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Adaptive Multi-Paddock Grazing: Cattle Producer Survey Results

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Environmental impacts of agricultural production can be intense and widespread. Uniquely, agriculture has the potential to impact surrounding environments, communities, and people both positively and negatively. Implementation of best management practices (BMPs) can increase positive impacts while mitigating the negative ones. BMPs are intended to minimize environmental consequences of agricultural production while increasing operation profitability (Paudel et al., 2008). They are also backed by research to be the most effective, environmentally sustainable, and economically efficient way to manage an agricultural enterprise long-term (Gillespie et al., 2007; Paudel et al., 2008).

A newer BMP within the beef industry, adaptive multi-paddock (AMP) grazing focuses on grazing cattle in a way that improves animal and forage productivity, increases water infiltration and reduces water runoff while potentially sequestering more soil organic carbon than other grazing methods (Park et al., 2017; Stanley et al., 2018). AMP grazing is an intensive grazing style in which lightweight, portable fencing systems are used to move animals strategically around a large pasture or range, allowing for dense grazing interspersed by long periods of recovery for the land. AMP grazing is commonly grouped with other adaptive grazing methods such as Holistic Management (HM), High-Intensity Short Duration Grazing, and Management-Intensive Grazing (Mann and Sherren, 2018) which show promise for sustainability and regeneration (Teague and Barnes, 2017). While investment in grazing systems research has been substantial, few detailed studies have gathered broad understandings of rancher perspectives regarding the efficacy or social, cultural, and economic dimensions of alternative grazing systems (Becker et al., 2016; Gosnell et al., 2020). Current AMP grazing research is limited and focused on the environmental and production benefits of the practice (Park et al., 2017; Stanley et al., 2018; Teague and Barnes, 2017). While some studies have explored perceptions of AMP by adopters, empirical studies on

social and economic dimensions of AMP (and HM more broadly) are limited (e.g. Stinner et al. 1997; Roncoli et al. 2007; McLachlan and Yestrau 2009; Richards and Lawrence 2009; Alfaro-Arguello et al. 2010; Sherren et al. 2012; Ferguson et al. 2013; Mann and Sherren 2018; Gosnell et al. 2020). Additionally, little is still known about the wider beef industry's knowledge and perceptions of AMP grazing or their willingness-to-adopt the grazing style.

The purpose of this survey is to better understand current utilization, knowledge, and perceptions, in order to inform a study of willingness-to-accept (WTA) AMP grazing.¹ To understand its current utilization, we analyze grazing management with questions crafted to allow for both researcher-identification and producer-identification of AMP grazing. Additional sections of our survey analyze expected and experienced barriers to AMP adoption, desired improvements within the operation broadly, current BMP adoption, and marketing claims; all of which we anticipate helping explain and motivate AMP adoption. Our in-depth analysis of beef producers' utilization, knowledge, and perceptions was conducted from a national online survey of 459 producers. This material is based upon work supported by the VF Foundation, Wrangler, and Timberland and is part of the wider "Adaptive Multi-Paddock Grazing Research Project" based at Arizona State University. Any opinions, findings, and conclusions expressed in this material are those of the author(s).

Research Design

A national online survey disseminated in September 2019 focused on current grazing management classification, producer motivations for current management methods, perceptions and willingness to adopt AMP grazing, and demographic characteristics. BEEF Magazine administered the survey in two iterations to their email listserv of cow-calf producers who owned at least 25 head. The first

¹ Investigators received approval from the Michigan State University's Institutional Review Board to administer this survey (STUDY00003111).

email was delivered to 52,202 emails and opened by 2,160 individuals. A follow up email was delivered three weeks later to 50,036 emails and opened by 1,582 individuals. The two emails received 351 responses providing a 0.3% response rate from total delivered emails and a 9.4% response rate from opened emails.²

To increase sample size, the survey was then sent through select cattlemen's associations. Cattlemen's associations for the 11 states holding the most beef cows that calved January 1, 2019 and the Michigan Cattlemen's Association were contacted for collaboration (LMIC, 2019). The survey was sent through the Arkansas Cattlemen's Association, Kansas Livestock Association, Michigan Cattlemen's Association, Oklahoma Cattlemen's Association, South Dakota Cattlemen's Association, and Pharo Cattle Company, a listserv of regenerative grazers, receiving 108 responses. Response rate on this effort is unknown since we did not have access to email listservs for the associations.

From the combined 459 responses, 40 responses were dismissed from the survey for answering no to at least one of the three qualifying question – 'Do you voluntarily agree to participate in this research study?', 'Are you a primary operator on a beef cattle operation?' and 'Does your operation graze beef cattle?' – leaving 419 usable responses. An additional outlier response was dismissed for indicating they had 450,250 cows. The 'Request Response' option was selected for the remaining questions in the survey. Therefore, not every question was answered by all 418 respondents.

Operation Demographics

Respondents were first asked questions about their operation demographics (Table 1). Ninety percent of operators indicated a portion of their cattle operation was devoted to the cow-calf

² Emails came from a newly created email by BEEF Magazine special for this survey rather than their daily newsletter email. Thus, we expect many emails went to spam.

segment of the beef cattle industry while backgrounding/stocker, seedstock, grass finisher, and feedlot segments represented 27%, 19%, 18%, and 12% of the operations, respectively.

The average number of beef cows on operations as of January 1, 2019 (including lactating, gestating, and replacement heifers) was 223 head with a median of 100. Operations with 100 or more beef cows compose 51% of operations and 90% of the beef cow inventory in our sample. On average, operations in our sample are larger than those across the nation. According to the 2017 Census of Agriculture, the average beef cow herd is 43.5 head and operations with 100 or more beef cows make up 9.9% of beef operations and 56% of the beef cow inventory (USDA, 2019).

