Estimate of Documentation of National Park Service Scenario Building Model used for Decisionmaking in the Beef Production Climate Resilience Toolkit

Data to Decisions ESIP Lab Project
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INTRODUCTION:

This table represents the analysis done of the decisionmaking process used by the University of Nebraska Lincoln and South Dakota State University core project team to meet their objectives for helping County Extension agents build climate resilience options into beef production field operations in their geographic regions. The decisionmaking process used was called the National Park Service Scenario Building model. (See (https://www.nps.gov/subjects/climatechange/upload/CCScenariosHandbookJuly2013.pdf.)

One of the primary PIs of the project, Dr. Crystal Powers from the University of Nebraska Lincoln was contacted several times to see if she could help the Data to Decisions (D2D) team identify whether and where documentation existed to more completely identify specific "artifacts" that could be considered as important entities in a data to decision record (per column 4 of the table, "Documentation Created (Y/N"). Unfortunately, Dr. Powers was not available to assist the team during the time frame of the ESIP Lab project, so I used slide deck that Dr. Powers had previously presented to the Ag/Climate Cluster and ESIP at a face to face meeting. The slide deck did not allow the D2D team to go into the detail originally planned; however, enough detail was provided for a high level mapping to be done to various PROV extensions. The results of that mapping are presented by Dr. Tom Narock at: https://github.com/ESIPFed/d2dprovenance/blob/d2dprovenance/deliverables/narock/ESIP_Winter_2019_Narock_PROV.pptx. Dr. Powers' slides are available in the github repository at: https://github.com/ESIPFed/d2dprovenance/blob/master/deliverables/hoebelheinrich/PowerPoint%20PresentationCPowers.pdf The presentation slides from the ESIP Winter 2019 breakout session on the project which describes the work in more detail (along with those of Dr. Narock, mentioned above) can be found at: https://github.com/ESIPFed/d2dprovenance/blob/master/deliverables/hoebelheinrich/ESIP_Hoebelheinrich_PROV.pdf.

Legend: Yellow = Should be included in general mapping to PROV extensions; Teal = to be included in case specific background documentation; No highlight = Not mapped

PHASE	SubPhase	Used (Y/N)	Documentation Created (Y/N)	Comments / Notes
Orient	Establish project purpose & desired outcomes	Y		Desired: Extension Program plan (slide 29):

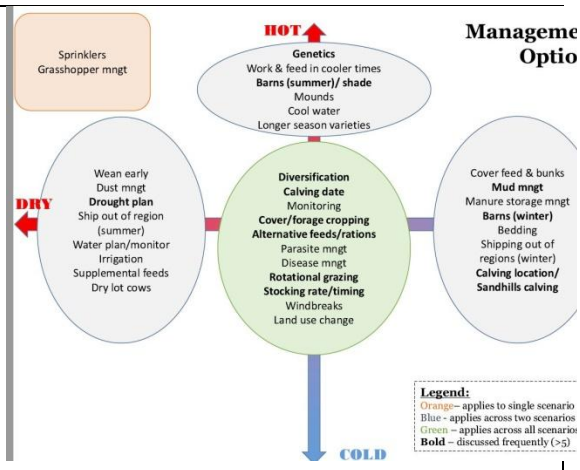
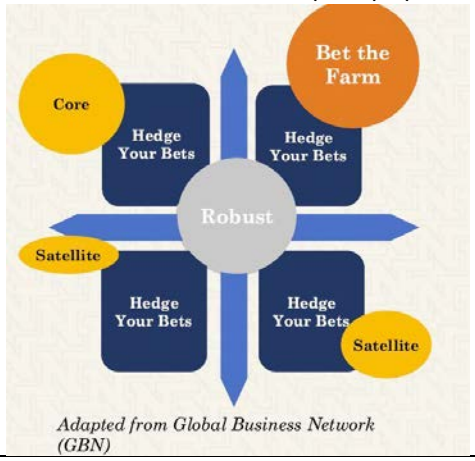
				Extension Program Plan • Identifying gaps in Extension and Research • Prioritizing new programming or resources **University of Nebraska** • Biological Systems Engineering • Animal Science • Agronomy • Climatology • Extension – Climate and Beef teams **South Dakota State University** • Agricultural and Biosystems Engineering • Extension **Funding** • USDA Northern Plains Climate Hub • USDA NIFA Animal Agriculture in a Changing Climate
Orient	Recruit core team	Y	Aka "Stakeholders: 1: core team for scenario building process; 2: Extension agents who advise: 3: the people who have decisions to make re: operations for beef production including: farmers/ranchersanimal health professionals, equipment manufacturers, and lenders / insurers. " Ultimate purpose directed to 3rd stakeholder, i.e., operational focus.	
Orient	ID Strategic Challenges	N	Per slides, are considered out of scope.	Described in terms of "overall drivers" = economics, regulations, taxes, people, local conditions
Orient	Establish timeframe, conduct background interviews & research	?	Impact factors	Cow/calf Feedlot cattle Feed Forage Annual crops Pasture/range Logistics Lot conditions Manure storage People Pests Water Use the categories included in the 4 square

