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## **Alabama Extension Commercial Horticulture Virtual Events and Social Media Evaluation System During the COVID-19 Pandemic**

### **Abstract**

Alabama has a rapidly growing specialty crop industry valued at \$165 million in direct sale and \$103 million in value-added products. The demand for fresh fruits and vegetables remained high during the COVID-19 pandemic. To support producers with timely information, the Alabama Extension Commercial Horticulture Team used three different social media (SM) events along with a unique monitoring and evaluation system as formative evaluations. Overall, 120 virtual events via a Facebook channel and a farmer group page reached 2,271 direct and 57,000 indirect participants with many new clients and beginning farmers that found the information useful and timely.

### **Introduction**

Alabama has a rapidly growing specialty crop industry that is valued at \$165 million in direct sales and \$103 million in value-added agriculture. The specialty crop industry in Alabama engages 58% full-time and 48% part-time producers who are predominantly beginning farmers (Fields and Guo, 2018). The rapid growth of the fruit and vegetable industry is due to the increased demand for fresh fruits and vegetables, furthered by the COVID-19 pandemic in 2020-2021 (Rabinowitz et al., 2020). Specialty crop producers need constant training and consultations due to the high value and perishable nature of produce. However, the national and statewide COVID-19 pandemic restrictions affected

the Alabama Extension Commercial Horticulture Team's ability to organize group training or face-to-face workshops in 2020 and 2021. The Extension team had to refine their communication and marketing plan to rely heavily on social media based educational events for providing technical, experiential, and social learning that have been articulated by Lubell et al. (2014) as the "Extension 3.0" model.

Social media (SM) is today ubiquitous and a major part of our modern lives in the Network Age (Lubell et al., 2014). The advent of smart phones and other mobile devices has made social networking possible from any location with a dedicated Internet service. Extension has become capable of incorporating modern communication and SM tools for promoting public education and learning (Kelton et al., 2020), strategic program communication and marketing (Doyle and Briggeman, 2014; Davis and Dishon, 2017), and health and well-being (Garcia et al., 2018) that supports implementation of developmental and utilization-focused evaluations (Patton and Patton, 2021). With the phenomenal growth of SM based educational programs and networking, evaluation of program effectiveness is a new challenge for educators used to the traditional Diffusion of Innovation theory (Sahin, 2006). In the SM evaluation world, there is a wide array of assessment criteria outlined in a perspective paper on the nature of the "Like" button as an indicator of social interaction by Hallinan and Brubaker (2021). The paper argues that the "Like" button can be interpreted as an indicator of affective, relational, or infrastructural orientation which is much more than what it was originally designed for. Electronic evaluation tools for Extension programs, that can be incorporated into SM channels, is discussed by Majumdar et al. (2020); authors provided the pros and cons of electronic polling and survey software that allows quantitative and qualitative data collection.

This paper discusses the various SM based events and a multipoint evaluation system that was developed and streamlined over two years. We were able to provide adequate technical and experiential learning from a distance while promoting peer-to-peer learning into an example of "Extension 3.0". These educational activities were supported by the USDA-NIFA Beginning Farmer and Rancher Development (BFRDP), Sustainable Agriculture Research and Education (SARE), Extension IPM/CPPM, and Alabama Department of Agriculture and Industries Specialty Crop Block Grant Program funded through the USDA.

## **Methodology**

Social media channels: The Alabama Extension Commercial Horticulture Team has 32 members consisting of Extension Specialists, Regional Extension Agents, and outreach administrators (program assistants) located across the state. Since October 2013, the Commercial Horticulture Team has used a dedicated Facebook channel called the "Alabama Extension Commercial Horticulture" with 1,914 followers to disseminate information about horticultural crop production, pest management, turf management,

and training events. Followers on the channel are distributed into 40% men and 60% women from 10 countries (United States, Egypt, India, Pakistan, Brazil, Philippines, Myanmar, Cambodia, Sri Lanka, Zambia). This channel is free and open to everyone with SM posts originating from Extension team members.