In 2018, operations in our sample sold on average 78 calves (median 33), 50 yearlings (median 8), and 56 finished cattle (median 0). These distributions, along with our herd size, are skewed by a handful of larger producers. Additionally, operations in our sample sold more calves on average than the industry average of 23 calves (USDA, 2017).

Eight percent of operations did not sell market steers, while 30% sold market steers between 500 and 599 pounds, 20% between 600 and 699 pounds, 18% over 800 pounds, and 12% sold market steers between 700 and 799 pounds. Operators received on average \$146.97 per hundredweight (cwt) on steers in the last year with minimum of \$80.00 per cwt and maximum of \$250.00 per cwt. This average aligns with the average feeder futures price for the same time period of \$144.87 per cwt (LMIC, 2020). Sixty nine percent of operators did not know their average cost of production per head for steers. Of the 31% who did, they indicated the average cost of production to be \$515.84 per head on average, which is marginally higher than the USDA estimated gross value of production of \$465.75 per calf (t-test value=2.75; p-value=0.08; USDA, 2019).

The largest portion of our sample, 52%, reside in the Midwest³ holding 53% of the beef cow inventory in our sample, followed by 27% in the South holding 19% of inventory, 19% in the West holding 29% of inventory and 2% in the Northeast holding less than 1% of cows as of January 1, 2019. According to the Livestock Marketing Information Center, the January 1, 2019 cattle inventory breakup among regions consisted of 34.5% in the Midwest, 44.7% in the South, 19.6% in the West and 2.2% in the Northeast. Therefore, inventory in our sample is more concentrated in the Midwest and West than nationally. The larger portion of Midwest inventory is likely due to targeting South Dakota, Kansas, and Michigan producers via their cattlemen's and livestock associations. Additionally, Midwest producers, especially those in Michigan, may have been more likely to respond to the survey due to Michigan State University's name recognition. Our West inventory is likely higher than that nationally due to receiving responses from larger producers within the region; herd average in the West was 334 cows.

More than a quarter, 27%, of operations have been established more than 50 years, 18% have been established 21 to 30 years, and 17% have been established 11 to 20 years while only 4% have been established less than five years. Primary operators in our sample tended to be more experienced than those nationally as 4% have been a primary operator more than 50 years, 16% between 31 and 40 years, 24% 21 to 30 years, 21% 11 to 20 years, 12% five to 10 years and 8% less than five years. Nationally, 73% of beef operators have been operating a farm 11 or more years, 13% have been operating between six and ten years and 15% five or fewer years (USDA, 2017).

³ Regions assigned following the U.S. census (U.S. Census Bureau, 2020). West included WA, OR, ID, MT, WY, CO, UT, NV, CA, AZ, and NM. Midwest included ND, SD, NE, KS, MN, IA, MO, WI, IL, IN, MI, and OH. South included TX, OK, AR, LA, MS, AL, TN, KY, GA, FL, SC, NC, VA, WV, MD, DC, and DE. Northeast included PA, NJ, NY, RI, CT, MA, VT, NH, and ME.

Our sample operates on average 3,022 acres (median 724). Of the total acres operated, an average of 2,560 acres are allocated to grazing cattle (median 390). From the acres allocated to grazing cattle, on average 1,220 are owned (median 220) which is less than 50%. Meanwhile, the average size of beef cattle farms in the U.S. is 565 acres with 407 acres being owned (USDA, 2017). Again, we see a handful of larger producers skewing the dataset. A summary of the operation demographic statistics is presented in Table 1.

Primary Operator Demographics

The average respondent age was 58 years old aligning closely with that of principle beef cattle producers nationally which are on average 57.4 years old (Table 2; NCBA, 2019). All respondents have attained a high school diploma and 64% hold a bachelor's degree or higher, making our sample more educated than the U.S. population (U.S. Census Bureau, 2017). Past studies of agricultural producers have also found responding producers to be more educated than the general public (McKendree et al., 2018; Thompson et al., 2019; Ward et al., 2008).

Annual pre-tax household incomes for producers in our sample also align with those found in other studies (McKendree et al., 2018). Sixteen percent of respondents' annual pre-tax household income was less than \$50,000, 67% was more than \$50,000 and 18% did not provide that information. Most respondents (70%) indicated the beef operation contributes 50% or less of the annual household income. More than half, 54%, of our sample do not have off-farm jobs while 32% have full time and 14% have part time off-farm jobs. Nationally, 40% of primary beef operators identified the beef operation to be their primary occupation while 60% had other primary occupations (USDA, 2017). Thirty-eight percent of operations do not have other employees or on-farm help; meanwhile 29% have full time help, 38% part time, and 5% have both. We did not ask whether the full time and part time help were paid or not. Nationally, only 20% of beef operations have hired labor and 50% have unpaid workers (USDA, 2017). Most of our respondents, 58%,

identified as Republican followed by Independent, 19%, and Democrat, 8%. A summary of the primary operator demographic statistics is presented in Table 2.

