

North American Truffle Growers' Association 2022 Survey Results

Data by growers for growers

Data to promote the industry and gain valuable insight on the best management practices for truffle production.

<http://ucanr.edu/trufflesurvey>

This survey aimed to collect producer data to better understand the truffle industry in North America. The questions helped characterize important demographics like orchard types, truffle species grown, site conditions, management practices, and production status. The results will guide future research needs and align growers with researchers.

North America Truffle Survey Team



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Retired Research Scientist, British Columbia



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Earned a PhD from MIT studying the interactions of fungi, plants and people in soils of high human impact



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Please note the following before viewing the survey results:

- All identifying information about orchards has been anonymized and will never be publicly available.
- Participants were asked to complete separate surveys for orchards in different locations and for orchards with different management strategies at the same location.
- Participants had the option to skip questions, so the figures presented are based on the available number of responses, which is listed for each figure.
- The terms "new grower" and "pre-production" were not clearly defined in the survey. We have reassigned these categories based on responses to other questions. "New grower" refers to someone who has not yet installed an orchard, while "pre-production" refers to a grower with an existing orchard that is not yet producing truffles.

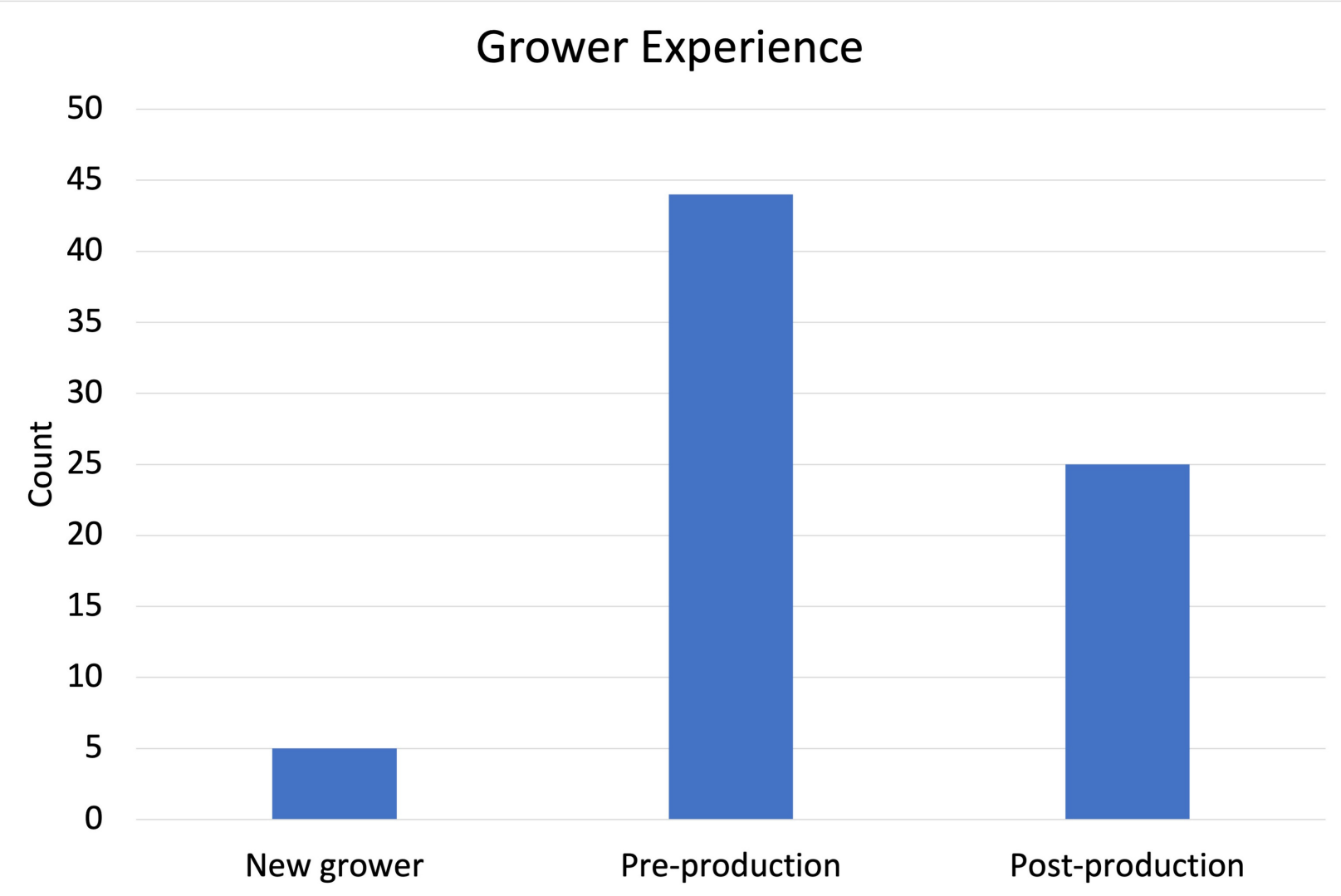
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Q 1. WHAT IS YOUR GROWING EXPERIENCE?