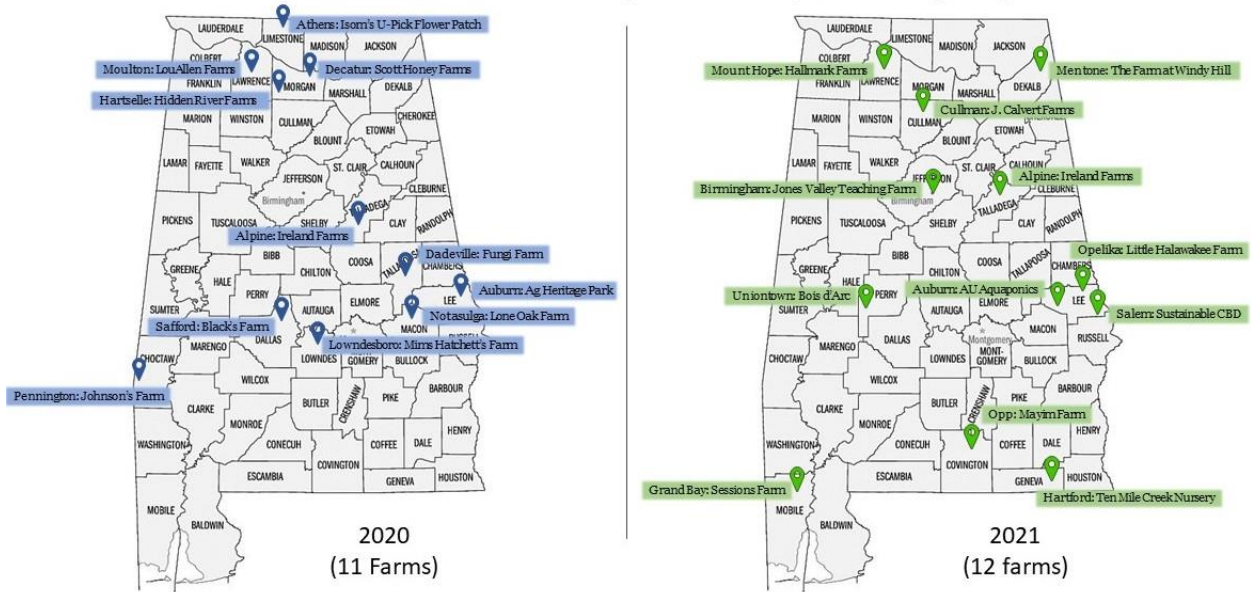
A Facebook learning group called the “Alabama Farmer Connection” as a peer-to-peer learning network with direct producer feedback at the Southern Sustainable Agriculture Working Group (SSAWG) Annual Conference in 2020. In addition to Facebook, individual team members also use Twitter, Instagram, and LinkedIn on a personal schedule.

Virtual events during COVID-19: The Alabama Extension Commercial Horticulture Team developed and implemented three special offerings during the pandemic years.

A. The “Commercial Horticulture Webinar Series” featured subject matter experts (Specialists or Extension Agents) to give rapid updates in the form of 10-15 min segments on the last Monday of every month from 9 to 10 AM. This webinar series has been in continuous production since 2016, utilizing Zoom and social media channels simultaneously. All 32 members of the Extension team participated in presenting informative segments based on research-based information. Webinars are archived on our webpage, “Digital Resources for Farmers,” on ACES.edu (full link in literature cited, Majumdar et al., 2021). To improve visibility, webinar recordings following Auburn University/Alabama Extension Publication Standards are also edited and shared via the “Alabama Beginning Farmer” playlist on YouTube connected to the Farming Basics Mobile App.

B. The “Alabama Virtual Farm Tours” (VFTs, Figure 1) were initiated upon recommendation from the Alabama Beginning Farmer/Sustainable Agriculture Advisory Panel with the aim of connecting beginning and mentor farmers through the Facebook group. Eleven VFTs were developed in 2020 and 12 in 2021 with 23 mentor farms (Figure 1) assisted by members of NGOs like CrotoVina (North AL), Farmscape Solutions (East Central AL), and Deep South Food Alliance (West AL). Producers were scheduled for interview with assistance from commercial horticulture extension team members and our advisory panel. During interviews, producers demonstrate their farming practices and share experiences, including marketing strategies. Videos were captured using an iPhone 11 Pro Max, a DJI OZMO Gimble, a lapel microphone, edited with Adobe Premier Pro, and uploaded to Alabama Farmer Connection (Facebook). Featured farms were interlinked in SM posts, flyers, and email announcements to generate greater visibility. We also provided a Certificate of Appreciation to featured producers, which was appreciated by the mentor farmers. All VFTs are archived on a webpage called “Digital Resources for Farmers” on ACES.edu (full link in literature cited, Majumdar et al., 2021).

