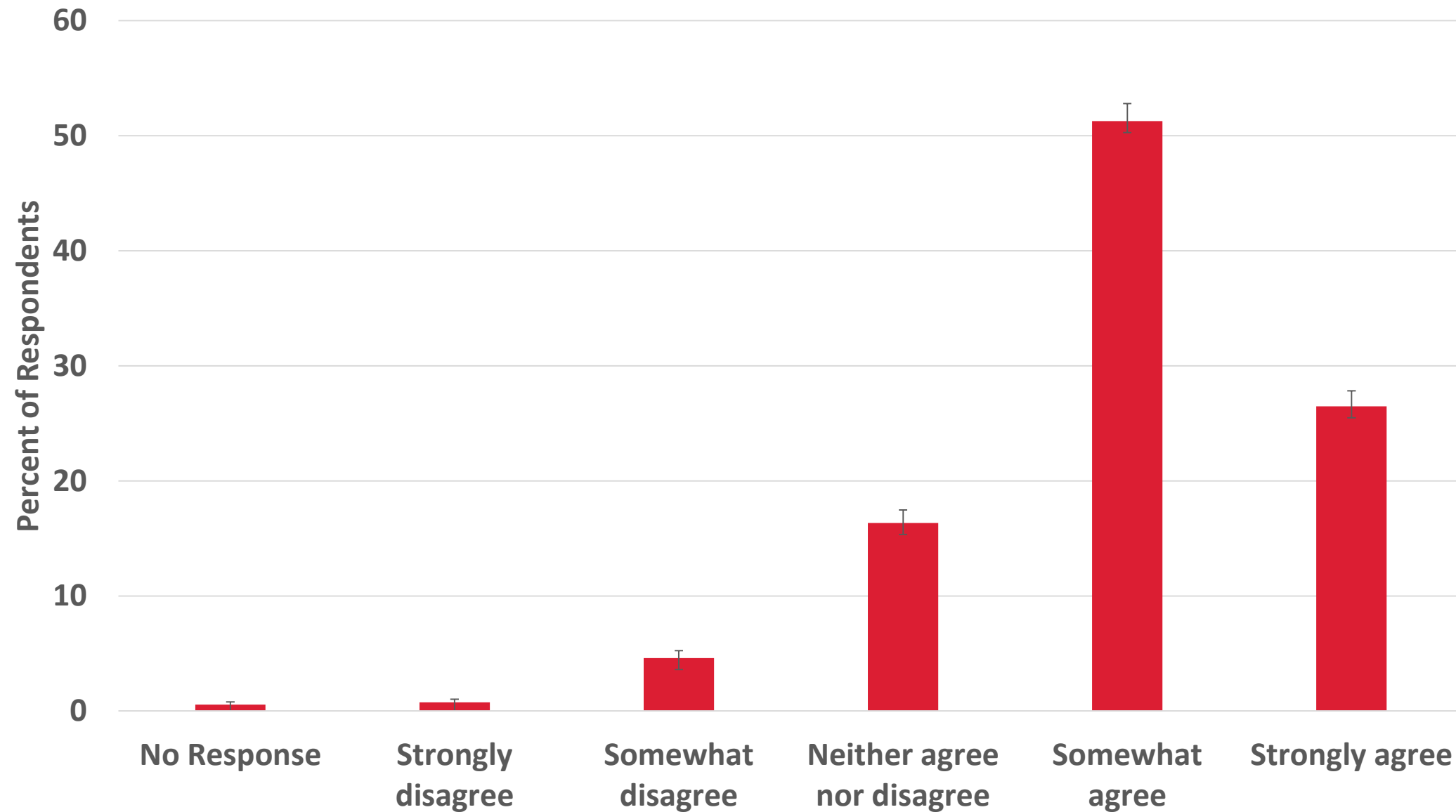


What types of information do you provide or use in selection?