Table 1 Operation Summary Statistics

Demographic Variable	
Operation Region (n = 409)	
Midwest	52%
South	27%
West	19%
Northeast	2%
Inventory in Region (n = 385)	
Midwest	52%
South	19%
West	29%
Northeast	<1%
Years Established (n = 411)	
Less than 5	4%
5 to 10	11%
11 to 20	17%
21 to 30	18%
31 to 40	13%
41 to 50	10%
More than 50	27%
Years as Primary Operator (n = 411)	
Less than 5	8%
5 to 10	15%
11 to 20	21%
21 to 30	24%
31 to 40	16%
41 to 50	11%
More than 50	4%
Average Herd Size (n = 386)	
Median	100
Average Acres Operated (n = 356)	
Median	724
Average Acres Grazed (n = 356)	
Median	390
Averages Grazed Acres Owned (n = 356)	
Median	220

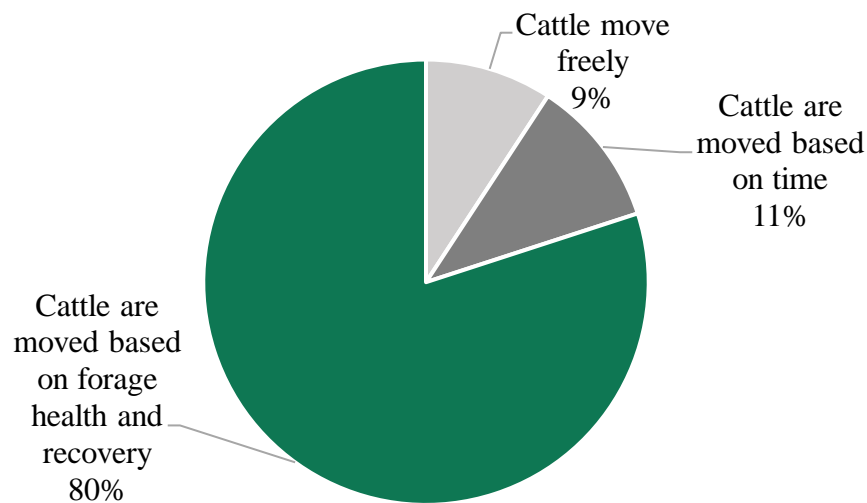
Adaptive Multi-Paddock Grazing: Utilization, Knowledge, and Perceptions

To identify AMP grazers along with gaining insight into their perceptions and knowledge of AMP, a series of questions regarding current grazing management methods were asked. These questions were crafted with the help of AMP grazing experts Dr. Jason Rowntree and Dr. Matt Raven to allow for researcher-identification of AMP grazers along with producer self-identification as an AMP grazer.

Producers were first asked about their grazing style and frequency of moving cattle. Nine percent of operations allow cattle to move freely among all available pasture(s) during the entire year (Figure 1). Meanwhile, cattle are moved between different pastures throughout the grazing season based on time by 11% of our sample and based on forage health and recovery by 80% of our sample. Operators indicated a variety of frequencies for moving cattle to different paddocks or pastures. Most producers, 19%, move cattle once a month, 16% move twice a month, 16% move once a week, 13% move two to three times a week, 11% move daily and 2% move multiple times a day (Figure 2).

Table 2 Primary Operator Summary Statistics

Demographic Variable	
Average Age (n = 317)	58
Education Level (n = 320)	
No High School Diploma	0%
High School Graduate	13%
Some College	13%
Technical Training	8%
Bachelor's Degree	43%
Grad. Or Professional Degree	23%
Annual Pre-Tax Household Income (n = 321)	
Less than \$25,000	4%
\$25,000-\$49,999	12%
\$50,000-\$74,999	18%
\$75,000-\$99,999	15%
\$100,000-\$124,999	13%
\$125,000 or more	21%
Household Income from Beef Operation (n = 320)	
0%	6%
Less than 25%	45%
26%-50%	19%
51%-75%	12%
Over 75%	18%

**Figure 1** Grazing Style Most Similar to How Beef Operators Graze Cattle (n = 325)

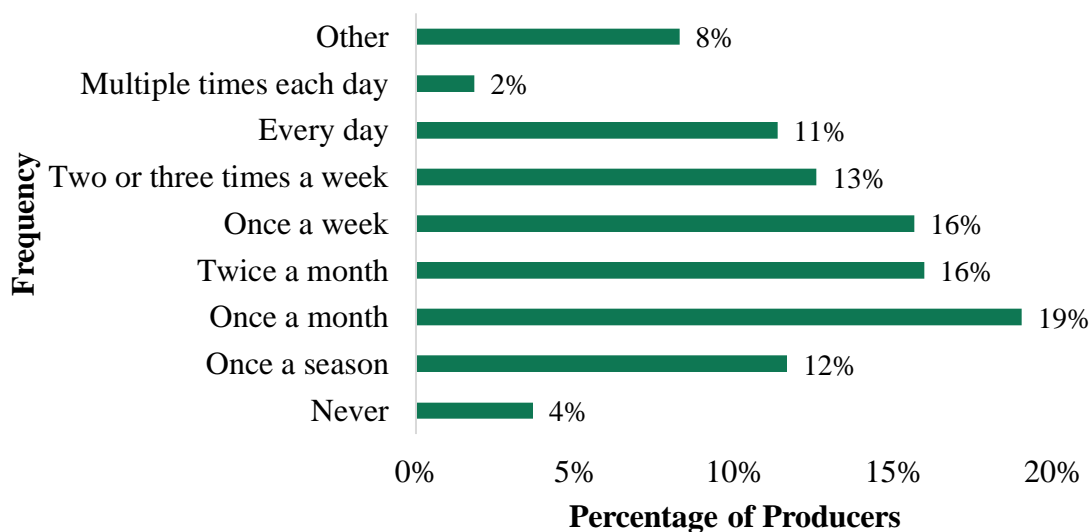


Figure 2 Frequency Cattle are Moved to a Different Paddock or Pasture (n=326)

From these questions, we identified operators as AMP if they said cattle are moved based on forage health and recovery and cattle are moved two or three times a week or more frequently. This classification resulted in 77 researcher-identified AMP grazers or 18% of our total sample (Table 3). After current grazing management methods and motivations for current management practices were established, respondents were introduced to AMP grazing.⁴ Following this introduction, they were asked about their knowledge and perceptions of the grazing management style, from which producer self-identification as an AMP grazer followed. Knowledge of AMP was higher than anticipated as 78% had heard of AMP, 17% were familiar with the concept but not the name, and only 5% had not heard of the management practice (Figure 3).