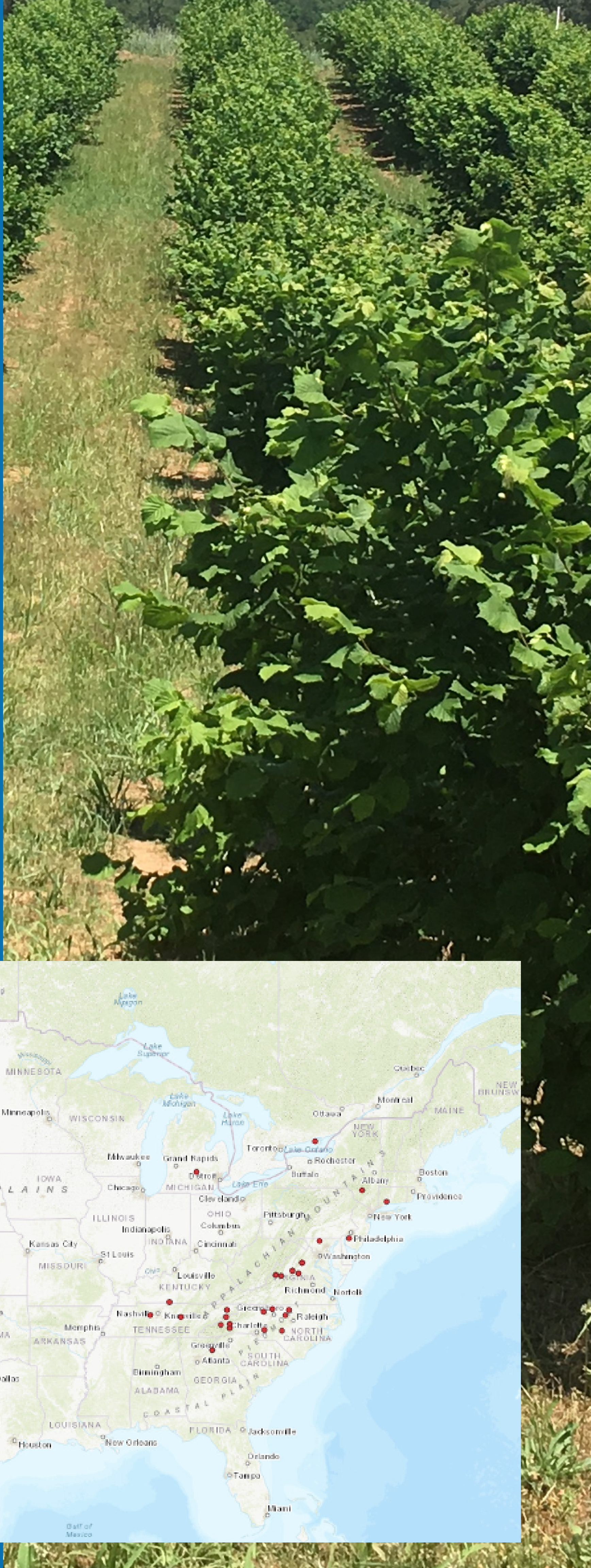
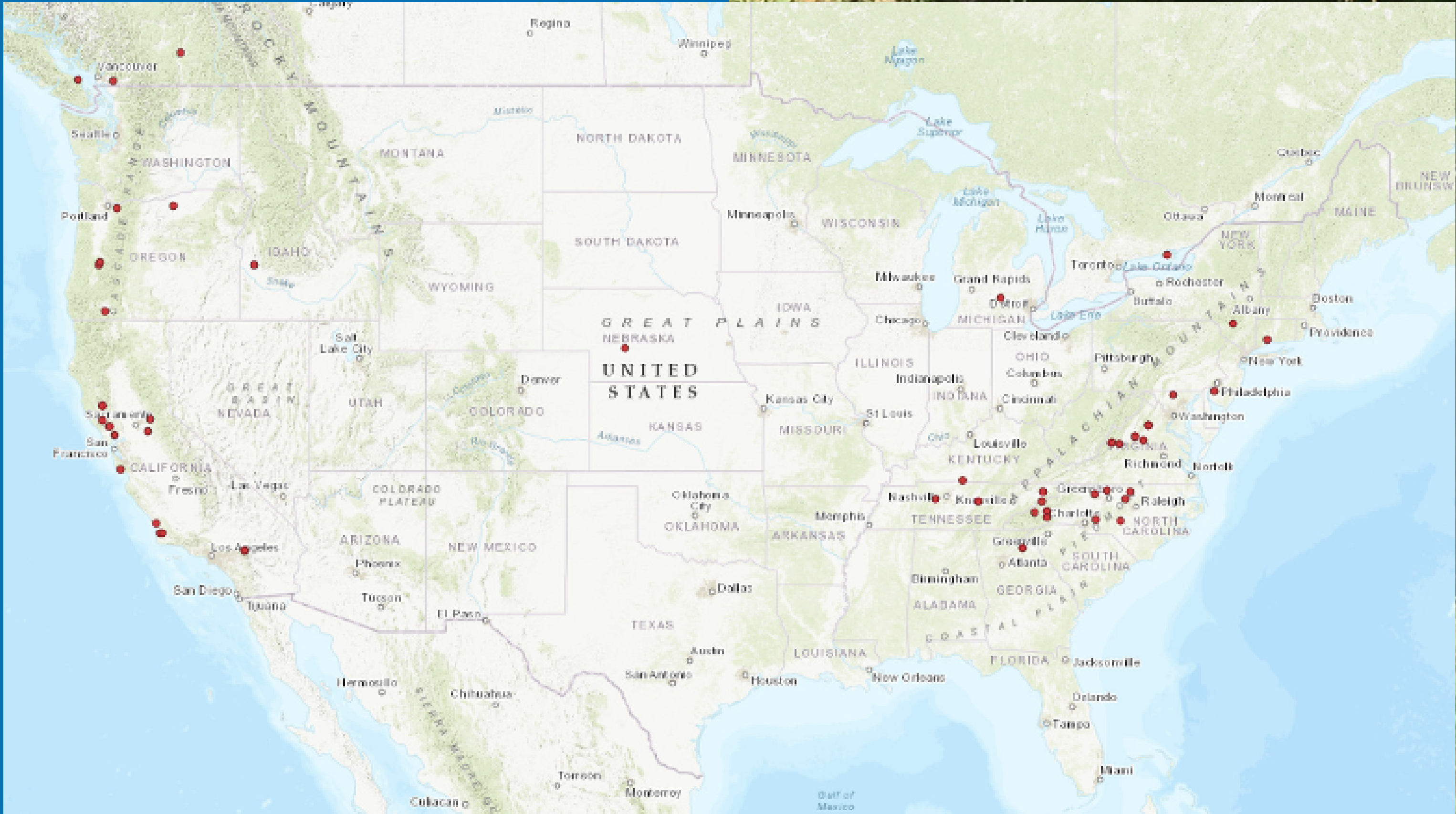
TOTAL RESPONSES: 74

Grower Experience	Count	Percentage
New grower	5	6.8%
Pre-production	44	59.4%
Post-production	25	33.8%