## Alabama Virtual Farm Tours (COVID-19 Special Program)

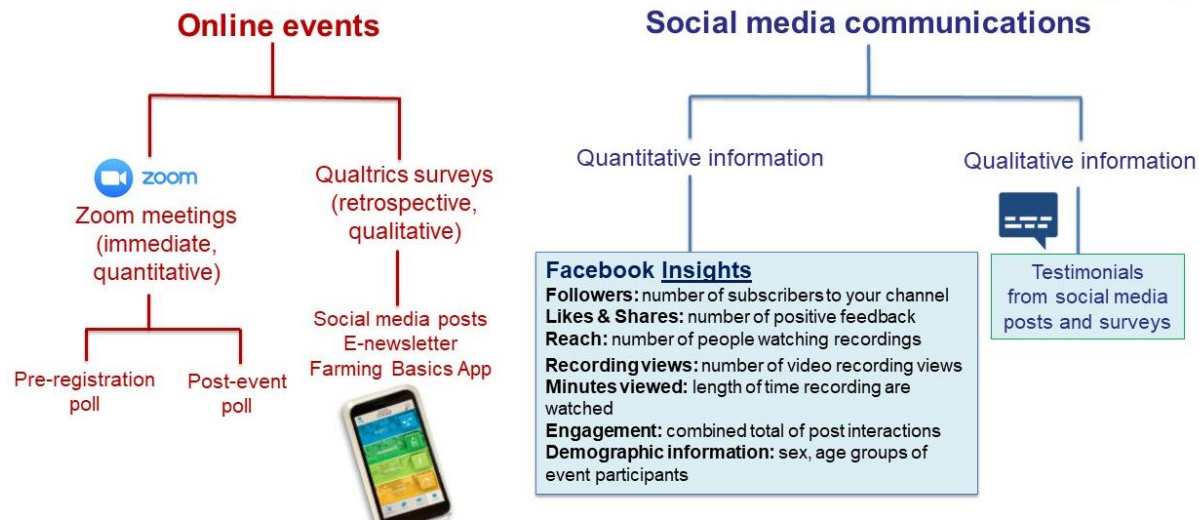


**Figure 1.** Map of Alabama showing wide spread geographic distribution of mentor farms featured on the Alabama Virtual Farm Tours (2020-2021).

C. Lastly, we developed the “Q&A Friday” weekly/biweekly show in response to farmers’ need for rapid know-how regarding crops and pests during the production season. These were done from March to October of each year as Facebook LIVE events featuring three panel members. The aim was to gather questions in advance from subscribers or during the LIVE event. We improved engagement with the audience by asking ag trivia questions with small prizes and introducing one special guest from the Alabama ag industry on every show which created curiosity among viewers. In 2021, we also added the use of illustrative posts/cartoons to spark conversations or interactions around horticultural and pest management topics.

Marketing and promotion activities: We marketed the three SM events via promotional cards mailed directly to producers, consumers, county Extension offices, field agents, nongovernmental organizations, producer organizations, and other external stakeholders. Interlinking the Farming Basics Mobile App with blog articles, social media and YouTube channels became a unique digital convergence strategy.

Virtual Events Monitoring and Evaluation System (VEMES, Figure 2): Virtual and distance programming posed unique challenges to the traditional evaluation system used by the Extension team. In response to new challenges, we developed a unique online evaluation system that collected both quantitative and qualitative data from online events. VEMES was piloted in 2020 and streamlined in 2021; VEMES is still an active system for gathering data. In future years, VEMES can be expanded to include other virtual events and SM channel evaluations.



**Figure 2.** Overall schematic for the Virtual Events Monitoring and Evaluation System (VEMES) developed by Alabama Extension Commercial Horticulture in 2020.

As part of VEMES, the Commercial Horticulture Webinar Series, VFTs, and Q&A Friday were evaluated using Qualtrics-based surveys shared through SM posts, Alabama IPM/Sustainable AG E-newsletter issues, and webpages. During 2020 and 2021, data was aggregated on a weekly basis and analyzed/shared with the team to identify new needs. We also used Microsoft Power BI for active data visualization and decision-making during team meetings. We tracked several SM metrics from the Facebook channel and Group page for analysis using INSIGHTS, including the total number of followers, number of active participants, number of “Likes”, “Reach” (number of people watching), “Views” (number of video recording views), “Engagement” (combined total of post interactions), and “Demographic information” (sex and age of event participants). SM data was compiled into an EXCEL spreadsheet two days after the online event since the number of views dropped significantly beyond that time period.

Data analysis: We tracked multiple data points for 120 virtual events. Aggregate data from VEMES was analyzed by Dr. Chaves-Cordoba, Statistician Consultant, Auburn University. Usage data from the Alabama Extension Commercial Horticulture channel on Facebook was found to be more extensive and consistent compared to the data from the ‘Alabama Farmer Connection’ Group page. Facebook Insights from the Commercial Horticulture Webinar Series (consistent event between years) was analyzed using the SAS system to understand online behavior of viewers. Since a large number of correlated social media metrics were tracked in both years, a Principal Component Analysis was conducted to reduce variables to two dimensional independent components (PRINQUAL Procedure in SAS); parametric and nonparametric tests were also done thereafter.