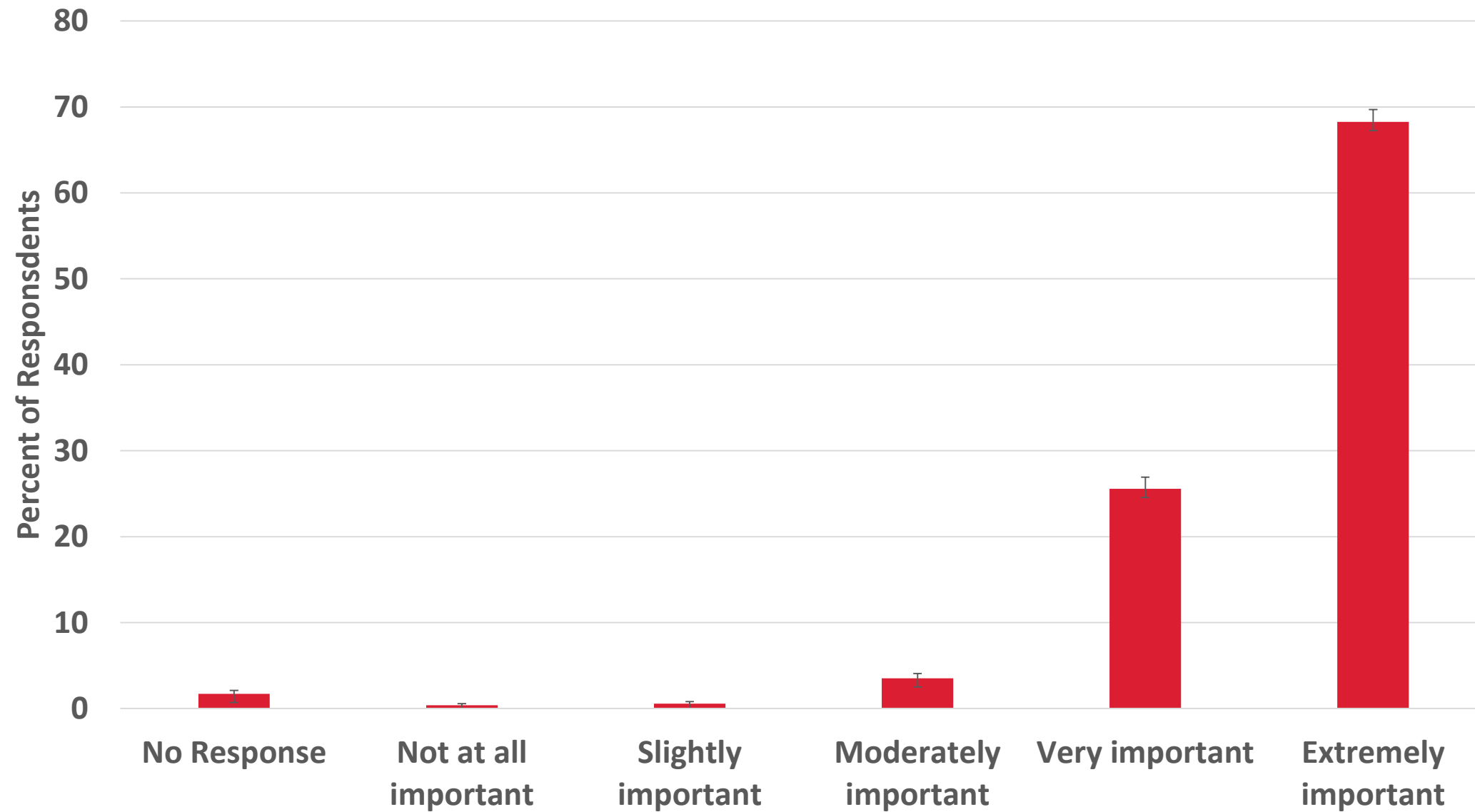


I consider myself an early adopter of technology?