Q 2. ORCHARD LOCATION

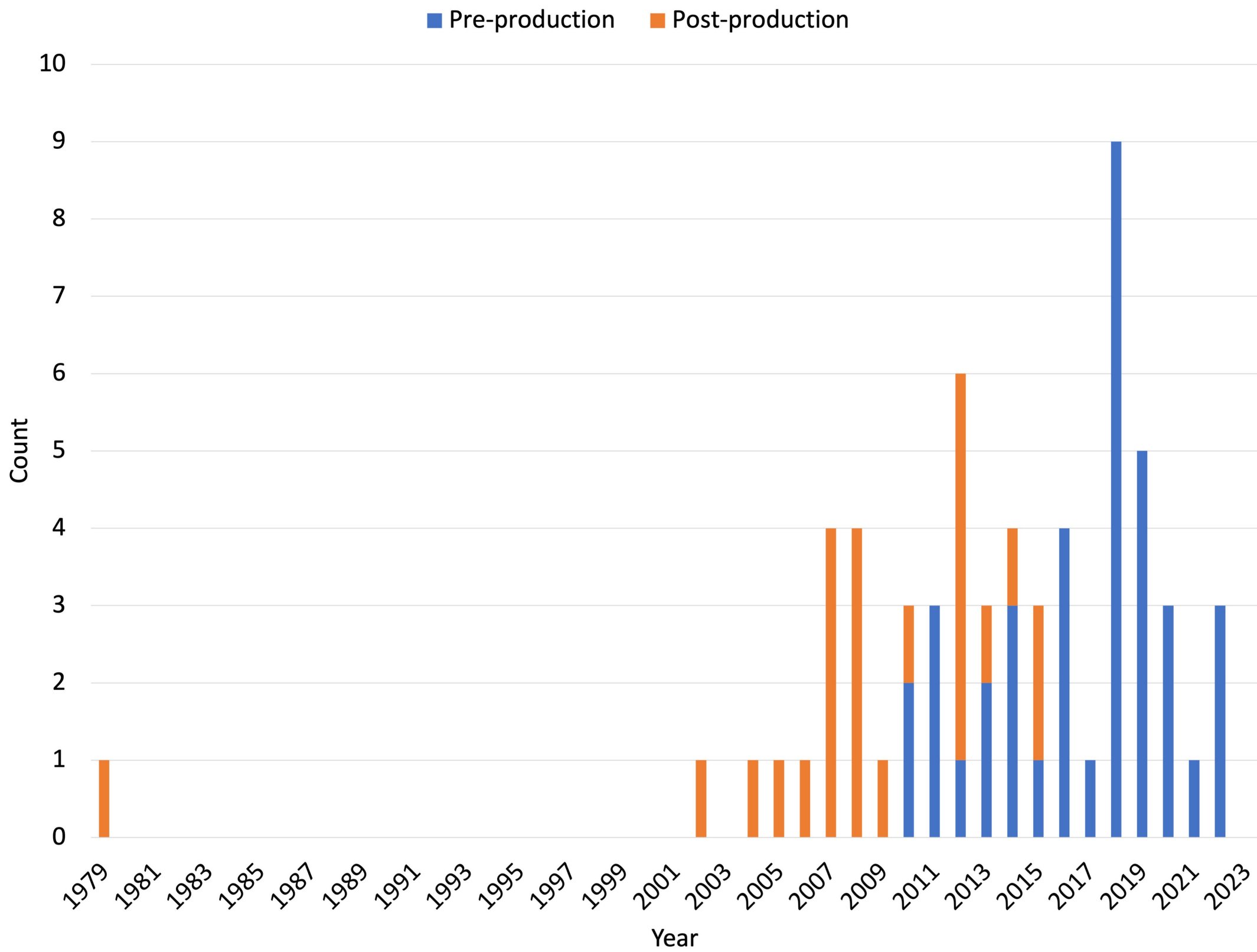
TOTAL RESPONSES: 62



Q 3. WHAT YEAR WAS YOUR FIRST TREE PLANTED?

TOTAL RESPONSES: 65

Year First Tree in Orchard was Planted



Note: This chart displays two separate datasets:

First, it shows the number of orchards planted annually, and color differences can be ignored.

Second, the color coding shows which orchards have come into production between the year they were planted and the time of the survey (2022). There are three distinct clusters:

1) All orchards planted between 1979 and 2009 came into production sometime after planting. Please note that this does not indicate that age alone is necessary to achieve truffle production.

2) Some orchards planted between 2010 and 2015 have since started producing truffles while others have not.

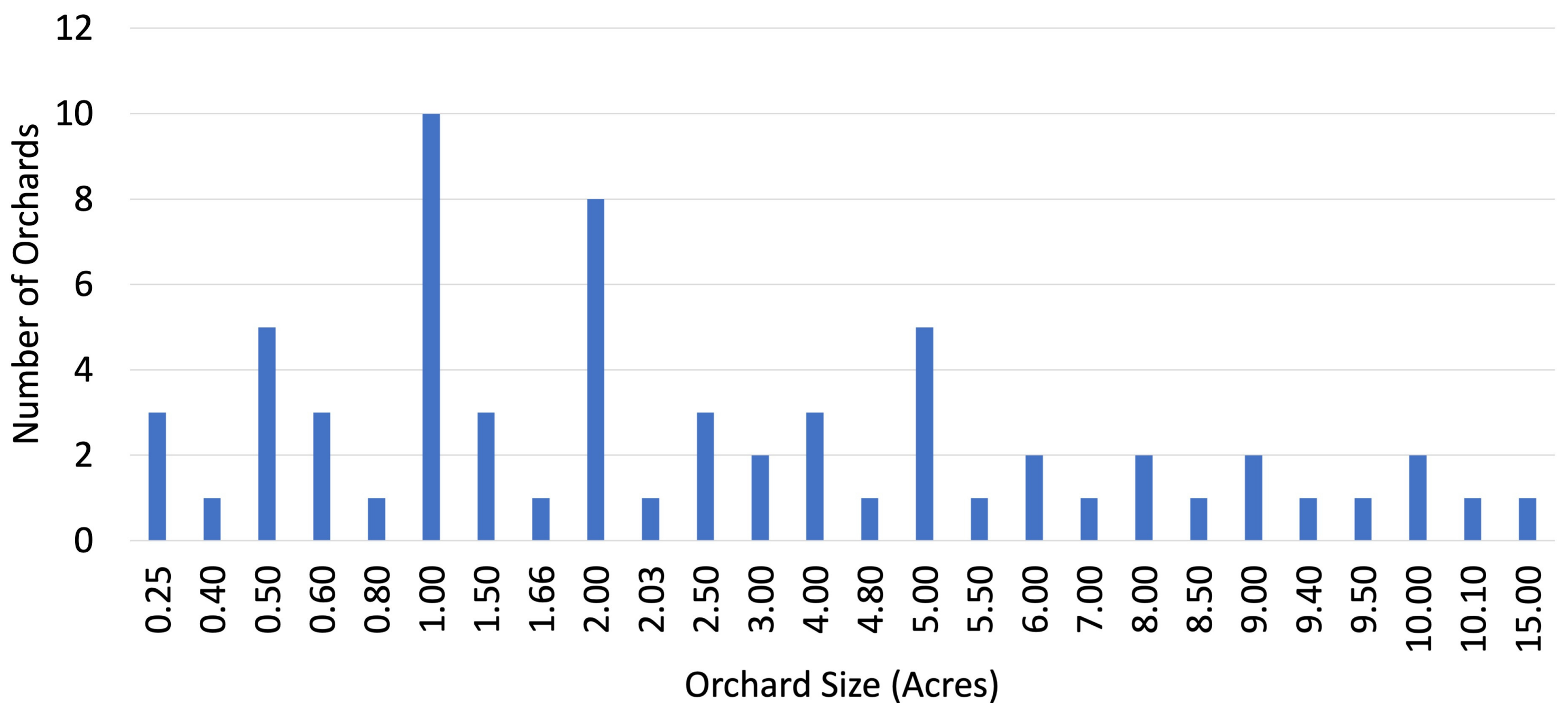
3) All orchards planted between 2016 and 2022 have yet to reach production.

