

# NRSP8 – Aim 1 2024 Report

Darren Hagen, Coordinator

Ted Kalbfleisch, Co-Coordinator

January 12, 2025

# Aim 1 - Extending genomics capacity to a broader range of Animal Science stakeholders

“New genomic technologies support the collection of expanded “omic” data types and increasing data volume. In fact, for most researchers, it is now easier to generate genomic data than it is to manage and analyze the resulting data. **Aim 1 specifically addresses the ways researchers can acquire, analyze, share and re-use genomics data types for their own programs.**”

- NRSP8 Nontechnical Summary (NIMSS)

# Aim 1 - Approach

1. Our approach will be to survey stakeholders to identify their needs in genomic analyses and data sharing.
2. Survey results will be used to develop well-documented and easily accessible workflows, as well as community best practices.
  - topics will be included in “training and education” workshops, along with detailed step-by-step guides and worked examples.
3. Resources developed under this aim will be prioritized based on stakeholder feedback

# Aim 1 - Outcomes

Outcomes will be measured by

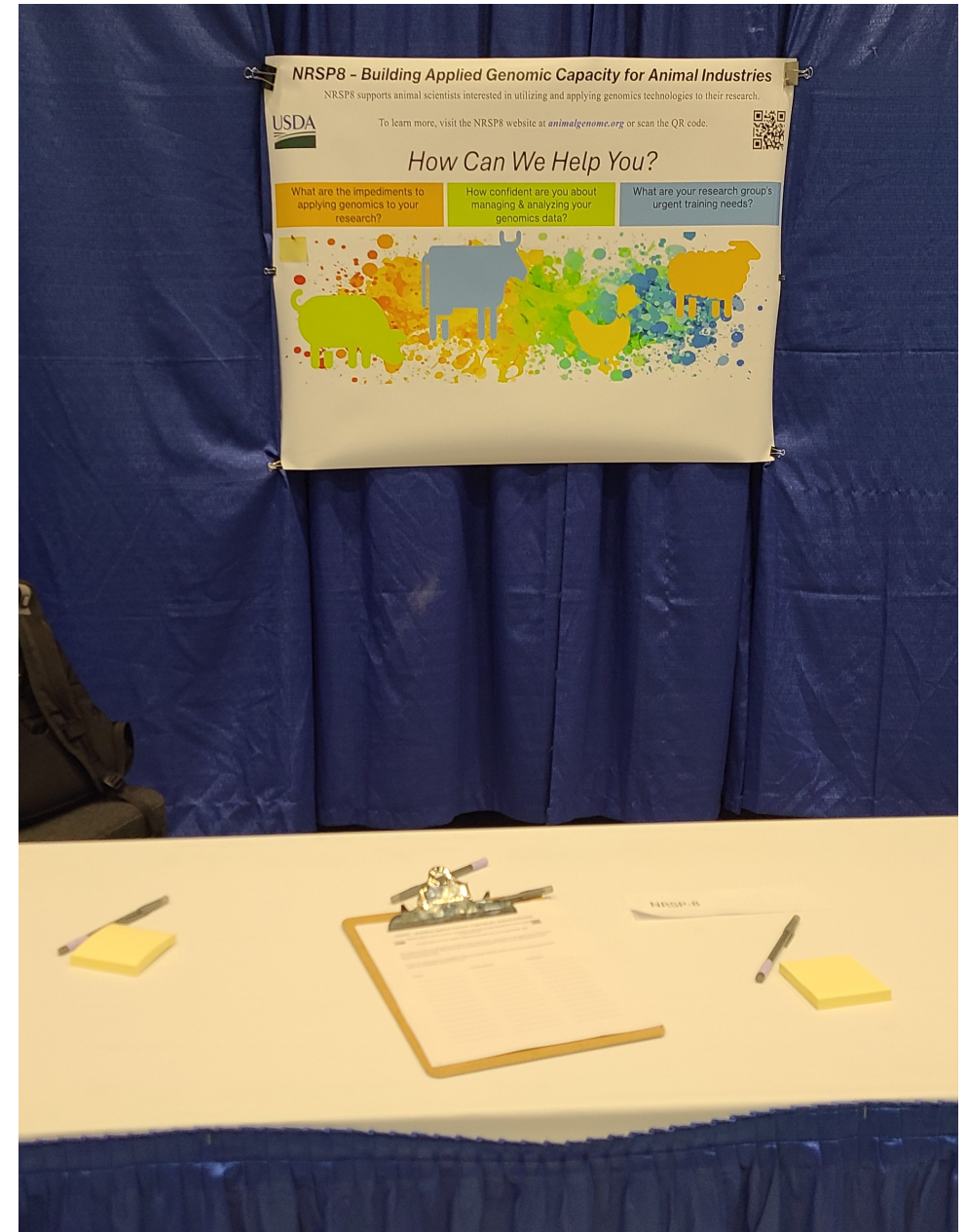
- (i) the number of workflows and standards developed and
- (ii) usage statistics for these resources by the stakeholder community.

*expected impact* - an expansion of capacity for the broader research community in effectively utilizing genomics approaches.

# Aim 1 - Efforts

- Darren Hagen
  - American Society of Animal Science (ASAS)  
– Calgary, AB  
July 2024
- Annette McCoy
  - American Association of Equine Practitioners (AAEP) - Orlando, FL  
Dec 2024

If you are attending a “non” genetics/genomics meeting, consider outreach



# Aim 1 - Efforts

## AG2PI COCONUT GRANT - PROJECT FINAL REPORT

PROJECT NAME	Developing standardized bioinformatics capacity across multiple agricultural species.
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PROJECT PRINCIPAL INVESTIGATOR	TODAY'S DATE	PROJECT START DATE	DATE OF COMPLETION
Fiona McCarthy	25 May 2024	3/1/23	2/29/24
TEAM MEMBERS (co-PI, co-I, personnel)	COLLABORATORS		
Stephanie McKay, Associate Professor, University of Missouri Pankaj Jaiswal, Professor, Oregon State University	Andrew Nelson, Cornell University Fernando H. Biase, Virginia Polytechnic Institute and State University Chi Zhang, University of Nebraska-Lincoln Shuyu Liu, Texas A&M university C. Titus Brown, University of California Davis Ted Kalbfleisch, University of Kentucky		