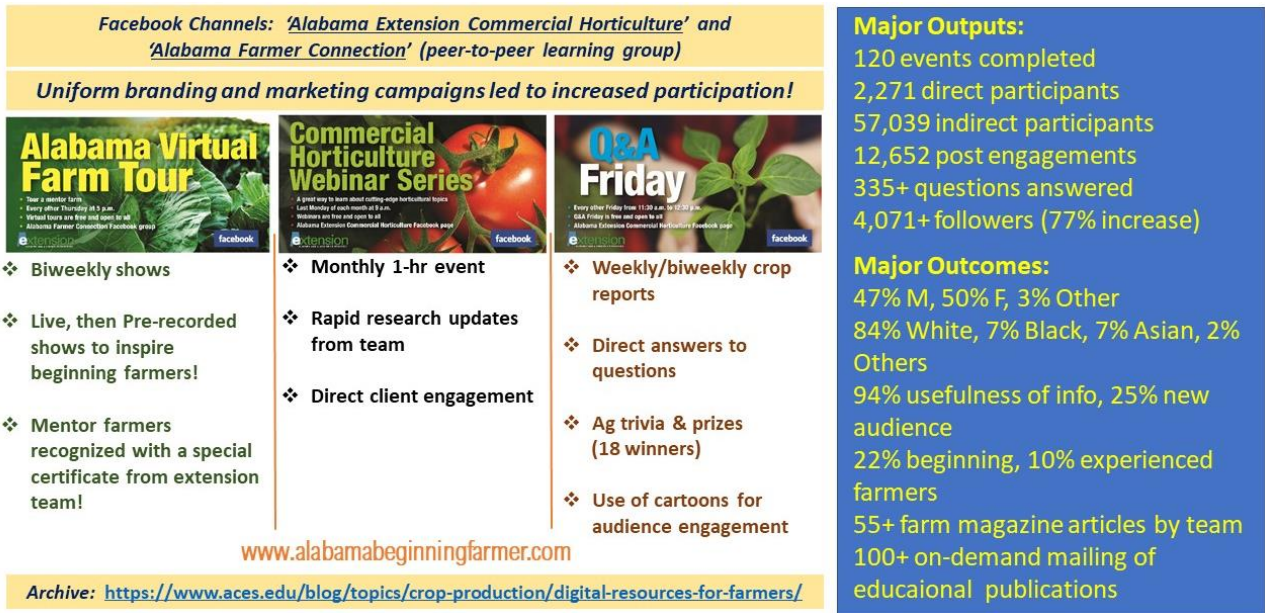
Reporting system: Major outcomes and impacts of the COVID-19 special programs have been communicated by the following activities:

- Visually attractive annual program reports (HTML and PDF formats) archived on a webpage called “Beginning Farmer Program Information and Evaluation Reports” (full link in literature cited, Majumdar et al., 2018), for sharing information freely with state and federal stakeholders, legislators, and university administrators. This is the major reporting “gateway” for the Extension team.
- Microsoft PowerPoint presentations at the monthly team and advisory panel meetings via Zoom to raise awareness.
- We use Microsoft Power BI for data visualization during internal team meetings and for generating quick reports for university administrators.
- Paper and poster presentations (virtual during the pandemic) at scientific and professional development conferences including at the Alabama Association of County Agricultural Agents and Specialists (AACAAAS) and the National Association of County Agricultural Agents (NACAA) annual conferences.

## **Results and Discussion**

Overall, virtual events completed by the Extension team reaching 2,271 direct and 57,039 indirect participants in two years (Figure 3); the webinars had the largest number of direct participants. Audience included 84% white, 7% black, 7% Asian and 2% others. There were 65% males, 38% females, and 1% other; this data trend is very similar to report by Kelton et al. (2020) who indicated nearly even spread of male and female participants across their ‘Are you smarter’ online events. About 22% of the audience were beginning farmers, 10% experienced producers, 31% urban, community, and home gardeners, and 10% educators. There was a significant growth in the number of followers on the Facebook channel and group with a 77% average increase during the pandemic. There were over 12,000 post engagements for all events; the Alabama Virtual Farm Tours had the highest engagement on the peer-to-peer learning group on Facebook. VFT viewers posted comments, answered surveys, and spoke to us in person with their feedback, all of which was positive. In VFT comments, the audience appreciated about how helpful and interesting the content was. Some knowledge/awareness changes gathered from Qualtrics survey (n=35) included adoption of paper strip transplanting, wicking irrigation, plasticulture, beekeeping, flower and mushroom production, on-farm and retail marketing strategies, and small farm equipment for weeding with a 90% usefulness of information. Overall, this evaluation data provided strong evidence in favor of the suggestions by Sahin (2006) that communication channel is all-pervasive in the five-stage innovation-decision process (that is, knowledge, persuasion, decision, implementation, and confirmation) leading to behavior change.