Q 4. WHAT IS THE SIZE OF YOUR ORCHARD IN ACRES?

TOTAL RESPONSES: 65

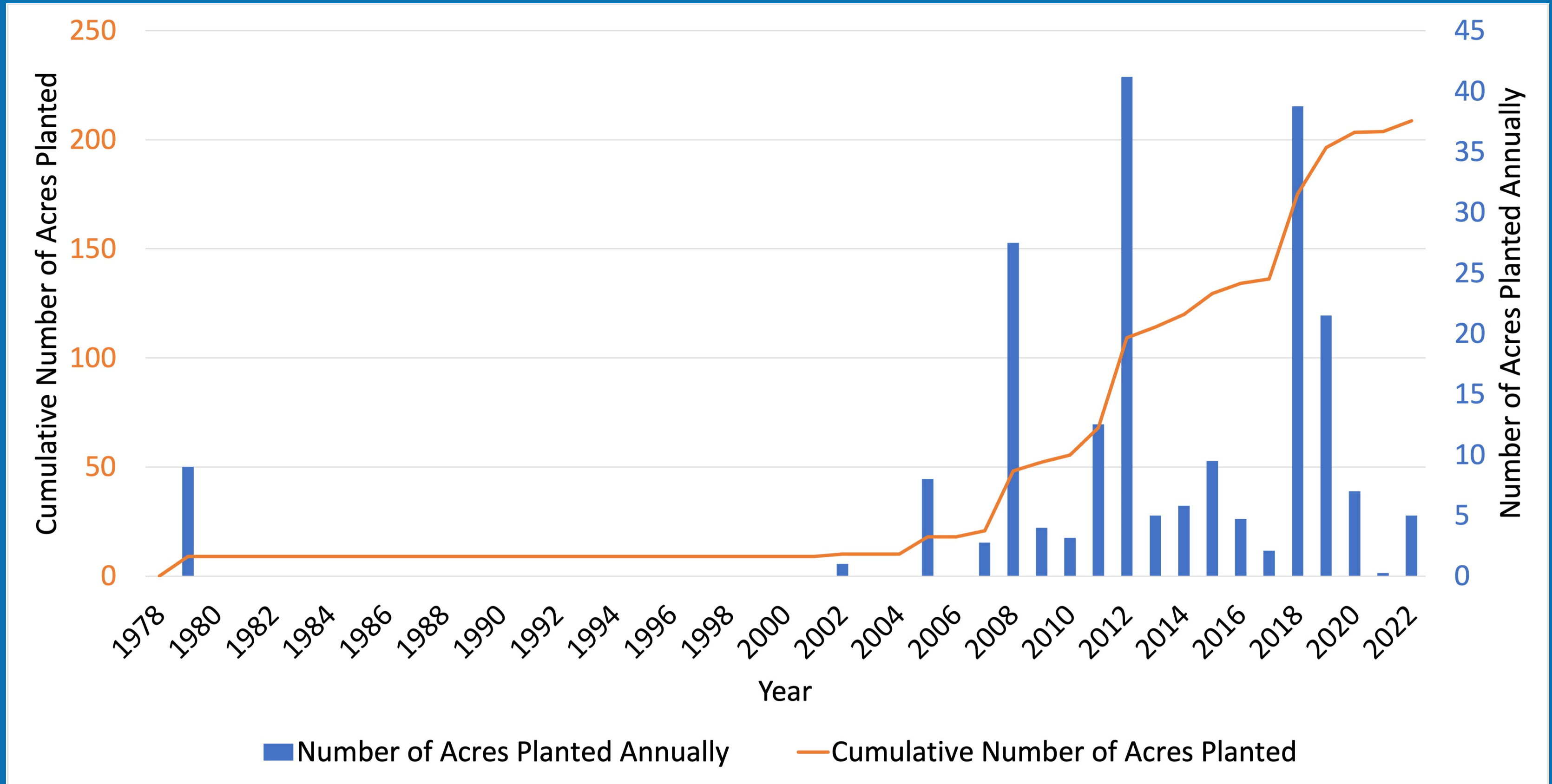
TOTAL ACREAGE: 208.74 ACRES
AVERAGE ORCHARD SIZE: 3.42 ACRES

What is the size of your orchard in acres?