⁴ Definition provided: “Adaptive multi-paddock (AMP) grazing is an intensive grazing method in which lightweight, portable fencing systems are used to move animals strategically around a large pasture, allowing for dense grazing interspersed by long periods of recovery for the land. This grazing method may be known by other names including holistic management or high intensity-short duration grazing.”

Table 3 Percentage of Adaptive Multi-Paddock (AMP) Grazers from Researcher-Identification and Producer-Identification

AMP Grazers	Number of Producers	Percentage of Producers
Researcher-Identified (n = 418)		
Yes	75	18%
No	343	82%
Producer-Identified (n = 308)		
Yes	102	33%
No	129	42%
A similar adaptive style but not AMP	77	25%

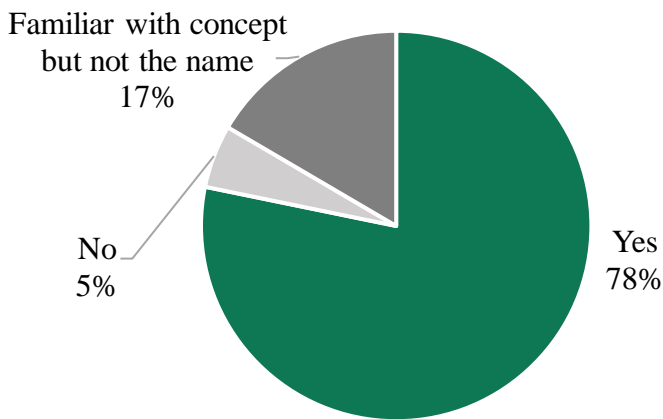


Figure 3 Producer Response to “Have you heard of adaptive multi-paddock grazing?” (n = 326)

The 309 respondents that indicated they had heard of AMP or were familiar with the concept received follow-up questions regarding the practice. From this group, 62% indicated from what they know of AMP, they would frame it as a best-management practice (BMP) while 30% did not know or were mixed (Figure 4).

to five AMP grazers and 11% knew

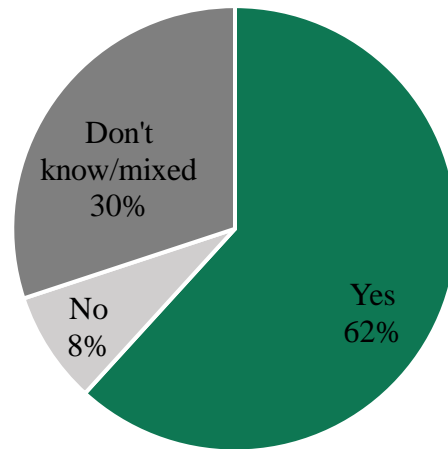


Figure 4 Producer Response to “Given what you know of adaptive multi-paddock grazing, would you frame it as a best-management practice?” (n = 306)

Even though producers had heard of AMP or were familiar with the concept, 31% did not know any AMP grazers while 40% knew two more than 10 (Figure 5). The group familiar with AMP were then directly asked if they used AMP grazing (producer self-identification) – 33% said yes, 42% no, and 25% indicated they use a similar adaptive style but not AMP (Table 3).

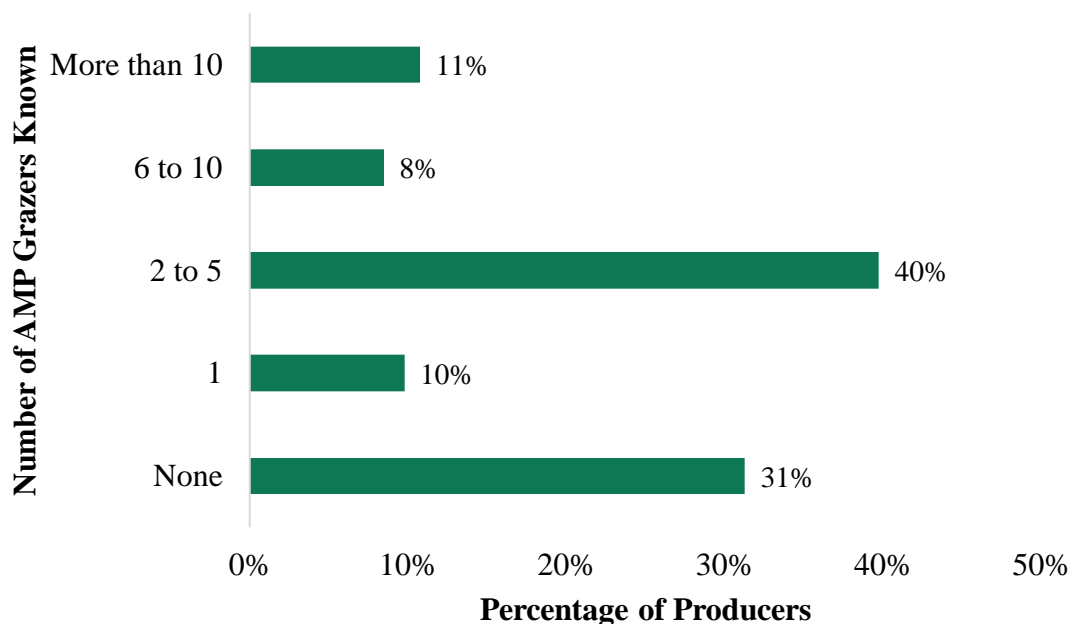


Figure 5 Producer Response to “How many adaptive multi-paddock grazers do you know?” (n = 307)

When including those unaware of AMP, 24% of our total sample self-identified as an AMP grazer compared to the researcher-identified 18%. This difference may indicate a knowledge gap between producers and academics in terms of what AMP grazing truly is and the specifications of the grazing style. For the remainder of this paper, AMP and non-AMP grazers will refer to the self-identified sample.