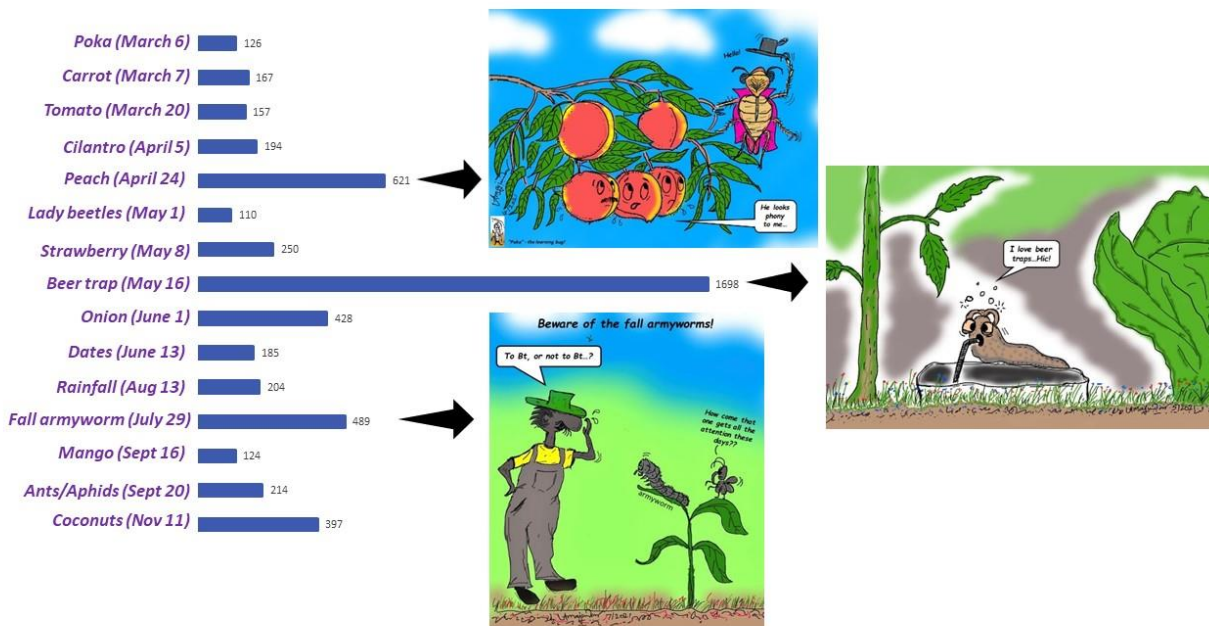




**Figure 3.** Major Virtual Events Monitoring and Evaluation System (VEMES) output and outcomes for three online activities.

Extension Specialists and Regional Extension Agents slowed down in individual meetings with producers while group meetings were cancelled during the peak of pandemic. However, a uniform branding and marketing campaign for online events and combining it with the Farming Basics Mobile App as a digital convergence tool worked very well for this Extension team to meet clients' needs and gather continuous feedback as a formative evaluation.

Over 335 questions were answered through the Q&A Friday shows which served as responsive programming and generated strong support from participants. Ag trivia quizzes paired with illustrations resulted in large spikes in 5,578 engagements (Figure 4). Posts were linked to appropriate blogs that resulted in 836 click-throughs (about 15% click through rate). Blog articles and illustrations related to snail baits, phony peach disease, and fall armyworms were the most popular SM posts (Figure 4).



**Figure 4.** Illustrative posts and ag trivia can spike audience engagement in social media channels.

Webinar data analysis: Due to the consistent frequency of the webinars on Facebook, we present descriptive analysis of SM data in Table 1. Facebook followers on the channel went up from 903 to 1855, that is, a 105% increase in two years; this increase was statistically significant ( $F=46.72$ ,  $p<0.0001$ ). Due to lack of normality in the data, other tests were done using nonparametric tests (Table 2). The Wilcoxon test works with ranges and identified the greater value was in 2021. The Z test confirms the significant difference with low p-values; Kruskal Wallis p-value= 0.0003 also validates the significant difference. Facebook Live participation averaged about 9 participants per event with a range of 5 to 22. Average engagement was 66 per event post with the large viewership for recordings.



**Table 1.** Descriptive analysis of 2020-2021 Facebook Insight data for commercial horticulture webinars.

Variable	N	Mean	Std Dev	Minimum	Maximum
Facebook live participants (Flp)	18	8.8	4.4	5.0	22.0
Likes_Shares	18	11.5	4.4	5.0	24.0
Reach	18	503.3	362.6	92.0	1448
Engagements	18	66.6	32.0	12.0	124.0
Recording_views	18	225.7	128.9	83.0	516.0
Minutes_viewed	18	449.0	177.8	198.0	751.0