TRUFFLE ORCHARD ACREAGE EXPANSION OVER TIME

TOTAL RESPONSES: 65



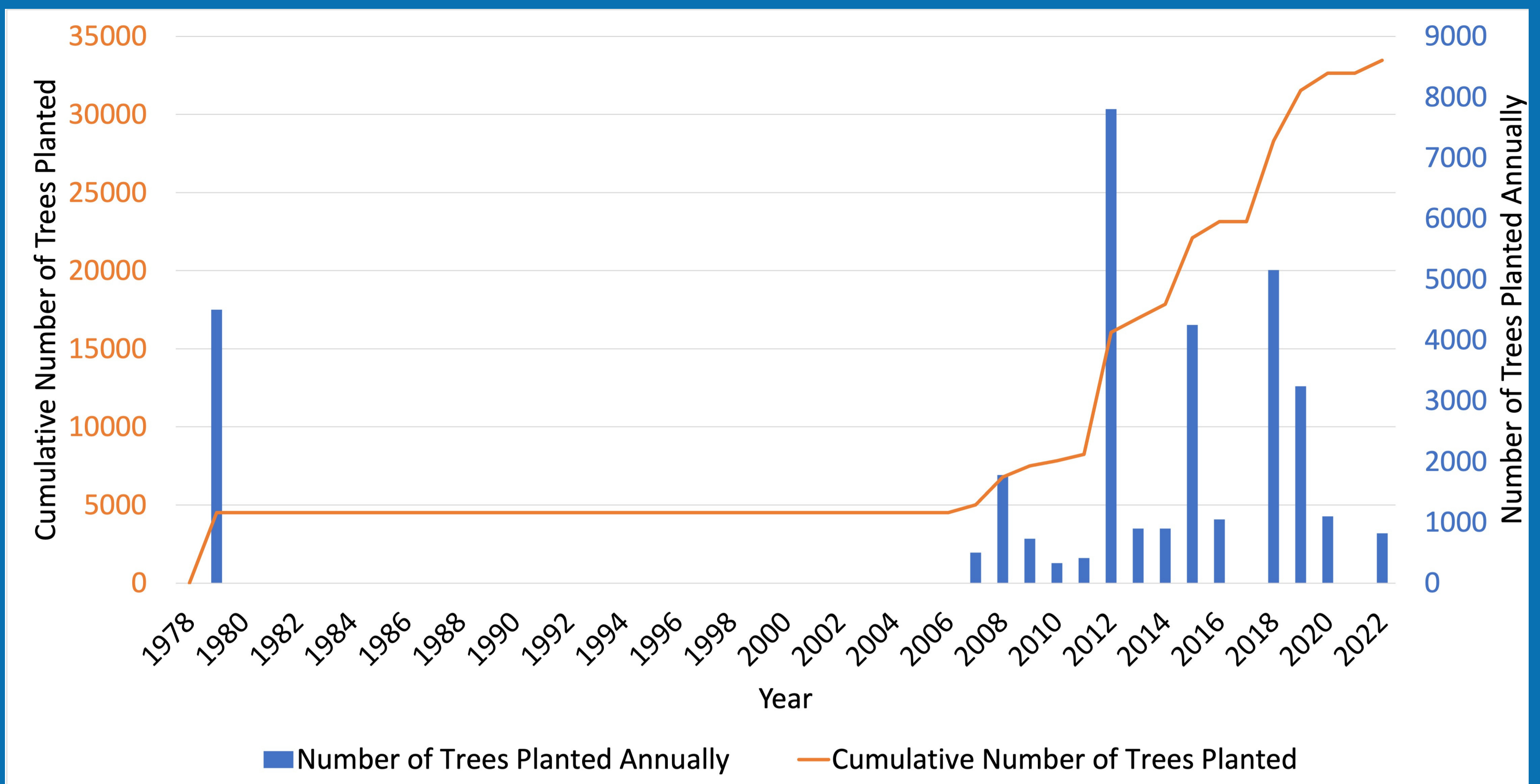
Q 5. WHAT IS THE TOTAL NUMBER OF TREES PLANTED?

TOTAL RESPONSES: 39

- TOTAL TREES PLANTED = 33,461 HOST TREES IN ALL ORCHARDS
- AVERAGE NUMBER OF TREES PLANTED PER ORCHARD = 858 TREES
- AVERAGE NUMBER OF TREES PLANTED PER ACRE: 234 ± 153 TREES

TOTAL NUMBER OF HOST TREES OVER TIME

TOTAL RESPONSES: 65



Q 6. IS YOUR ORCHARD PRODUCING TRUFFLES?

TOTAL RESPONSES: 71

PLEASE NOTE: EACH CELL LISTS A COUNT AND PERCENTAGE FOR EACH PRODUCTION STATUS. THE PERCENTAGES ADD UP TO 100% FOR EACH SPECIES WHEN READ VERTICALLY.

Is Your Orchard Producing Truffles?	All Truffle Species	Black (<i>T. melanosporum</i>)	Burgundy (<i>T. aestivum</i>)	Bianchetto (<i>T. borchii</i>)	Appalachian (<i>T. canaliculatum</i>)	Pecan (<i>T. lyonii</i>)	White (<i>T. magnatum</i>)	Muscat (<i>T. brumale</i>)
No	41 (41.4%)	20 (37.7%)	9 (45%)	7 (70%)	4 (57.1%)	1 (16.7%)	0 (0%)	0 (0%)
No, But Brule Is Present	16 (16.2%)	11 (20.7%)	4 (20%)	1 (10%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Yes	41 (41.4%)	21 (39.6%)	7 (35%)	2 (20%)	3 (42.9%)	5 (83.3%)	2 (100%)	1 (100%)
Orchard Has Ceased Production	1 (1%)	1 (1.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

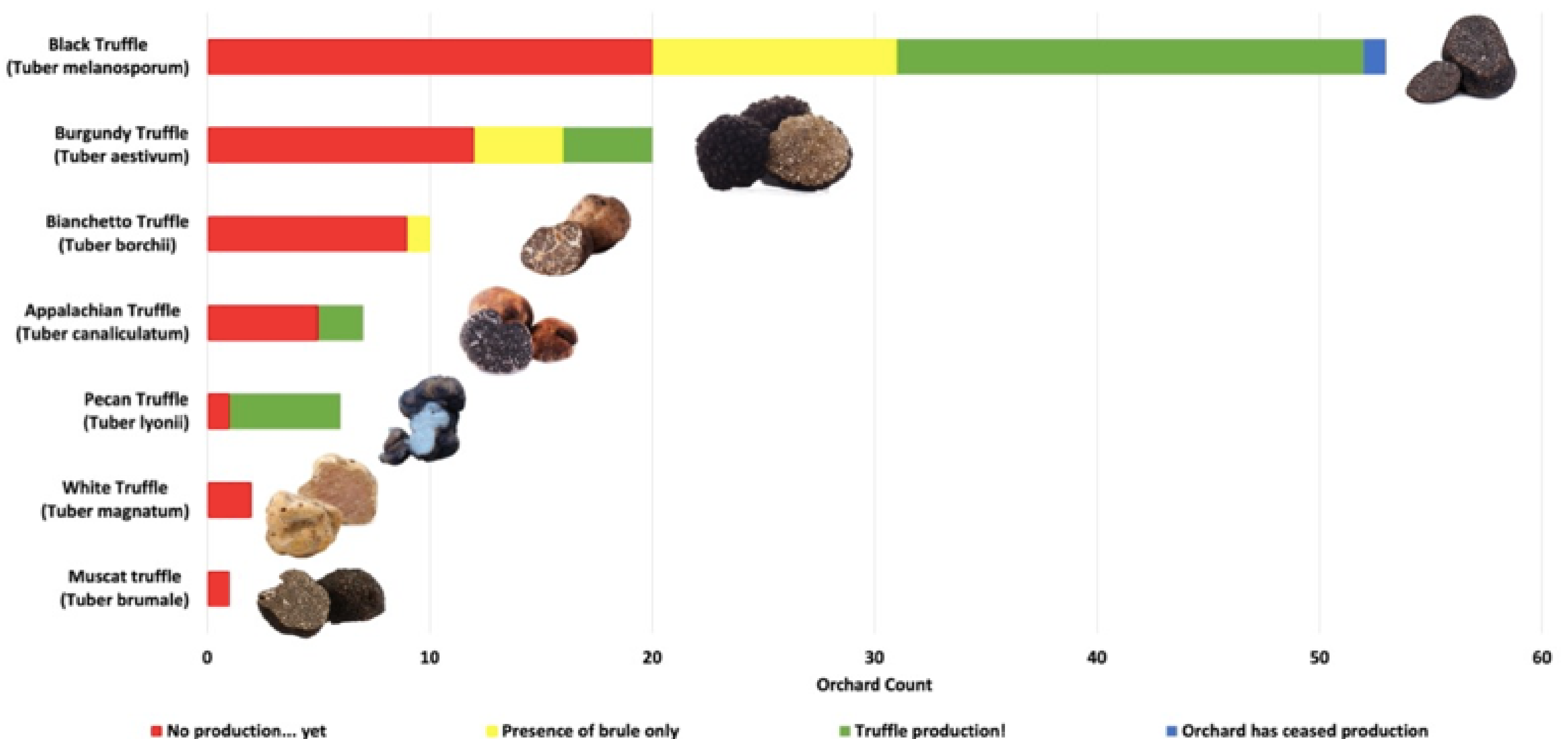
Q 7. WHAT TRUFFLE SPECIES IS YOUR ORCHARD INOCULATED WITH?