# Aim 1 - Efforts

ACTIVITY / PRODUCT	DESCRIPTION (include URL, if applicable)	OUTCOME / METRICS
Discussion of bioinformatics needs		Approx. 20-25 attendees. Report of the discussion & conclusions/next steps will be prepared and shared with NRSP8, NRSP10, AgBioData groups.
Workflow	Genotype-specific RNA Splicing Variants and <u>Microexon</u> Quantification	<a href="https://github.com/yshi20/MEPsuite">https://github.com/yshi20/MEPsuite</a>
Workflow	Prediction of anti-sense lncRNAs workflow	<a href="https://github.com/cer246/Identifying-antisense-lncRNAs/tree/main">https://github.com/cer246/Identifying-antisense-lncRNAs/tree/main</a>
Workflow	Integrating Illumina and ONT sequence workflow	<a href="https://github.com/gschettini/transcriptome_reconstruction_short_long_reads">https://github.com/gschettini/transcriptome_reconstruction_short_long_reads</a>
Workflow	Quantifying RNA splicing variants workflow	<a href="https://github.com/Kxpark/NexGenSnake/">https://github.com/Kxpark/NexGenSnake/</a>
Workflow	Identifying structural variants workflow	<a href="https://github.com/diblalab/Cattle_Structural_Variant_Benchmark">https://github.com/diblalab/Cattle_Structural_Variant_Benchmark</a>

NRSP8 may provide an opportunity to fund your student to refine development of their workflows

KY/Kalbfleisch\_AG2

# Prospective Opportunities

- More engagement with the External Advisory Board
- Integrate with and maximize the overlap with the RCN
- Grant Proposals
  - i.e. Molly McCue, Yanghua He, Fiona McCarthy (bring grad students to conferences and meetings)



# **NRSP8: Objective 2**

# **Coordinators 2024 report**

Coordinator: James Koltes [jekoltes@iastate.edu](mailto:jekoltes@iastate.edu)

Coordinator Elect: Cedric Gondro: [gondroce@msu.edu](mailto:gondroce@msu.edu)

**January 12, 2025**

# Objective 2 is broad to encompass everyone

**Specific Aim 2:** Supporting capacity to integrate genomic and biological data.

## Approach:

- Develop workshops to identify stakeholder data collection and data analysis gaps;
  - roundtable discussions with informaticians and engineers to develop interdisciplinary teams;
  - support for students and early career investigators, including attendance at bioinformatics and data science meetings.
- 
- This is capacity to support the community in broad terms. Everyone in the animal breeding, genetics, genomics, phenomics and bioinformatics community can fit into objective 2.

# Objective 2 activities in 2024

- **Gathering feedback and fostering discussions.**
  - Captured feedback from stakeholders (research, education, extension)
    - Interests in: student education, informatics resources, collaborations external to NRSP8
  - Development of new connections outside of the animal genomics community (EU, other NRSP, AgBioData).
- **Facilitating Communications:**
  - New news stream and bulletin board at [animalgenome.org](http://animalgenome.org) (lead by Zhiliang Hu)
  - General information posting about NRSP8 and USDA NIFA Animal Genomics RCN
  - [Development of a plan to modernize animalgenome.org](#)

# Summary of all stakeholder discussions & feedback

- **Industry:**

- Education is a priority, don't forget basic animal science training. Students are forgetting how to apply genetics to the animal.
- Continued bioinformatics training
  - More database experience/ expertise is needed
- Bioinformatics tools
  - faster comparison of pan genomes
  - Tools/ ways to assist with ID matching (phenomics data)
  - Sequence database/ resource would be helpful (similar to the cooperative dairy DNA repository, CDDR, in dairy cattle). Could we help develop an imputation panel/ resources across breeds within species
- Consider reaching out to additional organizations: ICAR, DHIA, NAAB to determine their needs.
- **Extension:** Simplified tools to help explain the importance of genetics/ genomics to constituents
  - Consider reaching out to Ebeef, BIF, beef genetics brown bagger seminar
- **Academics:**
  - More communications on what NRSP8 is doing.
  - Help to travel to NRSP8 meetings as funds are limited
  - Where does molecular genetics/ molecular biology research fit in NRSP8?
  - Can we identify strategic collaborations with EU efforts (e.g., Elixir G2P and phenomics- EU-Li-Phe COST consortium)
  - AgBioData RCN: Interested in hearing more about our needs, sharing resources (informatics/ db teaching material)

## **External groups expression interest in further discussions**

- NRSP9 (nutritionists): Can we help support databases and training for nutritionists working with genomics/ phenomics data
- NF-core community:
  - Slack user interest groups may be helpful to students to quickly ask and obtain answers for using common omics pipelines/ software (nf-core/animalgenomics)

# EU initiatives to approach for collaboration

- Phenomics: EU-Li-Phe COST consortium

<https://www.cost.eu/actions/CA22112/>

- Genotype to Phenotype Research: Elixir

<https://www.elixir-europe.org/>

# Project to update the NRSP8 website *animalgenome.org*



BBS

Building Applied Genomic Capacity for Animal Industries

## NRSP8 Trainee Travel Award

Supported by: USDA-NIFA  
Scherago International



Join NRSP8 efforts at all levels of collaborations, be it in terms of expertise, depths in science, or areas in

In collaboration with  
**Noelle Cockett (Animal Genomics RCN)**

Proposed 4 phase approach

### Phases

- 1) Communications
- 2) Tools/Database - phase 1
- 3) Database - phase 2
- 4) AngenMap listserve

[Animalgenome.org](http://Animalgenome.org)



# What is being planned in 2025

- **Building new collaborations & partnerships with EU partners**
  - Objectives 1 & 2: Collaboration with EU funded Elixir project
  - Objective 3: NF-core will provide informatics workshops in 2026
- **Communications:**
  - Modernization project for [animalgenome.org](http://animalgenome.org)
  - Current events page at [Animalgenome.org](http://Animalgenome.org)
  - Quarterly news email from NRSP8 leadership team
  - Support networking across animal science communities

# Thoughts for future activities

- We need to keep talking to stakeholders, we need to make the website a better place to communicate information, and maybe in 2025 we can start to coordinate researchers to develop some tools desired by stakeholders.
- Need to do more for early career scientists (pre-tenure)
  - Ideas: Mixers for informal mentorship (virtual or in person at conferences), help with travel?, foster opportunities to speak at meetings
  - Seek additional ideas
- Working to provide more timely updates on NRSP8 activities at [animalgenome.org](http://animalgenome.org)
  - Monthly updates and perhaps a 3x per year newsletter sent to AngenMap
- Investigate need for bioinformatic and genomic tools
  - E.g., imputation panel for genome communities to impute to sequence perhaps in collaboration with existing resources (MSU, MU, others?)
  - Investigate areas to help, leverage or share pangenome research



# Additional Thoughts for future ideas

- See if we could get traction for a T32 style grant across institutions to develop capacity building resources and train grad students and postdocs on the intersect bioinformatics / quantitative genetics / genomics. I think we are a bit overdue in bringing these 3 communities together in an integrated framework.
- Some centralized place for storing genomic/phenomic data with open access for model development (especially AI), and again thinking animalgenome.
- A community discussion on how to offer cross-institutional grad courses in this space, with annual workshops for networking and soft skills training (a bit pie in the sky with the tuition system we have in the US – but maybe could at least this conversation)