Interested in examining expected versus experienced challenges to adoption, we asked non-AMP and AMP grazers a question regarding barriers to adoption. If operators had not heard of AMP, do not already use AMP, or use a similar adaptive style but not AMP, they were asked to indicate which challenges would hinder their adoption of the AMP grazing management method. Forty-five percent indicated that their operation is not set up for this kind of grazing, 36% do not have enough help on the farm, 35% say it is too time consuming, and 18% fear the financial requirement for set-up is too high (Figure 6).

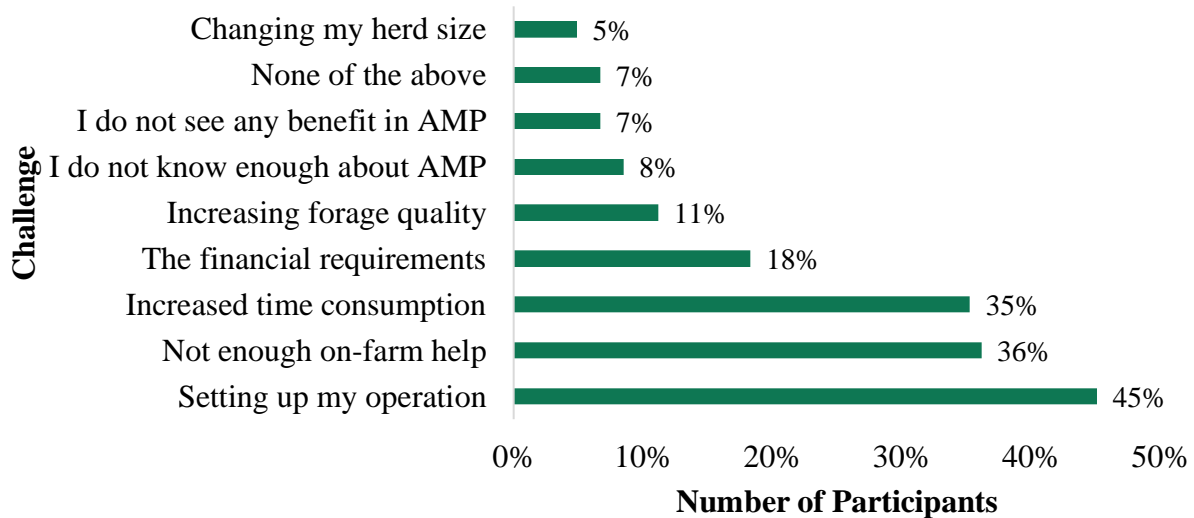


Figure 6. Expected Challenges that Hinder Adaptive Multi-Paddock Grazing Adoption (n=224)

AMP grazers were asked the biggest challenge they faced when adopting AMP grazing (Figure 7). Forty-nine percent said setting up their operation for the grazing style was the biggest challenge which aligns with the perceived challenges of adoption. However, contrary to perceived challenges only 7% indicated it is much more time consuming and 4% identified the financial requirements to be the biggest challenge. Perhaps an overlooked expected challenge for adoption is increasing forage quality as 16% of AMP grazers determined this to be the biggest challenge while only 11% expected it. There were no challenges experienced among 10% of our AMP grazers.

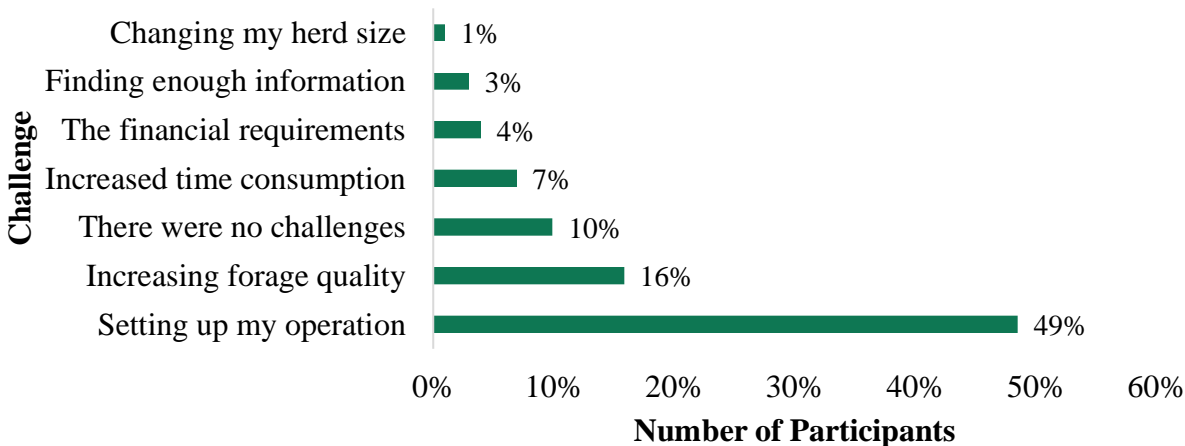


Figure 7. Biggest Experienced Challenge when Adopting Adaptive Multi-Paddock Grazing (n = 101)

Marketing

Producers were asked to select the claims most frequently used when marketing their cattle (Figure 8). Pre-conditioned (weaning or vaccination) claims were the most frequently used with 57% of our respondents utilizing them. Other commonly used claims include natural (no hormones/no antibiotics), age and source verified (ASV/SAV), grass-fed, and humanely raised with 35%, 24%, 24%, and 23% utilization, respectively. The option of none, or conventional production, remained common among a fifth of our sample. Meanwhile, the organic claim was only utilized by 3% of our respondents. Understanding producer use of claims when marketing cattle can help us better understand their WTA AMP grazing for a premium. Additionally, this insight may help explain differences among producers and their motivations for current management methods. Those who market as grass-fed may place more importance on caring for the land than those that market as conventional.