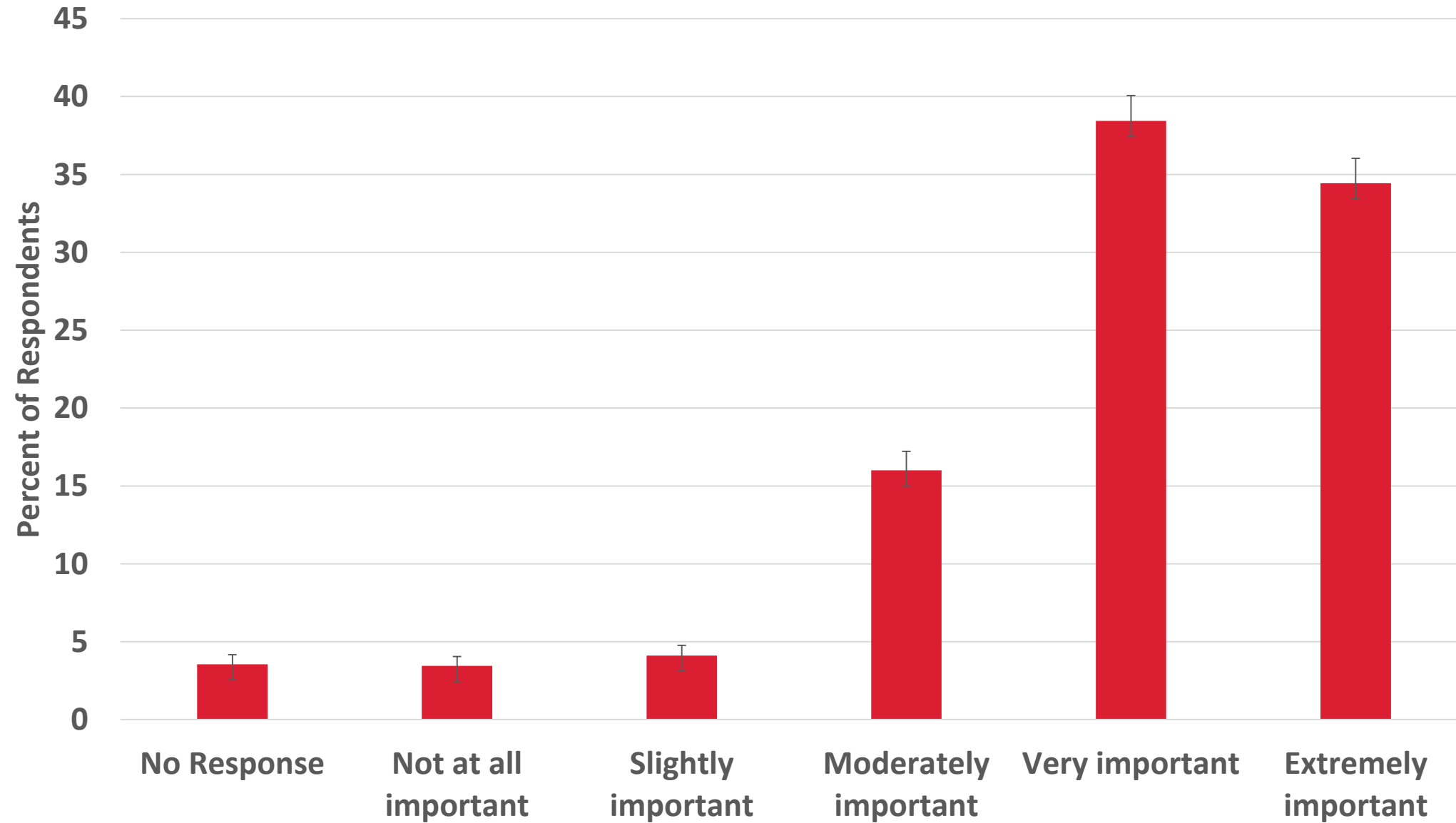


Reproduction emphasis next 5 years?



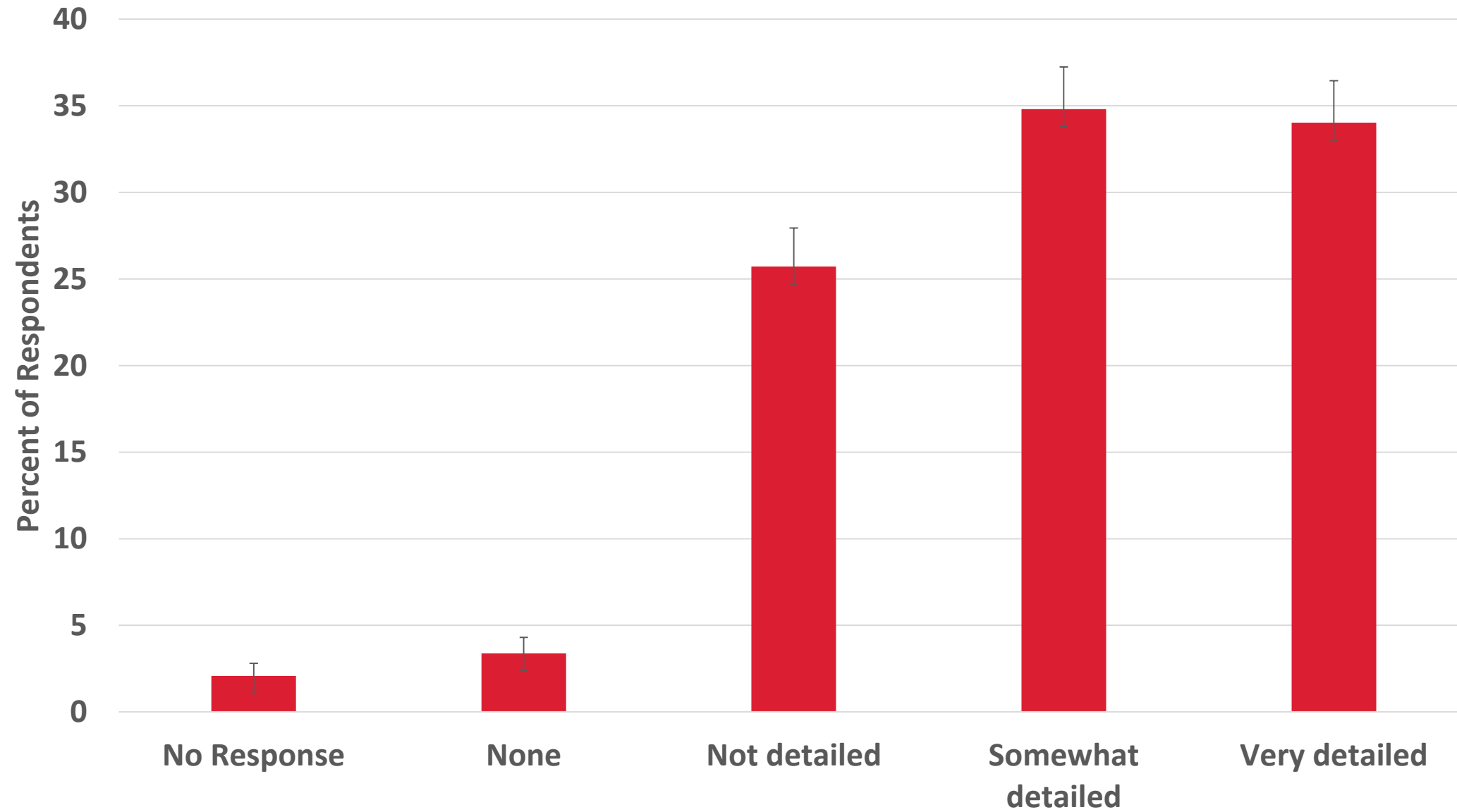


Carcass emphasis next 5 years?