# Thoughts on developing future capacity: Collaborations between the USDA-NIFA Animal Genomics RCN & NRSP8

- The USDA-AFRI RCN led by Noelle Cockett will also be able to help with some aspects of “capacity”.
- Continued and frequent discussions between the USDA-AFRI RCN project and NRSP8 will be critical as the RCN has funds and plans to bolster research capacity in 4 focus areas:
  - Genome Sequencing
  - Functional Annotation
  - Genome Representation
  - Precision Phenomics

# Incoming Aim2 Coordinator: Cedric Gondro, Michigan State



## Contact information

- Coordinator as of January 2025: Cedric Gondro: [gondroce@msu.edu](mailto:gondroce@msu.edu)
- Outgoing coordinator: James Koltes [jekoltes@iastate.edu](mailto:jekoltes@iastate.edu)
- Chair-elect: TBA soon!



# NRSP8 AIM 3 REPORT

R. R. COCKRUM - AIM 3  
COORDINATOR

YANGHUA HE - AIM 3 CO-  
COORDINATOR

VIRGINIA POLYTECHNIC  
INSTITUTE AND STATE  
UNIVERSITY



# TRAINEE TRAVEL AWARD

39 APPLICATIONS  
10 AWARDS

## Award Details

- ✓ Up to \$2000 for travel expenses
- ✓ Registration fees to attend NRSP8 workshop and PAG32/USA

## Eligibility

Trainees completing a PhD or Postdoctoral Fellowship in animal or veterinary sciences (e.g., genetics/genomics, animal breeding, bioinformatics, physiology, anatomy, nutrition, reproduction, or other relevant disciplines) are eligible to apply for this travel award. First-time PAG attendees are strongly encouraged to apply. Trainees can only receive one award per 5-year cycle. Up to 12 travel awards will be awarded for the 2025 meeting. Trainees must be enrolled at a US institution and their mentor must be a member of NRSP8. Instructions to join NRSP8 can be found at <https://www.animalgenome.org/NRSP8/join>

## How to Apply

- Applicants must provide:
- ✓ A short (250 word) **scientific abstract** to be submitted for presentation at PAG32.
  - ✓ A **personal statement** (500 words) that describes their professional goals and how this travel experience will help them to

achieve those goals. Where does this experience fit in with their larger training program? Please include how this experience fits in with one of the NRSP8 aims (<https://nimss.org/projects/view/mrpro/outline/18969#objectives>).

- ✓ A **mentor letter of recommendation** which includes a clear statement about how the student's research and/or motivation for attending PAG32 aligns with the NRSP8 goals of extending genomics capacity to a broad range of Animal Science stakeholders and/or developing capacity to integrate genomic and biological data. This letter of recommendation should also be submitted directly to the selection committee ([NRSP8\\_L10@acfmz.wvu.edu](mailto:NRSP8_L10@acfmz.wvu.edu)) and should clearly indicate the student's name and affiliation.
- ✓ The application can be accessed at <https://forms.illinois.edu/sec/670635109>.

## Due Date

Due **October 1, 2024**  
Awardees will be notified by November 15, 2024. Applications will be reviewed by members of the NRSP8 Leadership Team. Awards will be paid after the meeting as a travel stipend.

**Leland Ackerson IV**, Michigan State University, MI

Abstract: Constructing the Swine Reference Pangenome

**Johanna Aldersey**, Oak Ridge Institute for Science and Education (ORISE), TN

Abstract: A tale of two atlases: Discover the secrets of channel catfish splenic cells

**Yifei Fang**, Cornell University, NY

Abstract: Cross-species comparative transcriptomic analysis of embryonic stem cells (ESCs)

**Samantha Hammack**, University of Illinois Urbana Champaign, IL

Abstract: Sex-specific muscle transcriptome response to exercise in pre-pubertal foals

**Fazhir Kayondo**, Iowa State University, Ames, IA

Abstract: A genome-wide association study of measures of stress response in young healthy pigs and in grow-to-finish pigs exposed to a natural polymicrobial disease challenge

**Guangsheng Li**, Cornell University, NY

Abstract: Sex differences of bovine blastocyst revealed by transcriptome profiling and long-read sequencing

**Hunter McConnell**, University of Missouri, MO

Abstract: Development of a method for identification of ancestral alleles from whole genome sequence data

**Temitayo A. Olagunju**, University of Idaho, ID

Abstract: An ovine super-pangenome to characterize genetic diversity in sheep

**Guglielmo Raymo**, University of Maryland, MD

Abstract: Functional Interrogation of the de-novo rainbow trout microbial genome atlas reveals longstanding symbiotic host-bacteria interrelationship

**Junjian Wang**, North Carolina State University, NC

Abstract: Quantifying heritability enrichment of functional genomic elements in complex dairy cattle traits using multi-component linear mixed models