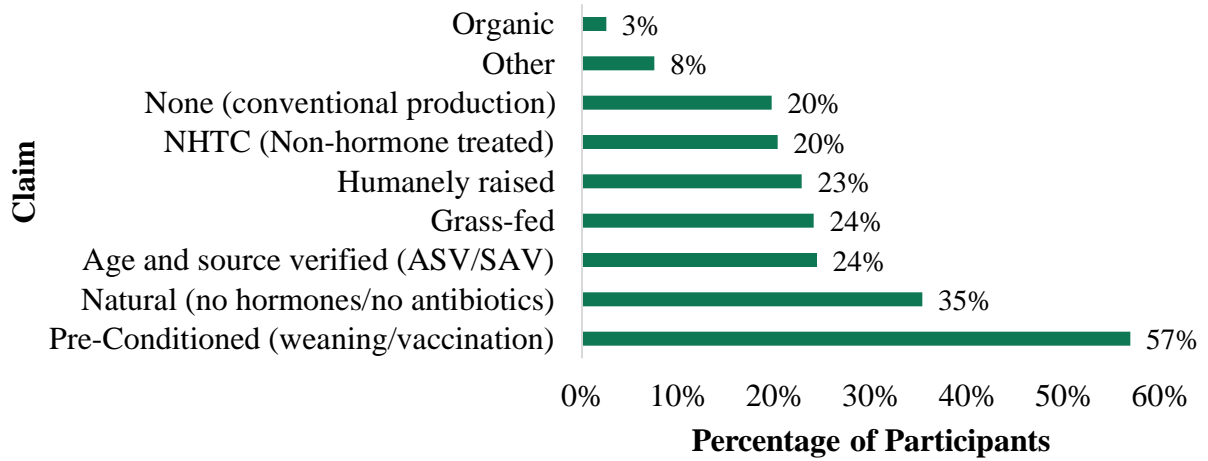


Figure 8 Beef Operation Marketing Claims (n = 320)

Additionally, we asked respondents to indicate which method or outlet they use most often when marketing cattle (Figure 9). Local auctions captured 47% of respondents trailed by direct to consumers with 15% and direct to feedlot operation with 10%.

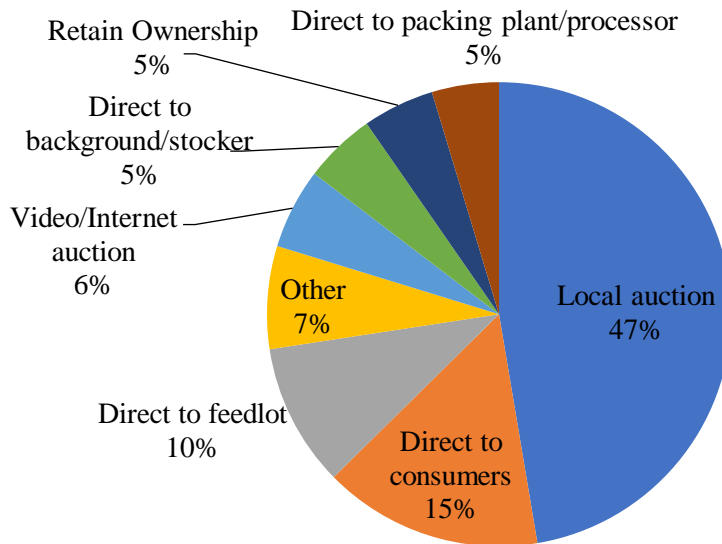


Figure 9 Beef Operation Marketing Methods/Outlets (n = 321)

Animal Best Management Practices

Respondents were given a list of best management practices (BMP) and asked if they utilize this practice on their operation (Table 4). This list was based on a 2016 study of 30 cattle ranches in California examining management practices (Simon et al., 2016). Simon et al. (2016) found that even though some management and facility characteristics, such as castration and vaccination programs, were shared by most operations, other aspects like weaning age, cattle balking, and electric prod use varied. From Simon et al.'s (2016) 41 question survey, our project team, including animal scientists, derived a list of 13 BMPs representing practices that put operations at higher risk if not implemented. While there are no federal standards or regulations, there are recommended BMPs within the beef industry based on scientific research (BQA, 2020). Producer use of these practices were asked in effort to measure practice adoption and operation risk.

Ninety-six percent of respondents indicated they use a method of animal identification and are able to safely restrain cattle, while 93% have an established relationship with a veterinarian. Between 84% and 89% of respondents maintain a herd health program that includes vaccinations for cows and calves, have written or computer financial records, perform visual health checks on their herd at least twice a week, and have a planned breeding and calving season. Fewer producers, between 68% and 75%, castrate bull calves within the first three months of age, regularly body condition score their cattle, train employees on low stress cattle handling and care, have written or computer health records, and use a low stress weaning program. Only 54% are Beef Quality Assurance certified while 6% indicated that BMP was not applicable. Thirty-five percent of producers quarantine new cattle at least 30 days after arriving onto the ranch, 34% do not and 32% indicated this was not applicable to their operation.