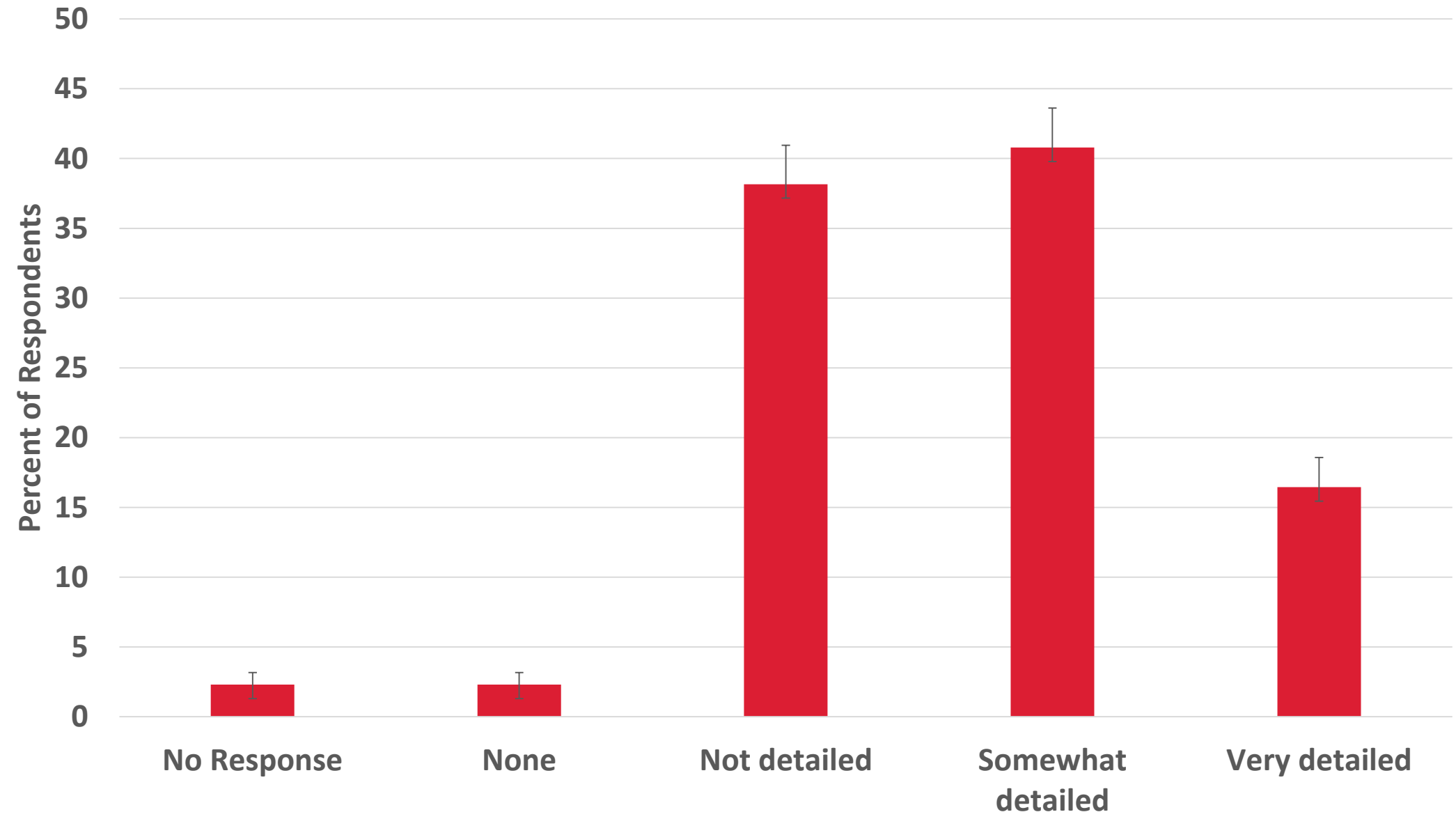


Level of production data utilized



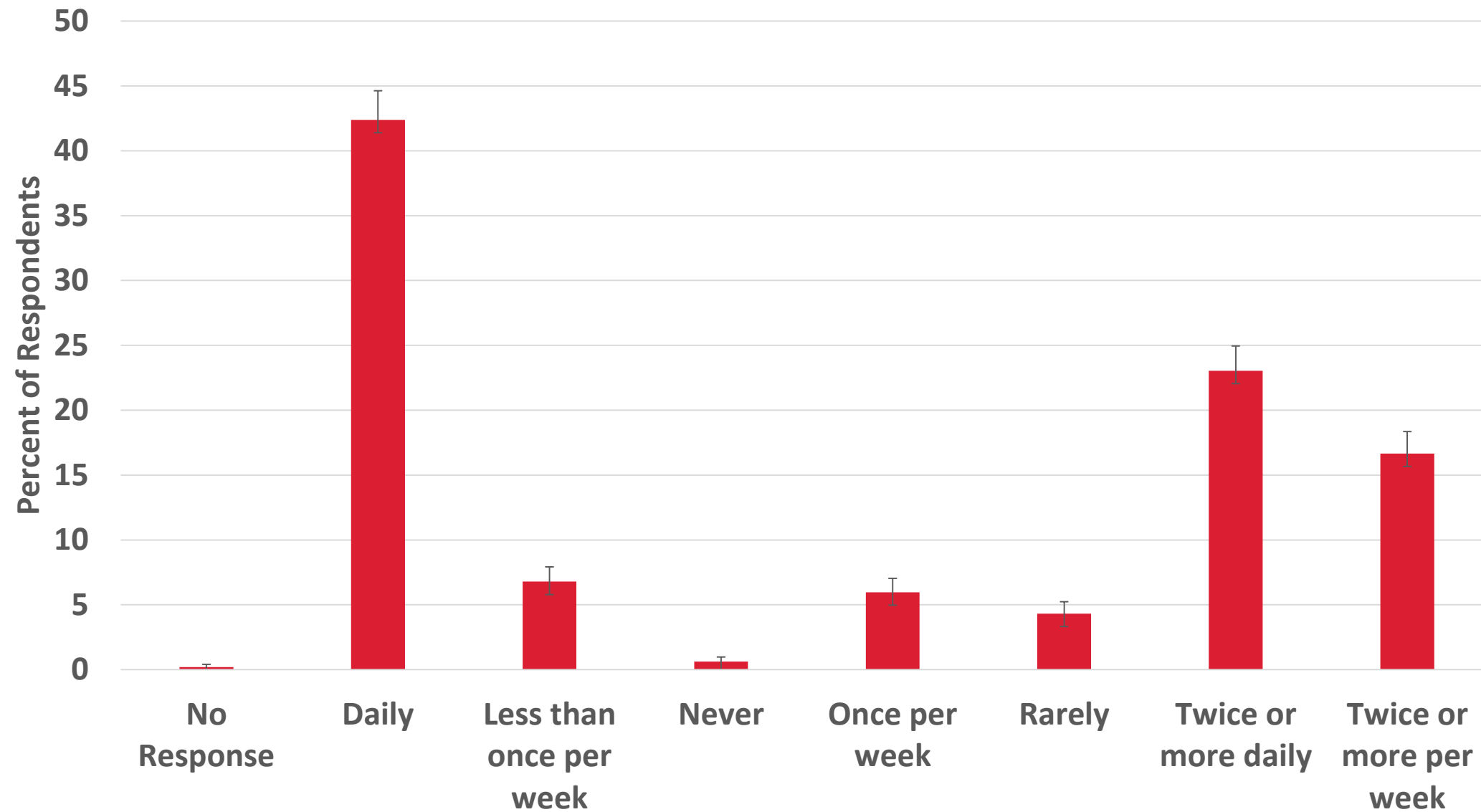


What level of cost data do you maintain and use?