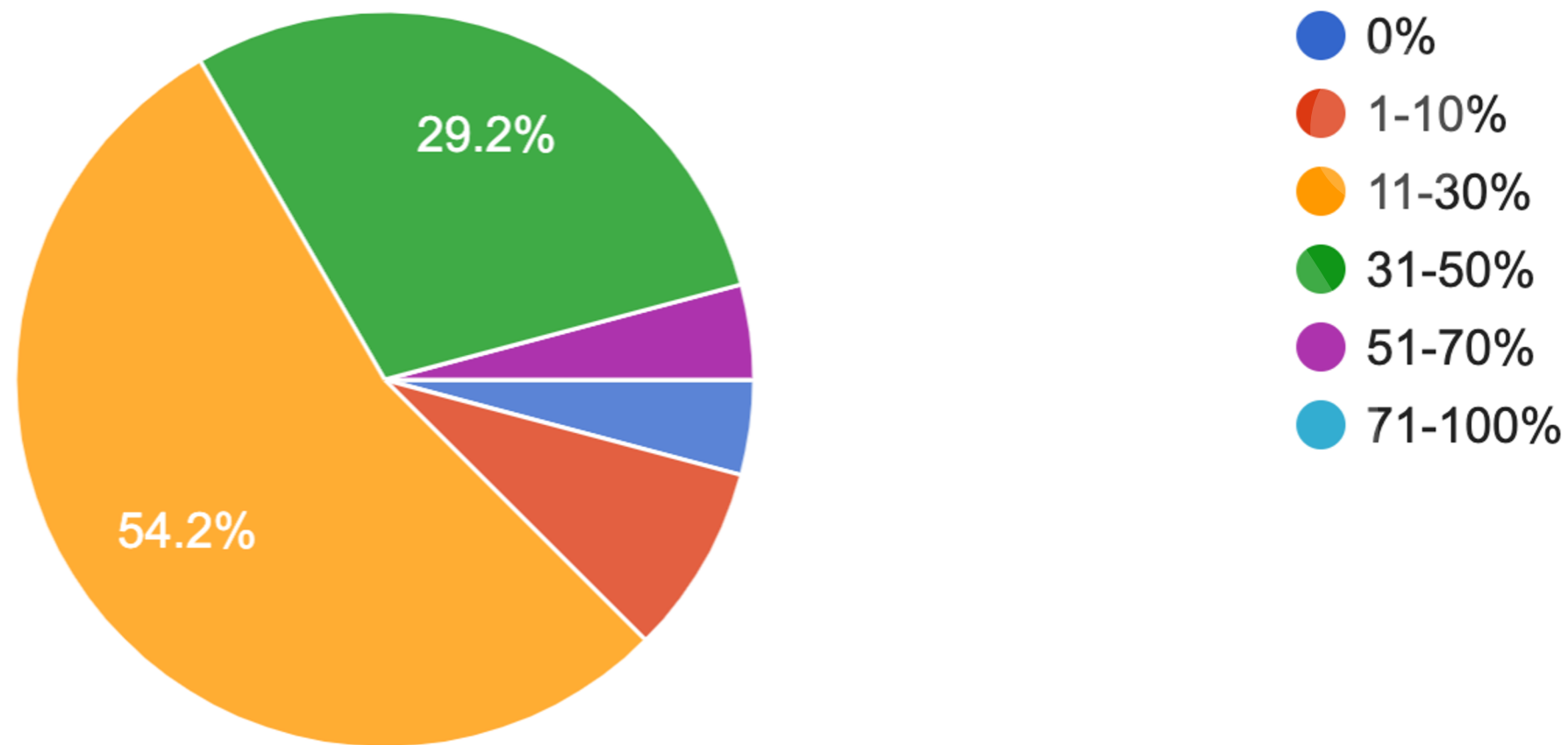
*HELP BUILD A DATA-SAVVY WORKFORCE* - SURVEY  
RESULTS



# Goal of the survey

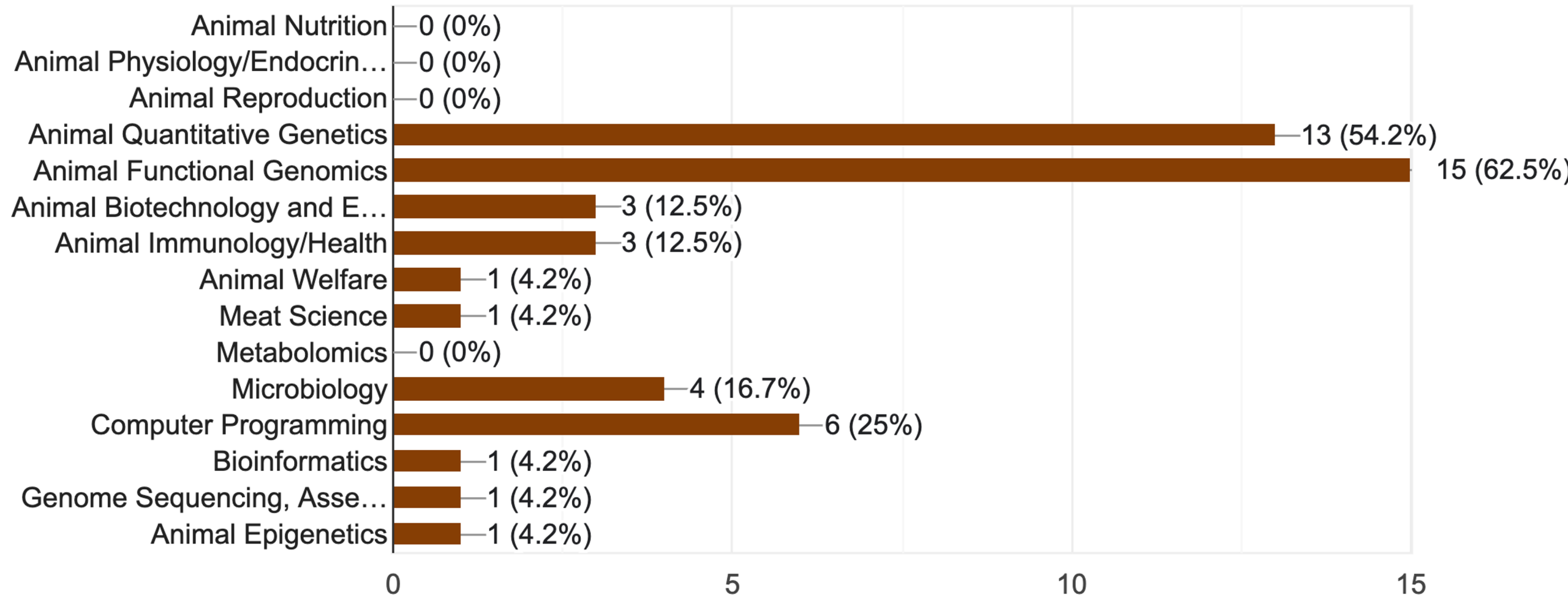
# What percentage of your role involves teaching?