TOTAL RESPONSES: 71

This chart displays the number of orchards inoculated with a certain truffle species. Some participants indicated that they grow more than one truffle species in a single orchard, so the number of orchards exceeds the number of responses. The data is further color-coded by production status.

- 1) Red indicates that the orchard has yet to reach production.
- 2) Yellow represents orchards where brule is present, but no production yet.
- 3) Green represents orchards currently in production.
- 4) Blue represents orchards that have ceased truffle production.

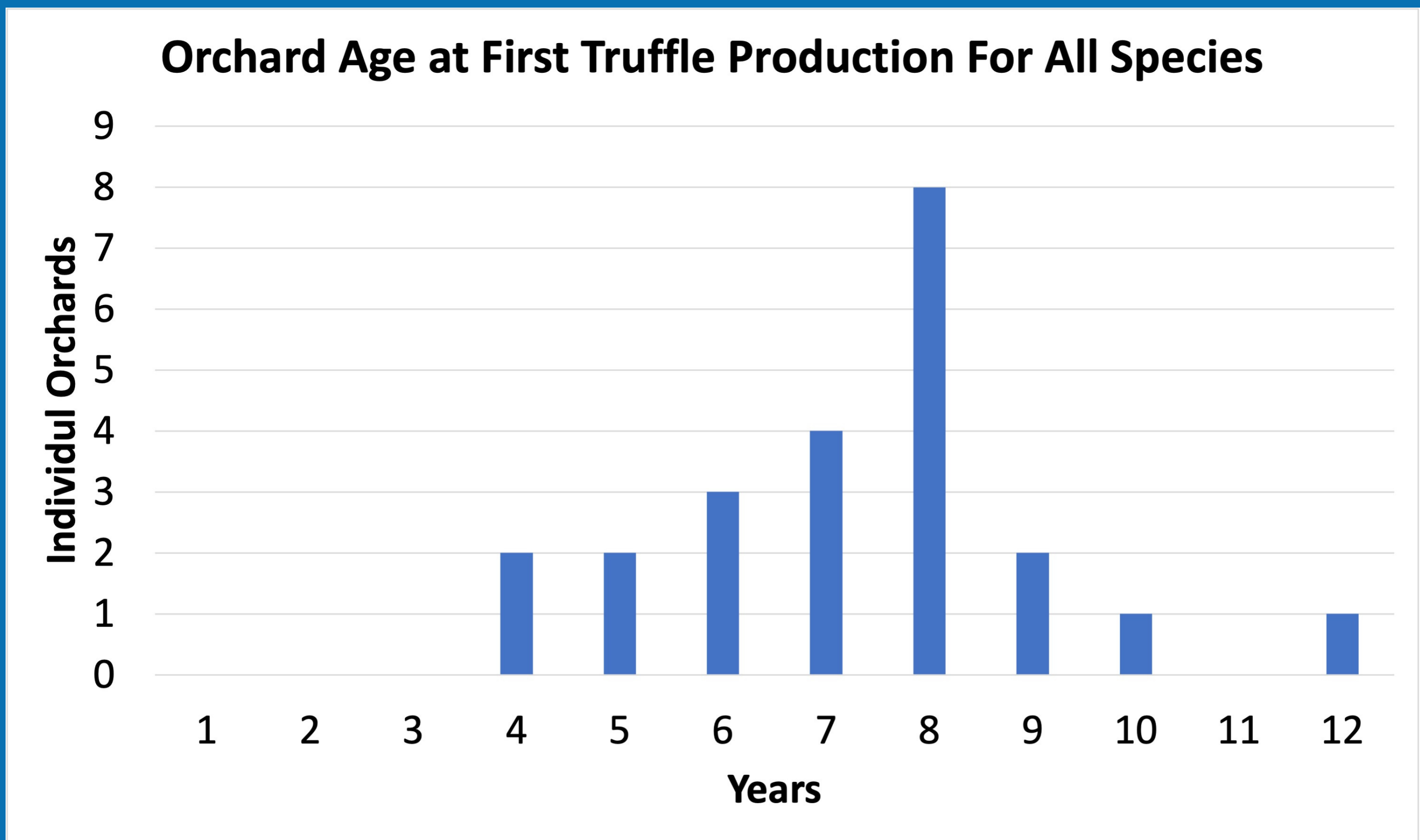
Production Status of Truffles Grown in North America



Q 8. HOW OLD WAS YOUR ORCHARD WHEN YOU FOUND THE FIRST TRUFFLE?

TOTAL RESPONSES: 23

AVERAGE ORCHARD AGE AT THE TIME OF FIRST PRODUCTION FOR ALL TRUFFLE SPECIES: 7.3 ± 1.9 YEARS OLD



Q 9. WHAT TREE SPECIES ARE PRESENT IN YOUR ORCHARD?

TOTAL RESPONSES: 71

There are 31 different host tree species growing in North American truffle orchards. The most commonly grown species, which are grown in at least appx. 10% of all orchards, are indicated with red text.