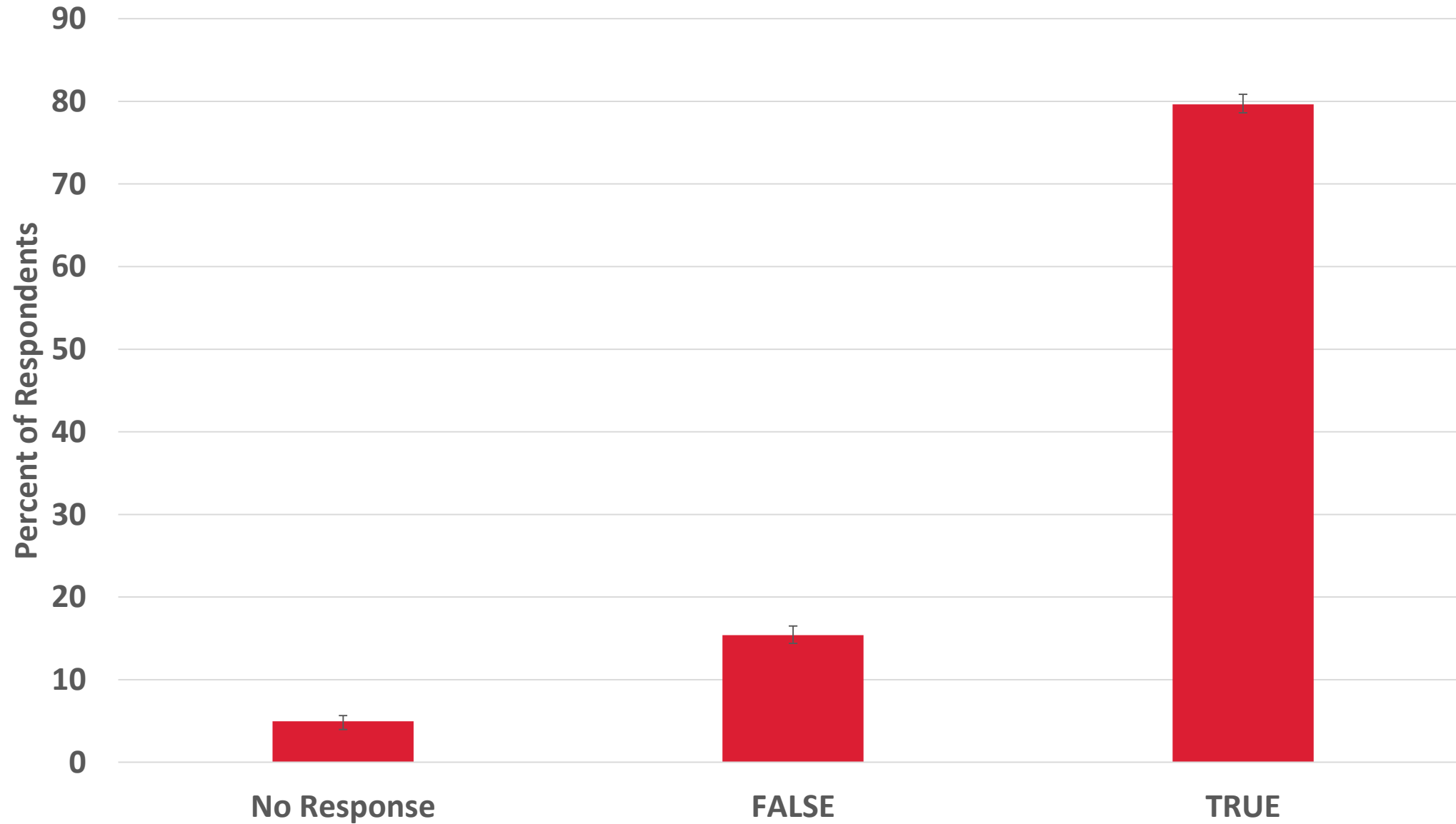


How often do you use internet as source of Ag info



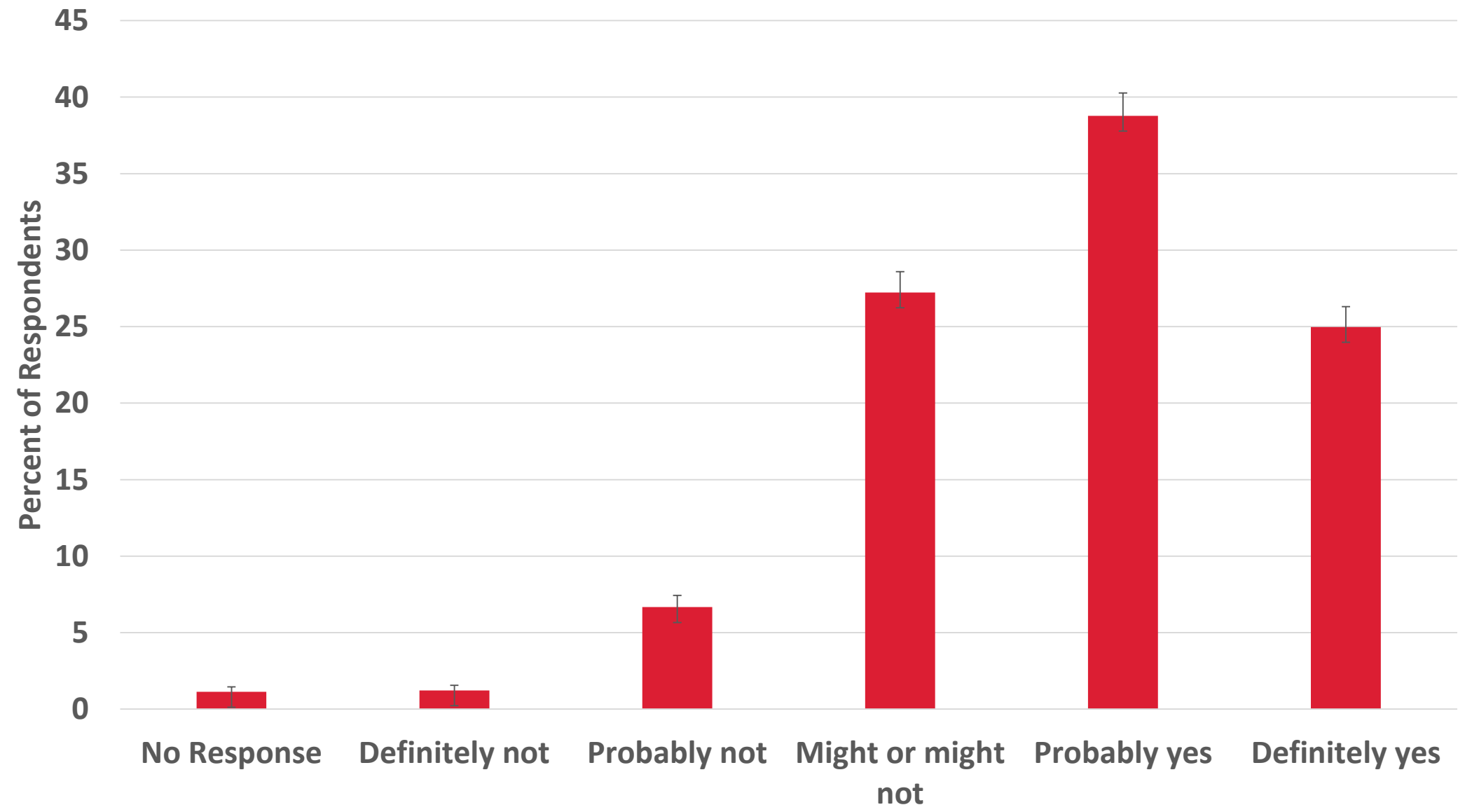


Selection index provide an objective and consistent weighting of EPD enabling efficient selection among animals?