24 responses



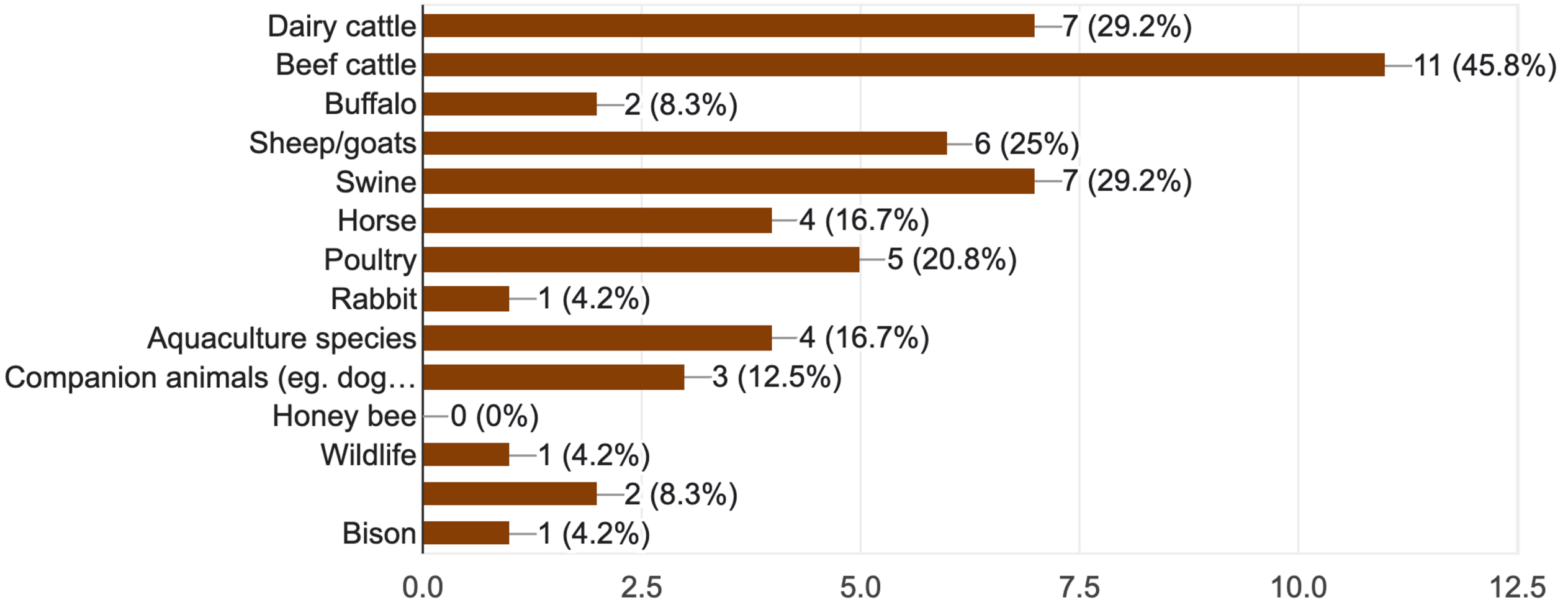
# What is your area of expertise?

24 responses



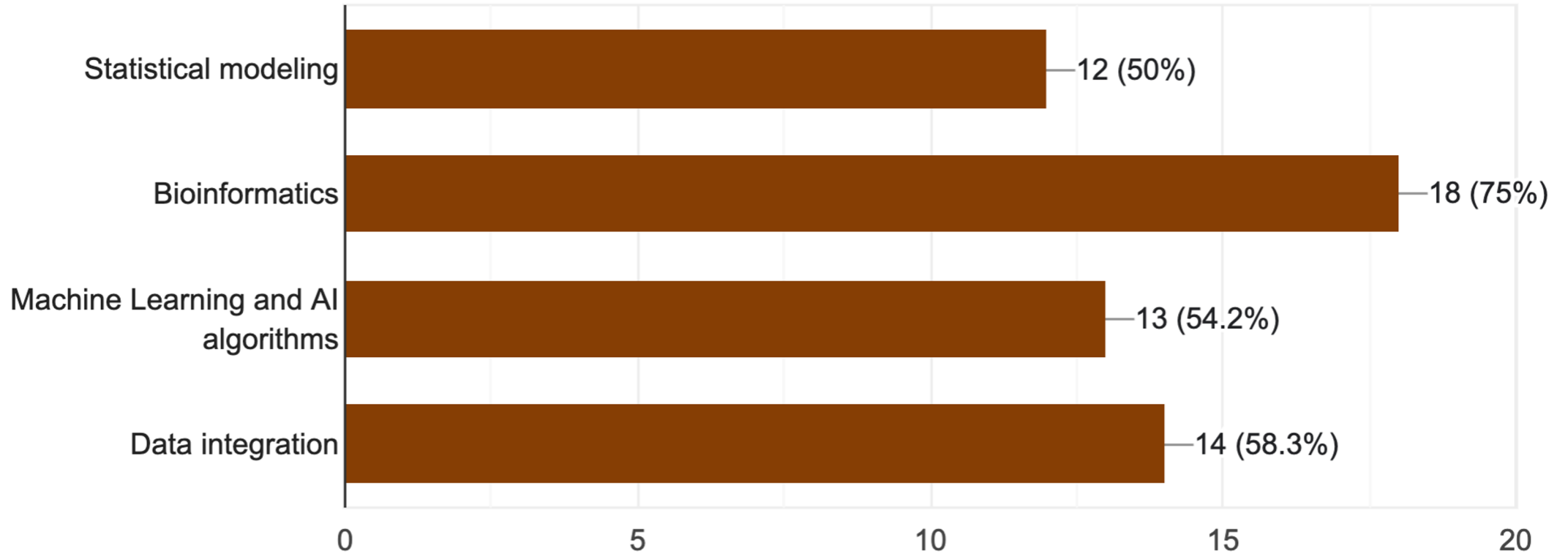
# Which animal species do you work with?

24 responses



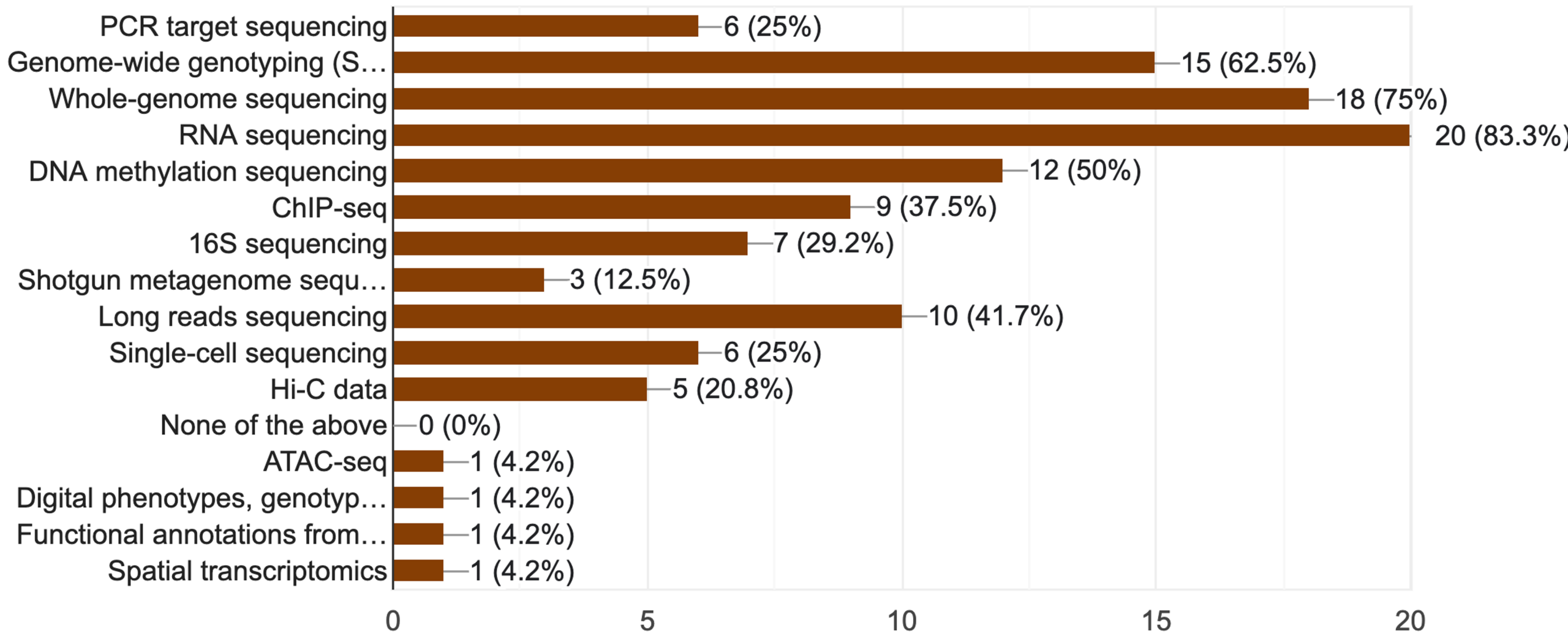
# What are your specific genomics needs in your research?