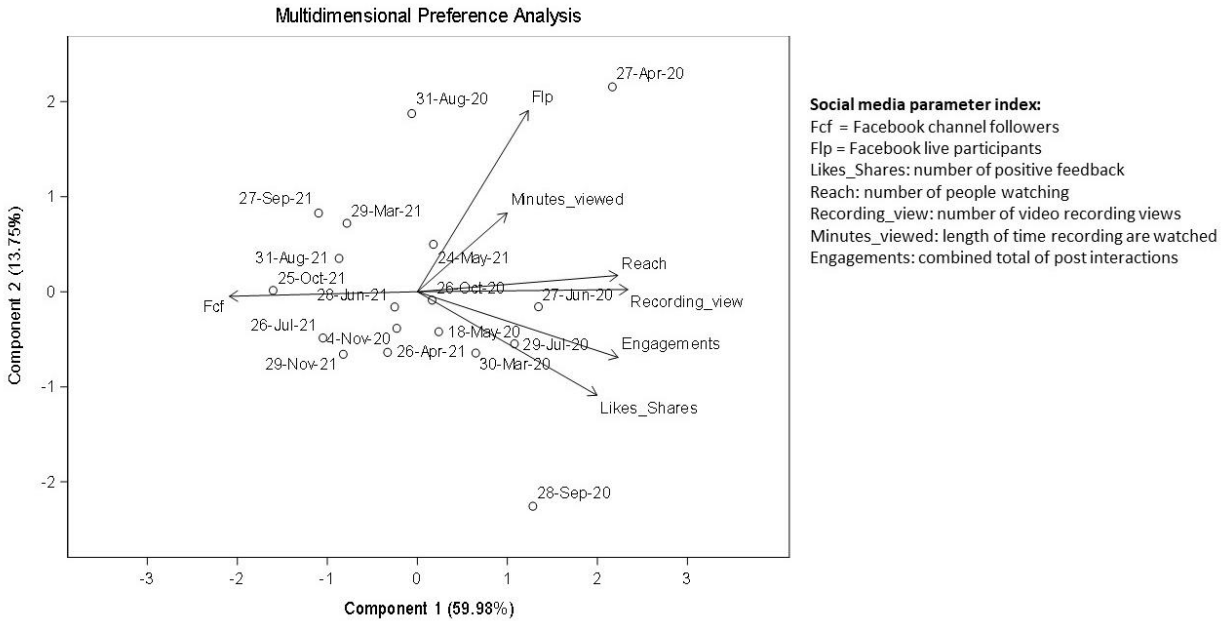
**Table 2.** Wilcoxon Two-Sample Test for variable Facebook Followers (Fcf) Classified by Variable year.

Wilcoxon Two-Sample Test					
t Approximation					
Statistic	Z	Pr > Z	Pr >  Z	Pr > Z	Pr >  Z
126.000	3.53	0.000	0.000	0.001	0.0025
	0	39	2	4	3

Z includes a continuity correction of 0.5.

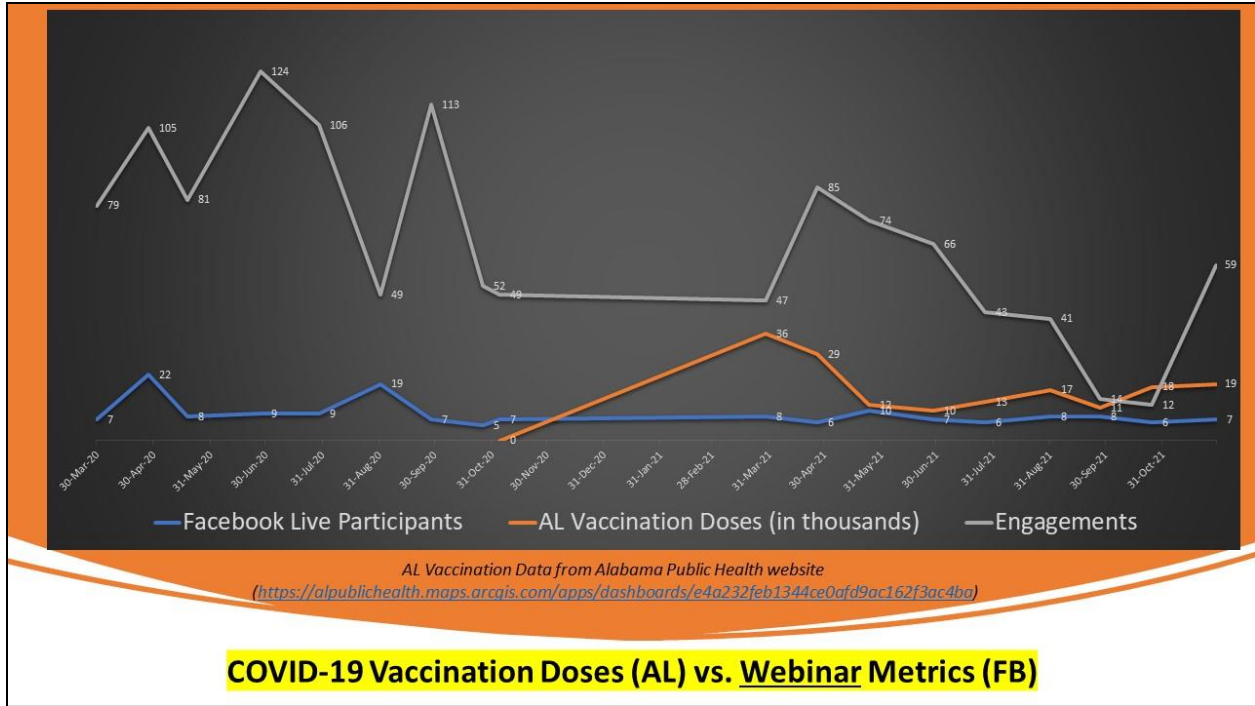
Kruskal-Wallis Test		
Chi-Square	DF	Pr > Chi Sq
12.8027	1	0.0003