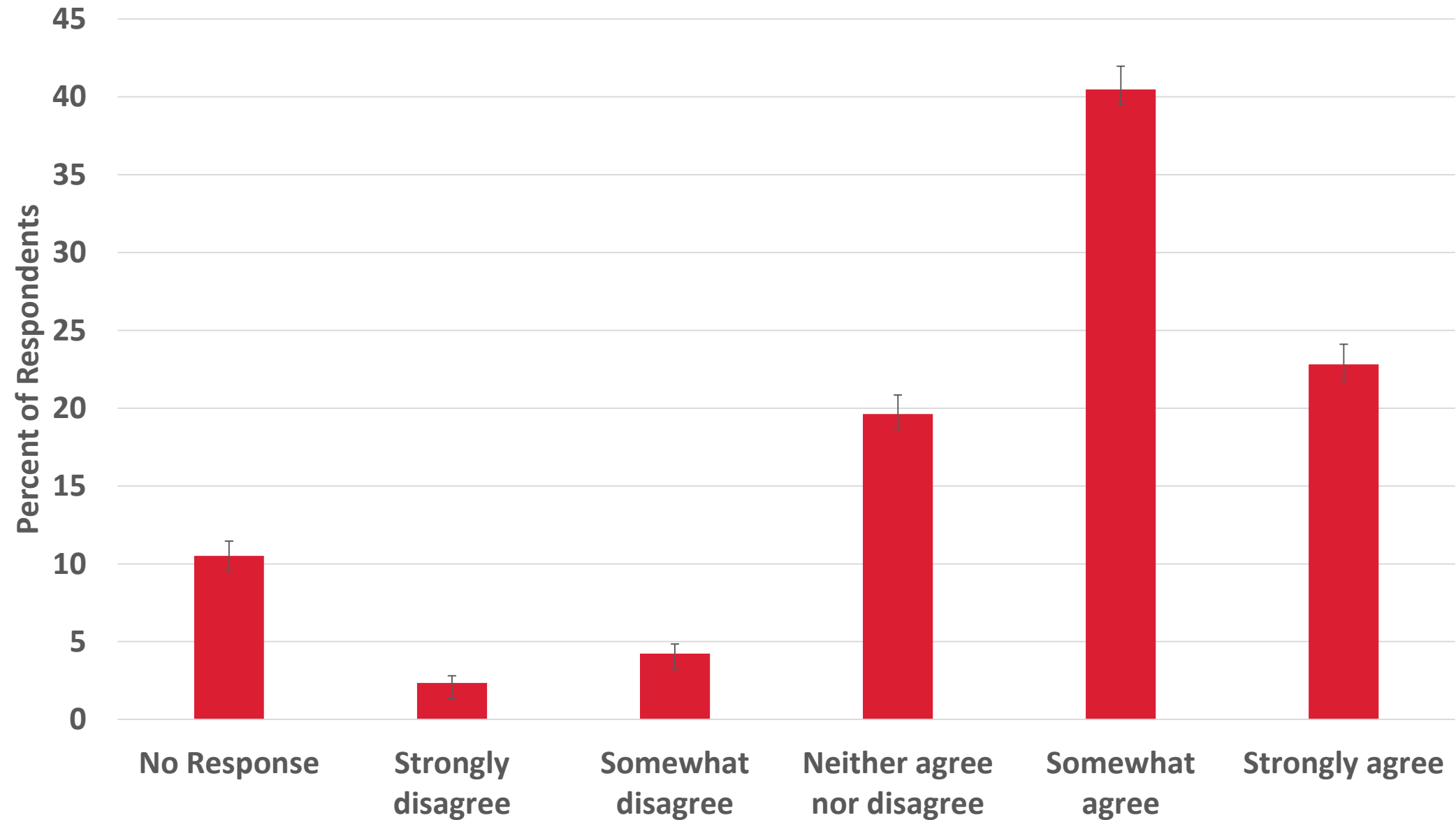


If an online decision support tool existed would you use it?





I would use tool to create customized index?





Selection index in a nutshell

- Tool to enable informed multiple-trait selection
- Based on:
 - Breeding objectives
 - Economic parameters
 - Relationships among traits
 - Population (herd) means
- Designed to improve commercial level profitability



Decision making process

- Develop a Breeding Objective
 - Identifies sources of cost and revenue
 - Sets goals conditioned on resources
- Identify breed(s)
- Develop a Breeding System
- Select seedstock supplier(s)
- Select bulls
 - Should align with breeding objective



Data is constantly
growing

(more animals, more
traits, more genotypes,
sequence data)

Requires turning data
into tools

This is where the global
ABG community spends
a great deal of time



Too complicated

- A lot of bull sales, and a lot of bulls in each sale
- Too many EPD—hard, if not impossible, to select on multiple traits simultaneously using only individual EPD
- In many cases EPD are breed-specific—must convert to common base
- Need to account for the value of heterosis and differences in breeds relative to average performance
- Indexes exist and are provided by breed associations (and some vendors)
 - Although robust they are generalizations



Increasing list of
EPD

Requires turning
tools into
impactful
decisions



Investment thought process

- Producers face the problem of obtaining the best bulls for their operation in that given setting.
- 'Best' is a relative concept.
- A 'less desirable' bull may become the preferred choice over a 'more desirable' bull if his sale price discount is larger than the differential in value between the two bulls.