Table 4 Beef Operations' Utilization of Best Management Practices (BMP)

BMP	n	Yes	No	N/A
A method of animal identification (e.g., ear tags, brands, etc.)	321	96%	4%	1%
Ability to safely restrain cattle (e.g., squeeze chute) for procedures	322	96%	3%	0%
Have an established client relationship with a veterinarian	321	93%	7%	0%
Perform a visual health check of your herd at least twice per week	322	88%	11%	1%
Planned breeding and calving season	321	89%	9%	2%
Maintain a herd health program that includes vaccinations for cows and calves	320	84%	14%	2%
Written or computer financial records	320	85%	13%	2%
Use a low stress weaning program (fence line, etc.)	321	75%	20%	5%
Written or computer health records for the herd	320	71%	28%	2%
Train your employees on low stress cattle handling and care (includes family workers)	320	72%	8%	19%
Body condition score your cattle to gauge their nutritional state during the production cycle	319	70%	26%	3%
Castrate bull calves within the first three months of age	318	68%	28%	4%
Beef Quality Assurance Certified	316	54%	40%	6%
Quarantine new cattle at least 30 days after arriving onto ranch	320	35%	34%	32%

Riskiness Index

BMP responses were used to create two operation indexes, one to measure operation riskiness and one for progressiveness. The riskiness index was established by grouping BMP's into high-level, mid-level, and low-level categories based on the practices' ability to help maintain a low-risk operation (Table 5). Low-risk refers to minimizing challenges to animal health, maintaining animals in a good nutritional state and minimizing stress to the animals while helping animals reach their performance potential. Practices within the high-level category received a weight of five as they were perceived to be the practices most essential for maintaining a low-risk operation. Mid-level practices received a weight of three and were viewed as practices still important for maintaining a low-risk operation but not as important as those in the high-level category. Practices within the low-level category received a weight of one and were viewed as the least essential practices for maintaining a low-risk operation. For example, although attaining BQA certification is recommended for producers, a producer could attain the same results without being BQA certified.

If operators indicated the production practice was being used in their beef operation, they received the respected weight for that practice towards their overall riskiness measure. If they indicated the practice was not being used or was not applicable to their operation, they did not receive the respected weight towards their overall index value. The riskiness index ranges from 0 to 42 where lower index values indicate higher risk operations and higher index values indicate lower risk operations.

Table 5 Classes and Weights of Best Management Practices for Operation Riskiness Index

BMP	Weight
High-level	
Maintain a herd health program that includes vaccinations for cows and calves	5
Written or computer health records for the herd	5
Method of animal identification (e.g. ear tag....)	5
Quarantine new cattle at least 30 days after arriving onto ranch	5
Mid-level	
Perform a visual health check of your herd at least twice per week	3
Have an established client relationship with vet	3
Ability to safely restrain cattle	3
Training your employees on low stress cattle handling and care	3
Planned breeding and calving season	3
Body condition score cattle to gauge nutritional state during production cycle	3
Low-level	
Use a low stress weaning program	1
Castrate bull calves within the first three months of age	1
BQA Certified	1
Written or computer financial records	1

We classified index values of 37 or higher to be lower-risk operations. An index value of 37 or higher required an operation to practice nearly all of the production practices analyzed. It does provide lenience for not practicing one high-level practice or a combination of mid and low-level practices. Operations with index values between 29 and 36 were classified as mid-risk operations. Here more lenience was provided for operations to not practice a combination of the practices analyzed but still required utilization of most practices. Index values below 29 classified operations as high-risk. Following these classifications, 25% of our sample are lower risk operations, 53% are mid-risk and 22% are high-risk operations.

Progressiveness Index

An index measuring operation progressiveness was established similarly to the riskiness index. BMP's were grouped into high, mid, and low-level categories (Table 6). High-level practices

received a weight of five as they reflect more advanced practices within the beef cattle industry. Practices within the mid-level category received a weight of three and were perceived to be progressive practices but not as advanced as those in the high-level category. Meanwhile, low-level practices received a weight of one, were seen as mainstream or standard within the industry.

Table 6 Classes and Weights of Best Management Practices for Operation Progressiveness Index

BMP	Weight
High-level	
Planned breeding and calving season	5
Training your employees on low stress cattle handling and care	5
Body condition score cattle to gauge nutritional state during production cycle	5
Castrate bull calves within the first three months of age	5
BQA Certified	5
Use a low stress weaning program	5
Mid-level	
Perform a visual health check of your herd at least twice per week	3
Ability to safely restrain cattle	3
Have an established client relationship with vet	3
Written or computer financial records	3
Low-level	
Maintain a herd health program that includes vaccinations for cows and calves	1
Written or computer health records for the herd	1
Method of animal identification (e.g. ear tag....)	1
Quarantine new cattle at least 30 days after arriving onto ranch	1

Operations received the respective weight for each BMP if they indicated utilization of the practice. However, if the practice was not used or not applicable to their operation, they did not receive the respective weight for that practice towards their overall progressive index value. The progressiveness index ranges from 0 to 46 where higher index values represent more progressive operations.

We separated the progressive index into four operation classifications: more progressive, mid-level progressive, standard within the industry, and below standard within the industry. More progressive operations required an index value of 40 or higher. This classification provides lenience for not utilizing one high-level and one low-level practice or a combination of mid and low-level practices while maintaining utilization of most practices studied. Index values between 35 and 39 classified operations as mid-level progressive. Here, lenience for not practicing at most two high-level practices and one low-level, one high-level and several mid or low-level practices, or a combination of several mid and low-level practices was provided. Operations classified as standard within the industry scored index values between 30 and 34 which provided more variation in practice adoption. These operations were seen to be doing the bare minimum in terms of industry recommended practice adoption. While there are no federal standards, certain BMPs within the beef industry are recommended based on scientific research (BQA, 2020). Below standard within the industry operations received less than 30 points on the progressive index. Following these classifications, 34% of our sample are more progressive operations, 27% are mid-level progressive, 19% are standard within the industry, and 20% are below standard within the industry.

These results indicate that even though a good portion of producers are taking steps to minimize risk and be more progressive within their operations, there is still room for improvement throughout the industry. Producers should use these indexes to analyze their own operations and see how they compare to those more broadly. Further, these indexes can help producers better identify areas for practice adoption or management change within their operation.