Principal component analysis (PCA, Figure 5) with seven Facebook parameters for monthly webinars resulted in separation into two major components that explained the variations. The number of followers explained about 59% of variation between years. Parameters like “Reach”, “Recording\_view”, “Engagements”, and “Likes\_Shares” were strongly correlated in 2020 suggested by their closeness in Figure 5. In 2020, viewers really liked webinar topics like agritourism, specialty melon production, organic insecticides, turfgrass insects, pesticide safety, cucurbit production, trellising and cover crops. In 2021, all webinars received a more uniform viewership (lack of arrows in Figure 5 on the left side). Overall lesson from PCA is that the number of followers on Facebook has a large effect on all social network parameters.



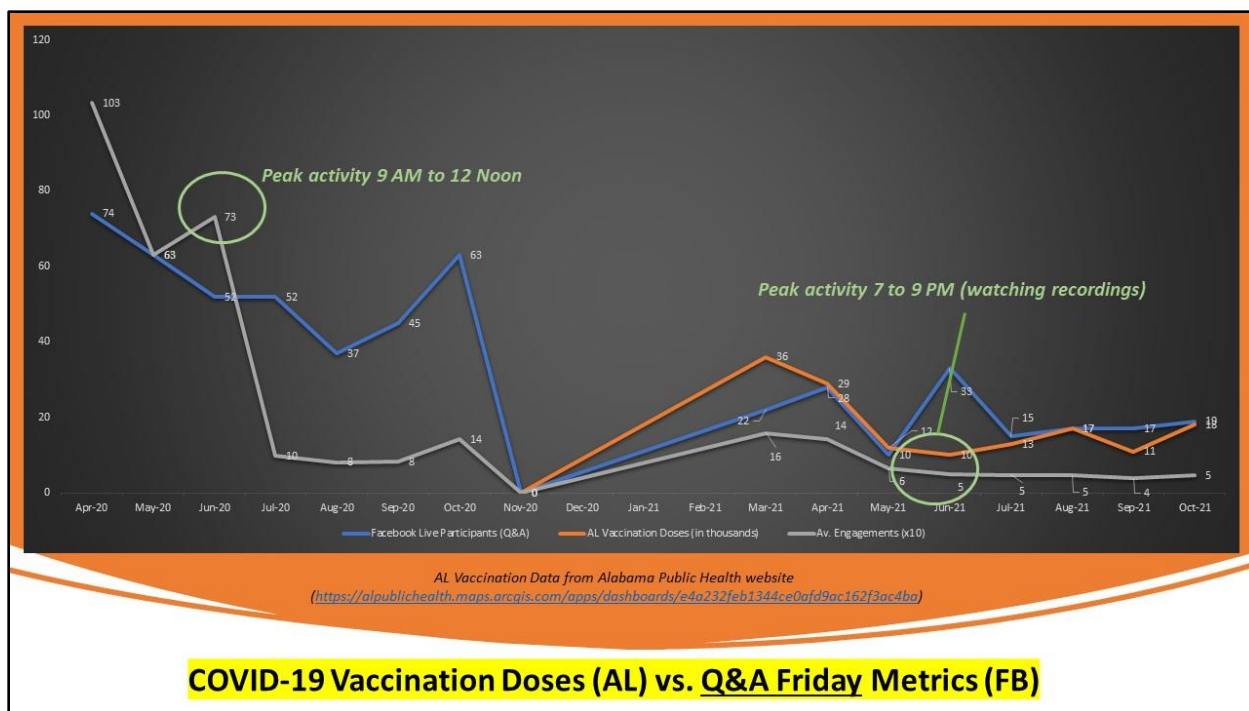
**Figure 5.** Principal component analysis (PCA) of seven social media parameters from Facebook.

COVID-19 vaccinations started in late 2020 in Alabama (Vaccine Distribution Dashboard, Alabama Department of Public Health). Overlaying social media data with the vaccination information indicated that COVID-19 vaccinations may have changed audience behavior between the years (Figure 6). For example, pre-vaccination engagement was high in 2020 compared to post-vaccination engagements when more people were watching the recordings in late-evening hours (after 7 PM). This created wide fluctuations shown in Figure 6. Vaccinations may not have been the only reason for the anomalies as other socioeconomic factors could also be at play, including more resumption of activities outside the home that would limit potential daytime involvement.



**Figure 6.** Interrelationship of COVID-19 vaccinations with decrease in Facebook Live participants and engagement for monthly webinar series.