24 responses



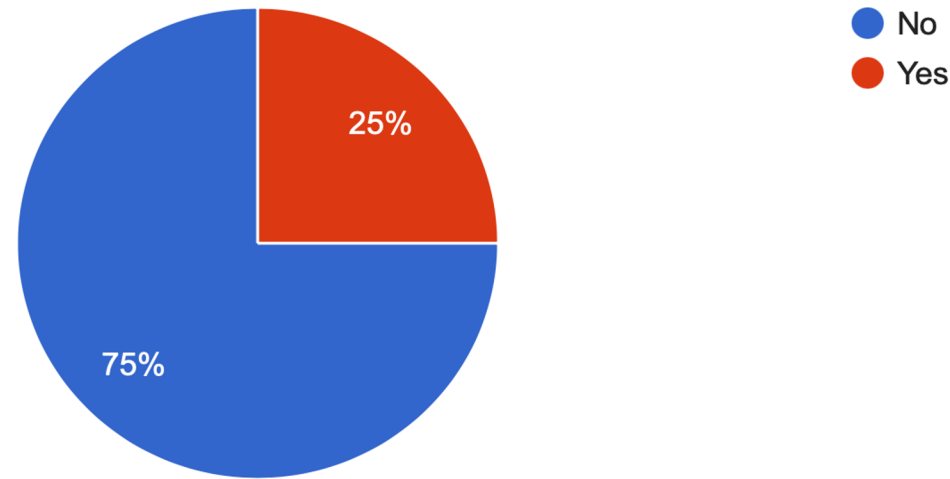
# What types of omics datasets are you working with?

24 responses



Has your group developed any genomic tools or software? If so, what have you created?

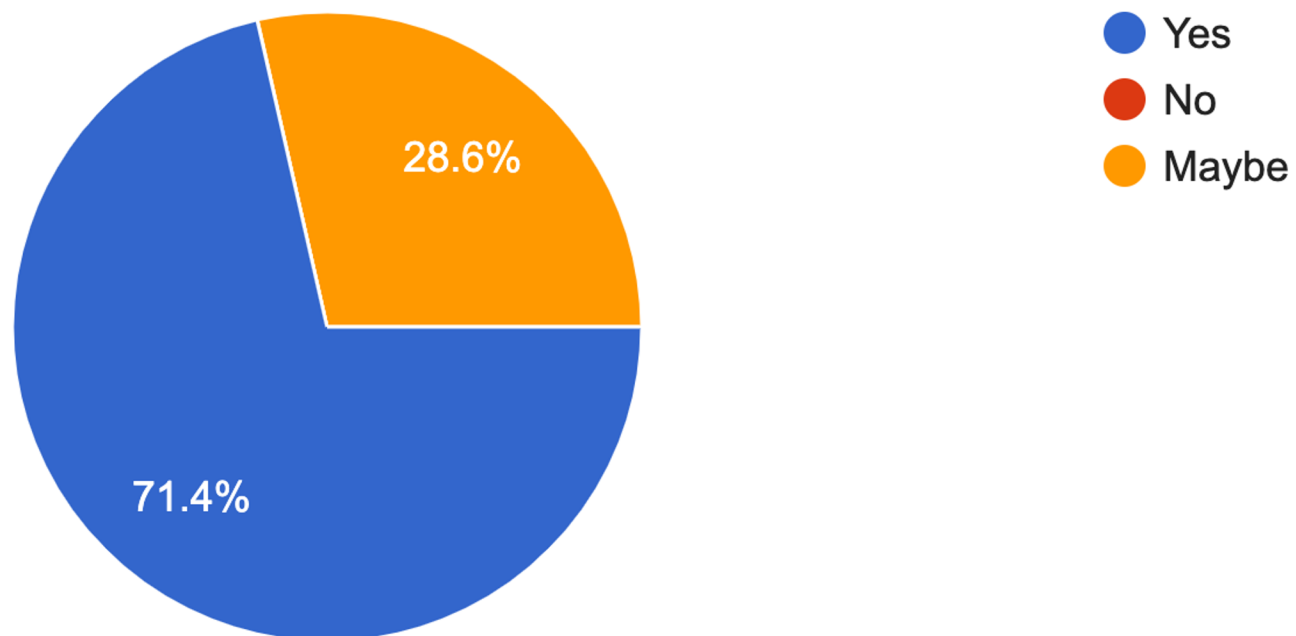
24 responses



- Pipelines for Mendelian disease variant identification for clinical applications in vet med. miRNA and isomer discovery, imputation
- Network analysis software, regulatory element prediction software
- gwaR (for GWA from GBLUP), various programs for behavioral genetics
- 1) SLEMM (<https://github.com/jiang18/slemm>); mixed-model solver for million-scale genomic REML and GWAS 2) MPH (<https://jiang18.github.io/mph/>): mixed-model solver for large-scale complex modeling
- Tools for custom analysis we occasionally need

If 'Yes' to the above question, would you like to share the omics tools developed in your lab with a broader audience?