Desired Improvements within Beef Operation

Producers were asked to indicate what they would like to improve within their beef operation (Figure 10). Profitability, forage quality, and minimize costs were the most popular desired

improvements being selected 84%, 69%, and 69% of the time, respectively. Forty-three percent of producers indicated they would like to improve their quality of life. Environmental improvements were less common but remained important to many producers. Environmental factors included improve water infiltration (31%), wildlife habitat/habitation (30%), reduce water runoff (30%), and reduce greenhouse gas (GHG) emissions (14%). A quarter of our sample want to improve animal welfare and 14% want to improve community involvement. Only 2% indicated they did not want to improve any of the options provided.

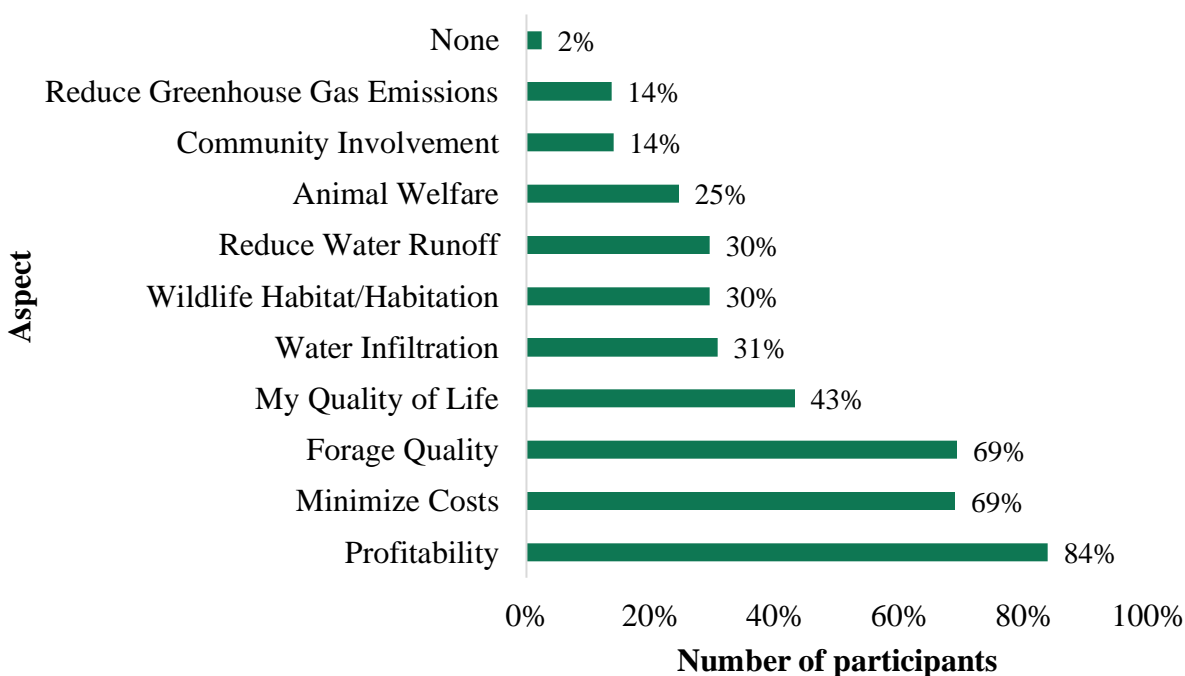


Figure 10 Aspects of Beef Operation Primary Operators Would like to Improve (n=322)

Conclusions and Implications

Mitigating environmental impacts of agricultural production while increasing profitability is essential for providing consumers sustainable food while maintaining operation economic efficiency. Through the adoption of BMPs this is attainable. Within the beef industry specifically, AMP grazing can improve animal and forage productivity while potentially sequestering more soil

organic carbon than continuous grazing (Stanley et al., 2018). Although 33% of our sample already self-identify as AMP grazers, our data shows this BMP has the potential for significant increases in adoption.

Largely, producers already know of AMP (78%) or are familiar with the concept (17%) indicating familiarity has already been established within the industry. Now, less focus is required on informing producers what the practice is and instead should be on marketing benefits and targeting producer motivations to support adoption. Even though most producers are familiar with AMP, not everyone is sold on it being a BMP. This provides room for industry professionals to convey environmental and productivity research findings to help producers better understand the benefits of the practice.

When leading AMP adoption, industry professionals can directly address expected challenges that hinder adoption like operation set up (45%), having enough help (36%), increased time (35%) and financial requirements (18%). Not only can challenges be addressed, they can be mitigated by comparing to experienced challenges. Increased time consumption and financial requirements were only experienced by 7% and 4% of self-identified AMP grazers, respectively. Meanwhile, industry professionals can prepare new adopters for the overlooked challenge of increasing forage quality.

Understanding what producers wish to improve within their operation can help in matching BMP benefits with desired improvements. Beef producers largely wish to improve profitability (84%) and forage quality (69%) while minimizing costs (69%). This may also point to trade-offs being made on the implementation of BMPs that will lower risk to their herd. Fewer producers wish to reduce GHG emissions (14%). Thus, when discussing the benefits of AMP grazing, more focus should be placed on how the practice increases forage quality and animal productivity, which

can increase profitability or minimize costs, and less focus on how it reduces GHG emissions. However, if policy instruments can be designed to pay producers for GHG emission reductions this becomes an environmental and financial benefit and should be highlighted. Specialized adoption discussion strategies should be established for other BMPs based on matching benefits with desired improvements.

Overall, beef producers are already familiar with AMP grazing. There is ample room however for increasing AMP adoption by informing producers of AMP benefits and matching those benefits to producer desires. Additionally, expected challenges are different than experienced challenges and thus should be discussed to ease producers' minds and increase adoption. Not only can understandings from this survey support AMP adoption, they can support BMP adoption throughout the entire beef industry.

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