When Facebook data from Q&A Friday shows and vaccination rates are overlaid (Figure 7), the decrease in the number of live participants and engagements was more dramatic in 2021 as more pre-pandemic activities resumed. As a result of these trends, the Extension team decided to stop Q&A Friday shows but continue the other two social media events (VFT and webinars) in 2022. We continue to use the VEMES dashboards for effective decision-making during monthly team meetings and refining strategies.



**Figure 7.** Interrelationship of COVID-19 vaccinations with decrease in Facebook Live participants and engagement for biweekly Q&A Friday shows.

Impact estimates: Long-term impact evaluations are ongoing for online events, so this report should be considered preliminary. Based on Qualtrics survey, VFTs (23 mentor farms) led to 16 distinct knowledge and awareness changes for farming practices mentioned by farmers (n=35) with 90% immediate use of information. Three respondents indicated \$2,500 in cost savings in 2020 related to improved pesticide inputs, locating local sources of compost and seeds, small farm equipment for weeding and transplanting, and beekeeping. Overall, there was 100% support for continuing VFTs since they are unique and encourages peer-to-peer learning without extensive traveling. VFTs are being continued throughout 2022 due to their popularity on Alabama Farmer Connection that has become an exceptional peer-to-peer learning system aligned with the recommendations by Extension 3.0 model by Lubell et al. (2014).

Participation in webinars grew 25% with good diversity in the audience. Overall, 125 client reports indicated \$50,000+ gain from input savings and yield improvements using Extension recommendations. In addition, several major grower magazines created 55+ stories based on information discussed at the webinars and Q&As which added to the promotion of events and further reach and benefit beyond Alabama.

VEMES reporting recommendations: In order to synthesize experiences into a reporting framework, here are some recommendations for educators on major outcomes (Table 3). This framework is related to data easily accessible via Facebook Insights; the

framework may be adapted for other SM channels as well. VEMES model incorporates the strong argument by Hallinan and Brubaker (2021) that SM engagement can be long-term and effective for behavior change. Gain in awareness, indicated by subscription growth rate, and ‘Likes’ on Facebook are directly related to behavior change when followers are called to action. This is also supported by Kelton et al. (2020) who used simple SM metrics as indicators of successful Extension programming in their report. We suggest Extension educators to utilize Excel spreadsheet to archive data consistently using the metrics in Table 3; such data sets can be visualized using Microsoft Power BI for real-time decision-making and shared out with team members. This conforms to the suggestion by Patton and Patton (2021) for ‘utilization-focused’ monitoring and evaluation practice that benefits Extension educators improve their deliverables.

**Table 3.** Virtual Event Monitoring and Evaluation System (VEMES) reporting framework for virtual events.

<b>Outcome</b>	<b>How is it measured?</b>
Gain in awareness	Subscription growth rate
	Reach of posts
Engagement level	Engagement for posts
	Likes and Shares
Behavior change	Click-through-rate (number of followers that click a link for additional content)
Client satisfaction	Testimonials
	Number of recommendations/referrals
	Net promoter score (NPS)

Several client testimonials are also available from online events that were very encouraging to the Commercial Horticulture Team; testimonials helped reduce apprehension among Extension professionals regarding the effectiveness of SM for direct grower education and engagement. In this aspect, we agree to observations by Davis and Dishon (2017). We recommend Extension educators to keep separate records of testimonials from SM engagement that indicate client satisfaction in qualitative terms. Commercial businesses utilize the net promoter score (0 to 10 scale) for gauging customer satisfaction; this could be utilized in Qualtrics surveys linked to SM channels. A score of 9 to 10 indicates loyal followers who act like megaphones for your information and services.



## Conclusions

The Alabama Beginning Farmer program, as a flagship program within the Alabama Extension Commercial Horticulture Team, has developed many other multimedia resources for farmers that integrate well with social media-based marketing and usage. We report all our evaluation materials and impact videos via the webpage, <https://www.aces.edu/blog/topics/farming/beginning-farmer-information-and-impact-resources/>.

Based on our collective experiences from two years of intense virtual events for producers, we can say that social media offers a great tool for educators to provide immersive training to audiences in an unbiased manner, assuming everyone has access. Social media also allows great two-way interaction and networking direct from home or farm, a benefit even for the intermediate-level or experienced producers. We feel beginning farmers have to strike a balance between long-distance and hands-on training that cannot be replaced. Using quizzes, humor, and illustrations are great methods for attracting new followers looking for fresh ideas.

Many parts of rural Alabama still don't have access to the Internet and that is a barrier for the public to learn from long distance programming. Lack of time for people with busy work schedules poses challenge for virtual event planning, however, on-demand viewing of archives is a benefit of virtual programs. Scheduling a large Extension team can be a challenge, but team dedication was outstanding which generated relevant content in our case. The timing and choice of messages via social media channels is absolutely critical, no matter what channels are used. This can certainly contribute to an increase in the public value of Extension programs. Evaluation and feedback system like VEMES will continue to evolve as additional communication channels are incorporated into Extension programming.

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