7 responses

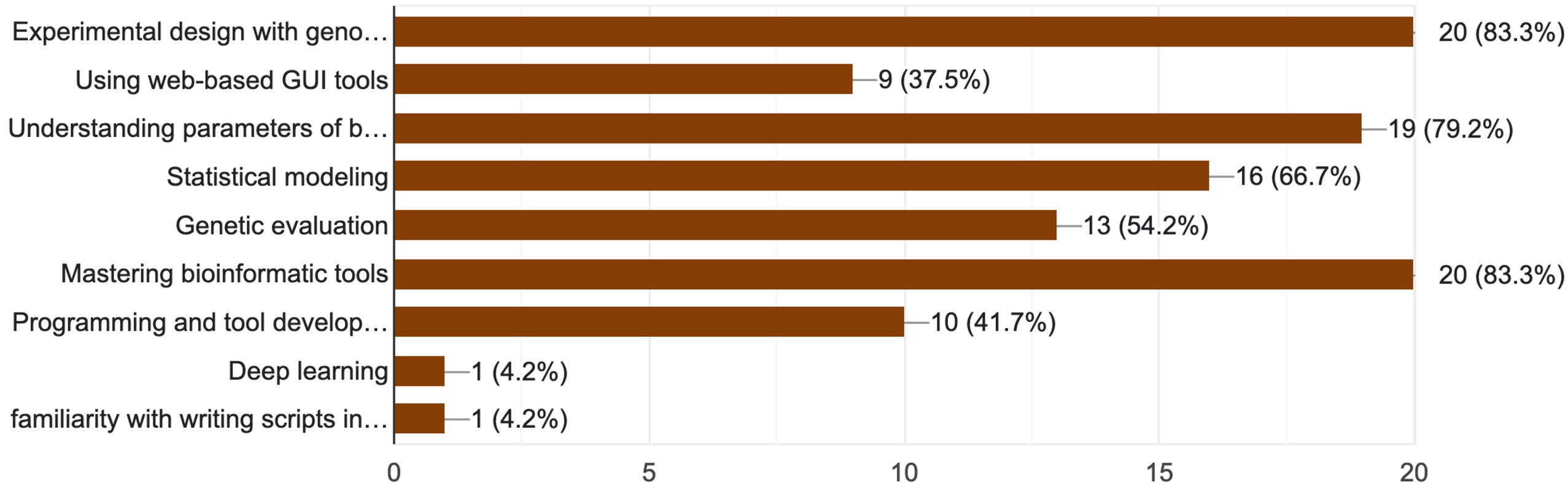




What tools do you use for analyzing 'omics data or large datasets?

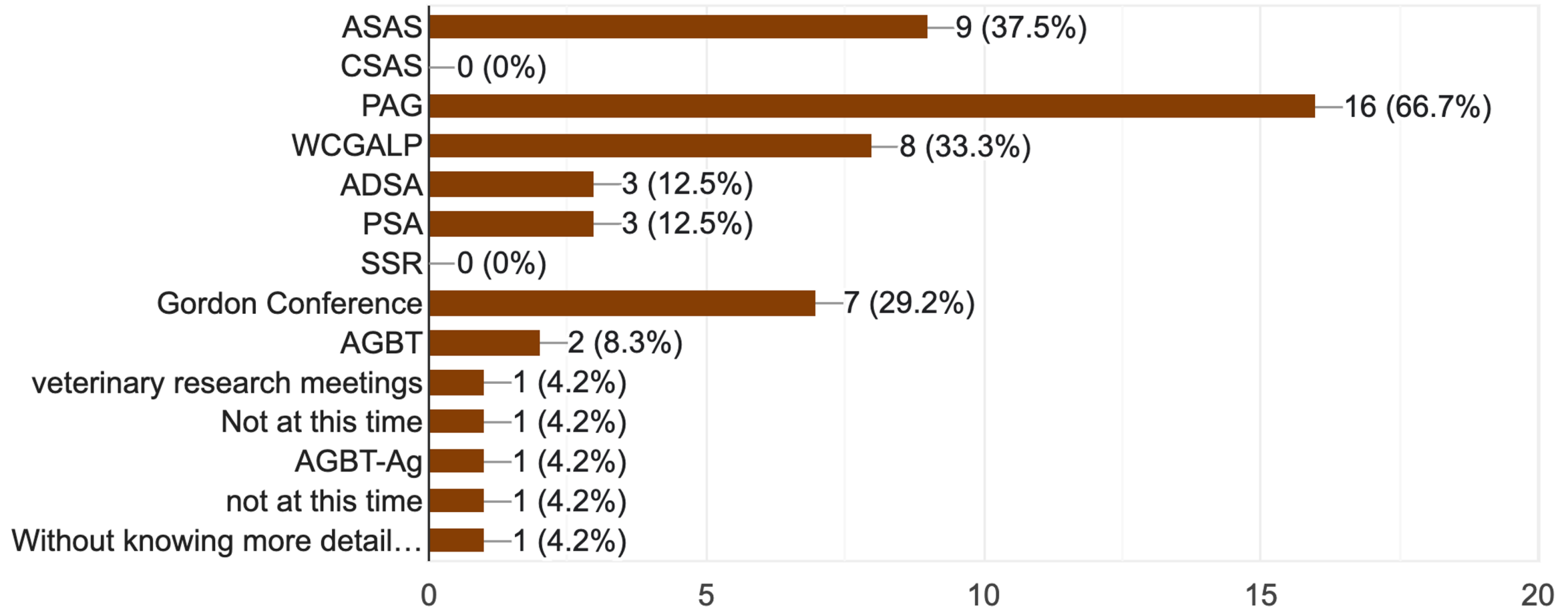
# What genomic or programming skills would you like your graduate students to master?

24 responses



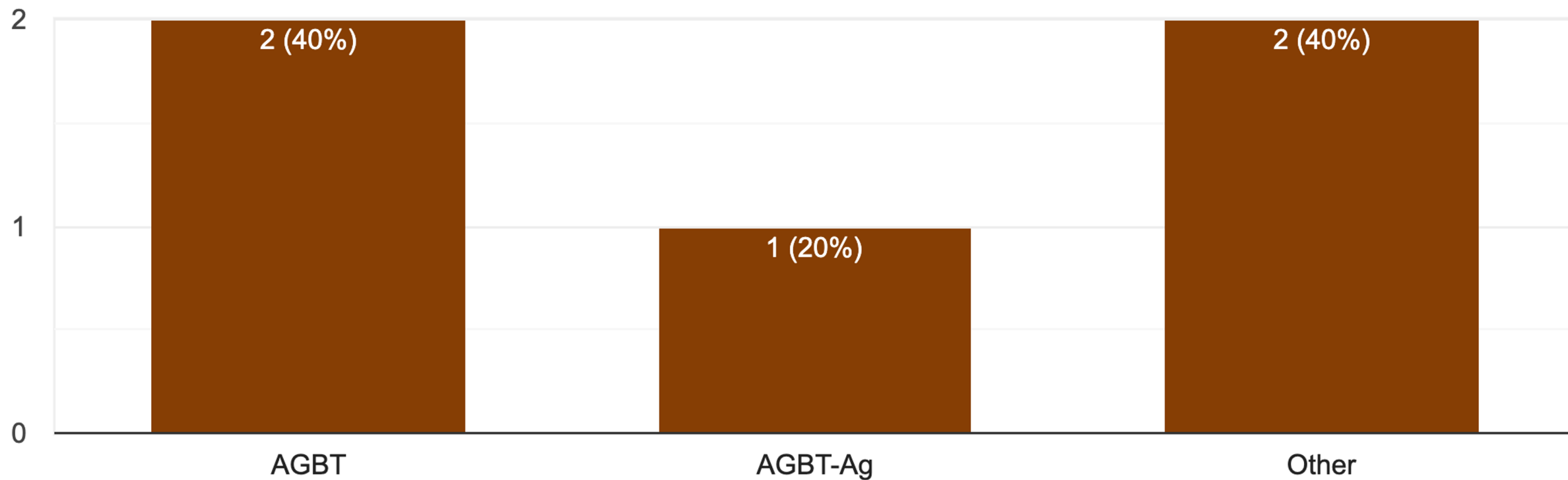
# If you work in the genomics field, would you be interested in leading a session at a genomics workshop at one or more of the following conferences?