What tree species are present in your orchard?	Total	Percentage	What tree species are present in your orchard?	Total	Percentage
Hazelnut / Filbert (<i>Corylus avellana</i>)	46	64.8	Chinquapin (<i>Castanea</i>) Unspecified Species	1	1.4
English Oak (<i>Quercus robur</i>)	44	62.0	Black Oak (<i>Quercus kelloggii</i>)	1	1.4
Holly Oak (<i>Quercus ilex</i>)	21	29.6	Cork Oak (<i>Quercus suber</i>)	1	1.4
Bur Oak (<i>Quercus macrocarpa</i>)	7	9.9	Downy Oak (<i>Quercus pubescens</i>)	1	1.4
Pecan (<i>Carya illinoensis</i>)	5	7.0	Holm Oak (<i>Quercus rotundifolia</i>)	1	1.4
Japanese Oak (<i>Quercus mongolica</i>)	4	5.6	Kermes Oak (<i>Quercus coccifera</i>)	1	1.4
Chinquapin Oak (<i>Quercus muhlenbergii</i>)	3	4.2	Northern Red Oak (<i>Quercus rubra</i>)	1	1.4
American Hazelnut (<i>Corylus americana</i>)	2	2.8	Oregon White Oak (<i>Quercus garryana</i>)	1	1.4
Chestnut (<i>Castanea sativa</i>)	2	2.8	Portuguese Oak (<i>Quercus faginea</i>)	1	1.4
Southern Live Oak (<i>Quercus virginiana</i>)	2	2.8	Scarlet Oak (<i>Quercus coccinea</i>)	1	1.4
White Oak (<i>Quercus alba</i>)	2	2.8	Turkey Oak (<i>Quercus cerris</i>)	1	1.4
Chinese Pine (<i>Pinus yunnanensis</i>)	2	2.8	Valley Oak (<i>Quercus lobata</i>)	1	1.4
Stone Pine (<i>Pinus pinea</i>)	2	2.8	Loblolly Pine (<i>Pinus taeda</i>)	1	1.4
Pine (<i>Pinus</i>) Unspecified Species	2	2.8	White Pine (<i>Pinus strobus</i>)	1	1.4
Beaked Hazelnut (<i>Corylus cornuta</i>)	1	1.4	Norway Spruce (<i>Picea abies</i>)	1	1.4
European Beech (<i>Fagus sylvatica</i>)	1	1.4	Spruce (<i>Picea</i>) Unspecified Species	1	1.4
European Hornbeam (<i>Carpinus betulus</i>)	1	1.4	Douglas Fir (<i>Pseudotsuga menziesii</i>)	1	1.4
Poplar (<i>Populus</i>) Unspecified Species	1	1.4			

Q 10. WHAT TRUFFLE AND TREE SPECIES ARE PRODUCING TRUFFLES IN YOUR ORCHARD?

TOTAL RESPONSES: 36 (NOTE PARTICIPANTS COULD ENTER DATA FOR MULTIPLE TRUFFLE AND TREE SPECIES, SO THE RESPONSES ARE GREATER THAN THE NUMBER OF PARTICIPANTS.)

TOTAL NUMBER OF PRODUCING ORCHARDS: 25

This table displays the number of growers producing fruiting truffles using specific truffle and tree species combinations. The number is influenced by how many growers are using that combination and doesn't necessarily reflect the potential for production. For instance, the higher count of black truffles on English oak (10) compared to burgundy truffles on filberts (1) is related to black truffles being the most cultivated species in North America.

Participants could enter data for multiple species, so the responses are greater than the number of participants.

	Black Truffle (<i>Tuber melanosporum</i>)	Pecan Truffle (<i>Tuber lyonii</i>)	Burgundy Truffle (<i>Tuber aestivum</i>)	Appalachian Truffle (<i>Tuber canaliculatum</i>)	Bianchetto Truffle (<i>Tuber borchii</i>)	White Truffle (<i>Tuber magnatum</i>)
English Oak (<i>Quercus robur</i>)	10	3	Zero Reported	1	Zero Reported	Zero Reported
Hazel (<i>Corylus avellana</i>)	6	3	2	Zero Reported	Zero Reported	Zero Reported
Filbert (<i>Corylus maxima</i>)	5	2	1	1	Zero Reported	Zero Reported
Pine (<i>Pinus spp.</i>)	1	Zero Reported	Zero Reported	Zero Reported	Zero Reported	Zero Reported
Chestnut (<i>Castanea spp.</i>)	Zero Reported	Zero Reported	1	Zero Reported	Zero Reported	Zero Reported



PLEASE NOTE FOR Q11 AND Q12

PERCENTAGES REPRESENT THE NUMBER OF ORCHARDS THAT RECEIVE EACH TREATMENT OR LAB ANALYSIS.

ANSWERS WITH AN ASTERISK (*) WERE FILLED IN BY PARTICIPANTS IN THE "OTHER" SECTION. THE REPORTED NUMBERS MAY NOT REPRESENT ALL PRODUCERS.

Q 11. WHAT, IF ANY, TYPES OF ORCHARD MANAGEMENT STRATEGIES DO YOU CONDUCT ON AN ANNUAL BASIS?

TOTAL RESPONSES: 67

What, if any, types of orchard management strategies do you conduct annually?	Count	Percentage
Weed management	58	86.6%
Irrigation	55	82.1%
Pruning	46	68.7%
Tillage	37	55.2%
Liming	30	44.8%
Reinoculation	28	41.8%
Fertilizer, including compost and biochar	18	26.9%
Leaf litter management*	1	1.5%
Small animal (rodents) and insect management*	1	1.5%
Tree disease management*	1	1.5%
Aeration*	1	1.5%
Fencing*	1	1.5%
None	3	4.5%

Q 12. WHAT, IF ANY, LAB ANALYSIS HAVE YOU DONE?

TOTAL RESPONSES: 67

What, if any, lab analysis have you done?	Count	Percentage
Soil pH	53	79.1%
Presence of mycorrhizae	37	55.2%
Soil analysis (physical/chemical)	56	83.6%
Plant tissue analysis	11	16.4%
None	4	6.7%

Orchard Truffle Production Status	Count	Average pH
No	14	7.39 ± 0.38
No, but brule is present	7	7.74 ± 0.16
Yes	17	7.56 ± 0.21

Q 13. WHAT IS THE PH OF YOUR SOIL?

TOTAL RESPONSES: 38

PLEASE NOTE FOR Q14 - Q17

PERCENTAGES REPRESENT THE NUMBER OF ORCHARDS WHERE EACH FORM OF MONITORING EQUIPMENT, ISSUE, MARKETING STRATEGY, AND BUSINESS SUPPLEMENTATION IS USED.

ANSWERS WITH AN ASTERISK (*) WERE FILLED IN BY PARTICIPANTS IN THE "OTHER" SECTION. THE REPORTED NUMBERS MAY NOT REPRESENT ALL PRODUCERS.

Q 14. WHAT, IF ANY, ADVANCED MONITORING EQUIPMENT DO YOU USE?