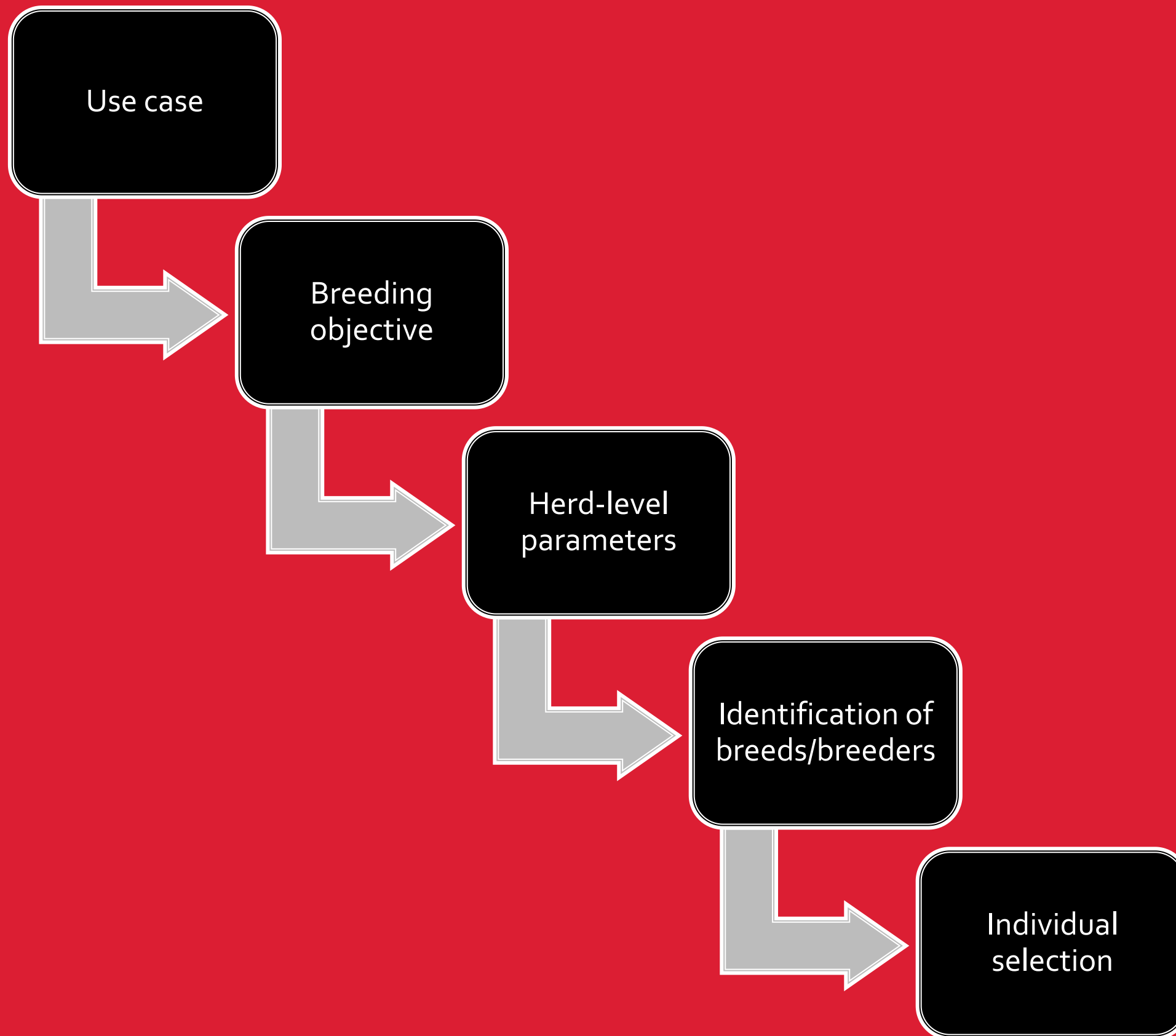
Use cases

- We have framed three possible use cases:
 - Commercial buyers (genetic purchasing decisions based on firm-specific breeding objectives)
 - Seedstock sellers (matching sale offering to individual customers)
 - Seedstock buyers (matching genetic purchasing decisions to specified goals)



Components of customized index

- (co)Variances—literature
- Cost/revenue pricing—industry averages or user-defined
- Breed information—user defined
- Phenotypic means—industry averages or user defined
- Breeding objectives—user defined
- EPD—Uploaded (user or seedstock seller), secure API breed association



Use case

Breeding objective

Herd-level parameters

Identification of breeds/breeders

Individual selection



Nuances

- Tiered layer of input
 - Essentially generalized index
 - Reasonable knowledge of unit cost of production
- Discounted gene flow
- Discounted expression rates
- Planning horizon
- Can be used to create generalized indexes with ability to further “tweak” by members/users



Current status

- Alpha version with grant team
- Next steps
 - Version to advisory board
 - Key training sessions (extension personnel, breed association staff)



Final comments

- The impetus for this project is **not** the belief that currently available selection indices are so inherently flawed that they are of little value.
- We believe that allowing beef cattle producers to take part in the creation of their own selection index has the potential to increase the rate of technology adoption.
- The other primary improvement is in the ability to combine multiple partial solutions (e.g., additive and non-additive genetic effects) to enable sire selection across breeds in an economic framework.



Thank you

USDA-AFRI-CARE Beef Cattle
Production System Decision
Support Tools to Enable Improved
Genetic, Environmental, and
Economic Resource Management
Survey of Industry Stakeholders;
Award Number: 2018-68008-27888