24 responses



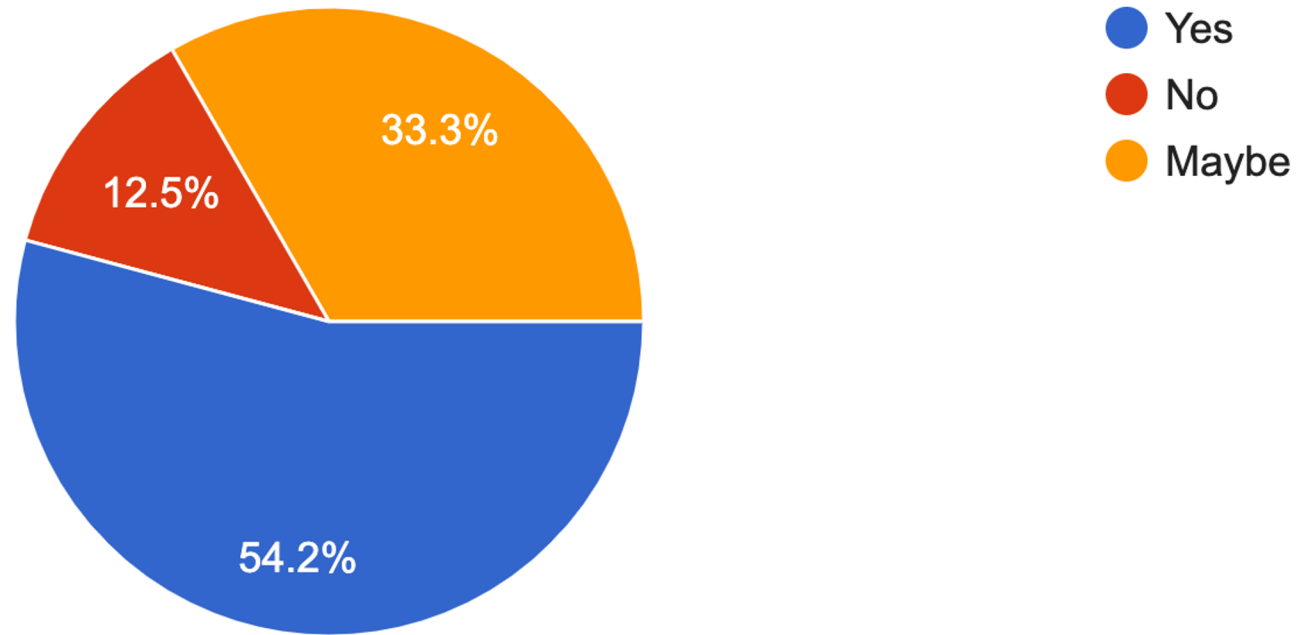
Please indicate 'Other' if you selected it in the question above.

5 responses



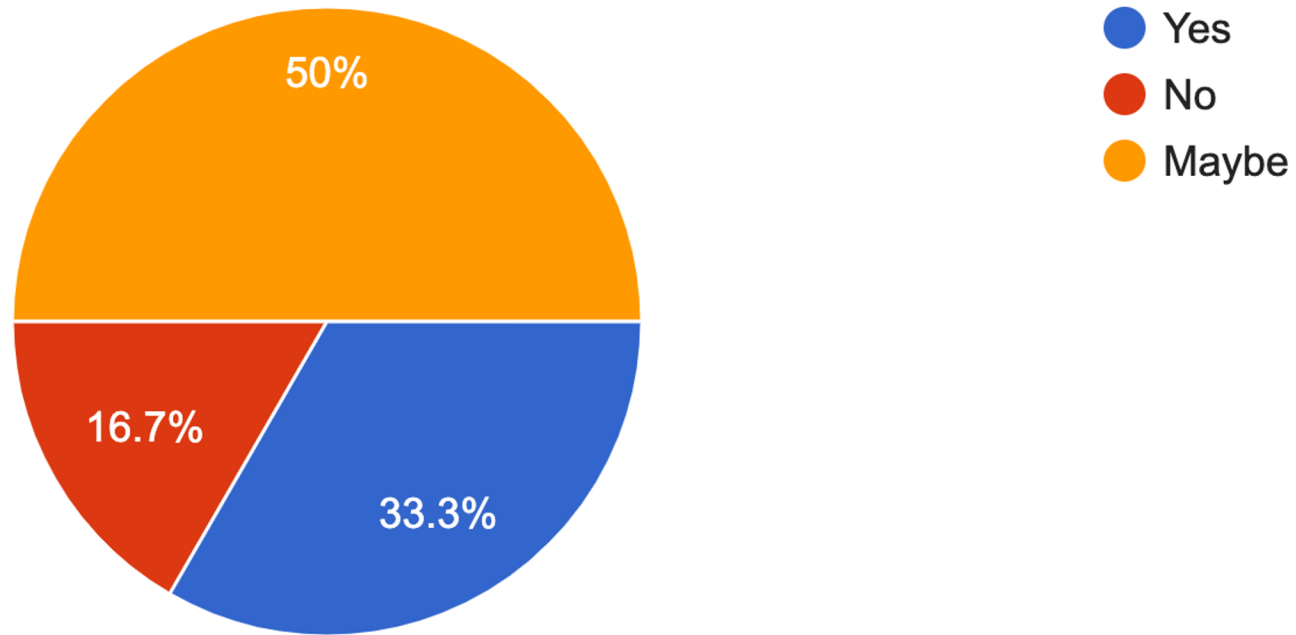
# Would you be interested in developing a cross-institution graduate-level genomics course?

24 responses



# Would you like to participate in creating asynchronous genomics learning modules?

24 responses



# NEXT STEPS

DEVELOP AIM 3 SUBCOMMITTEES

- GRANTWRITING
- TRAINING