TOTAL RESPONSES: 58

What, if any, advanced monitoring equipment do you use?	Count	Percentage
Weather station	27	46.6%
Soil temperature sensor	14	24.1%
Soil water content sensor	14	24.1%
Soil water potential sensor (Tensiometer)	15	25.9%
Feel and appearance*	3	5.2%
Feel and touch*	1	1.7%
Hand-push probe*	1	1.7%
Moisture block - Gypsum*	1	1.7%
None	26	44.8%

Q 15. WHAT, IF ANY, ISSUES HAVE YOU EXPERIENCED IN YOUR ORCHARD?

TOTAL RESPONSES: 65

What, if any, issues have you experienced in your orchard?	Count	Percentage
Mammals (i.e. deer, gophers, & squirrels)	52	80%
Insect pests (i.e. aphids, asparagus beetle, crickets, gypsy moth, Japanese Beetles, & slugs)	25	38.5%
Tree diseases (i.e. eastern filbert blight (EFB), powdery mildew, black mold, & brown spots)	16	24.6
Breeching	8	12.3%
Contamination	7	10.8%
Birds	2	3.1%
Ceased production	4	6.2%
Deep snow preventing truffle hunting*	1	1.5%
Overpruning leading to decreased production*	1	1.5%
Insufficient grower resources*	2	3.1%
None	5	7.7%

Q 16. HOW DO YOU MARKET YOUR ORCHARD OR TRUFFLES?

TOTAL RESPONSES: 59



Methods used to market truffle business.	Count	Percentage
Direct to chefs/consumers	28	47.5%
Your own marketing/distribution	15	25.4%
Farm website	8	13.6%
Agritourism*	4	6.8%
Domestic/global sales	4	6.8%
Restaurant*	4	6.8%
Food events*	3	5.1%
Online (including social media)*	3	5.1%
Boutique Store*	2	3.4%
Community Supported Agriculture (CSA)*	2	3.4%
Wholesaler*	1	1.7%
No marketing	27	45.8%

Q 17. WHAT METHODS, IF ANY, DO YOU USE TO SUPPLEMENT YOUR BUSINESS?

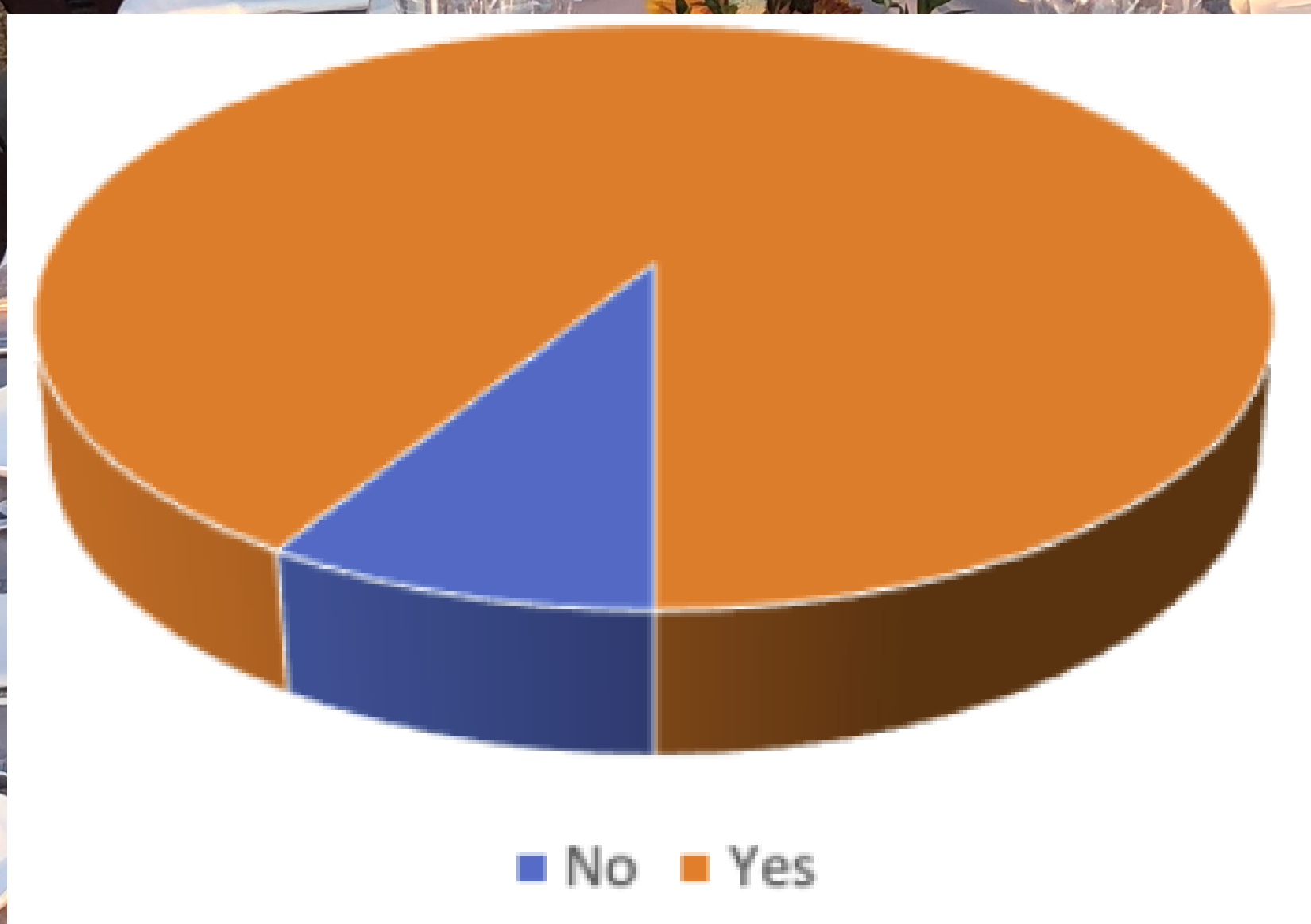
TOTAL RESPONSES: 51

What methods, if any, do you use to supplement your business?	Count	Percentage
Farm tours	9	17.6%
Consulting	8	15.7%
Import truffles	8	15.7%
Dog training	4	7.8%
Farm stays	3	5.9%
Overnight stays	3	5.9%
Existing Winery*	1	2.0%
Prepared meals	1	2.0%
Producing inoculated trees*	1	2.0%
Truffle hunts*	1	2.0%
Winery*	1	2.0%
Citrus Grower*	1	2.0%
None	31	60.8%

Q 18. ARE YOU INTERESTED IN PARTICIPATING IN RESEARCH PROJECTS TO IMPROVE TRUFFLE CULTIVATION PRACTICES?

TOTAL RESPONSES: 69

N = 69	Count	Percent
Yes	63	91.3%
No	6	8.7%



THANK YOU TO THOSE OF YOU WHO PARTICIPATED IN THE NATGA GROWER SURVEY 2.0!!