				matrix as the products of the research interviews? Unclear whether this data were gathered during Orientation to process or under the Exploration part. Input factors: Impacts depend upon different input factors = Cold / Warm / Wet / Dry
Orient	Articulate focal question	?		Can paraphrase as the need for management options for beef / calf production for different climate variations based on the categories mentioned above plus the resulting management options.
Orient	Recruit program participants	Y		Two different focus groups: 1 called "Potential Beef Futures" to determine scenarios; participants included beef farmers & ranchers, vets & animal health professionals, equipment manufacturers, lenders / insurers. 2nd group called "Management Options" including same participants (?)
Explore	Identify background materials that capture the critical driving forces, variables, uncertainties & impacts that affect the strategic challenge	Y		Looking for historical and projected climate trends and impacts from those on beef production: Background data from National Climate Assessment, possibly: 1. Temperature change 2. Precipitation Change 3. Growing season length Identified the Integrated Farm Systems Model as one of the bases for analysis. See: https://www.ars.usda.gov/northeast-area/up-pa/pswmru/docs/integrated-farm-system-model/
Explore	Create materials for pre-workshop review	Y	Specific to this particular decisionmaking process; could be useful to include in a background prov example.	There were presentations created that offered information on local & regional climate trends & projections, presumably developed from prior research. There was also a presentation done on potential impacts to the beef system, and a 3rd on the process for creating scenarios. All of these would have been created beforehand.
Explore	Create or pull together visuals such as tables & charts for	?	See above.	See above.

	workshops that will facilitate discussion (# of workshops?; visuals for each?)			
Synthesize	Divide the critical driving forces into "critical uncertainty" variables (w/ lesser confidence in the related data & projections) and the "predetermined elements" (w/ higher confidence in data & projections) affecting the focal question	Y		• From slides (#23), factors of most importance were: 1) Season, 2) Two major climate drivers based on percentage of impacts (Precip & Temp accounted for 84% of impacts0, 3) Area of farm impacted, 4) positive or negative impact, 5) how frequently a factor was discussed (?). No evident discussion of "uncertainty" of these variables. • Uncertainty seems to have been better addressed using the various modeling techniques highlighted in slide 24 which includes 1) the Integrated Farm Systems Model mentioned above as well as 2) the use of state trends & projections, 3) a range of economic & performance impacts, and 4) farm sensitivity analysis.[i]
Synthesize	Using the classic 2x2 scenario matrix frameworks, choose scenarios from the divided variables (process used? Documentation of the process?).	Y		Focus group 1 generated: 1) ground rules for discussion (not available), 2) "weather stories" (not available); slide #21 provides an image of a white board that shows what appears to be a synthesis of the weather stories, and 3) transcriptions of the scenarios created (not available).
Synthesi	Identify	Y		Discussed by focus group 1 (slide 23):

ze	scenario impacts or effects			**Sorting and Prioritizing**
				• Season
				• Climate Drivers
				  • 20 total but 84% of impacts were with two
				  • Precipitation & Temperature
				• Area of farm impacted
				• Positive or negative impact
				• Frequency discussed

Synthesize	Describe scenarios & develop scenario narratives / brief stories (who did? Workshop participants and/or core team?)	Y		Reflected on the 2x2 matrix in the details.
Synthesize	Review scenarios for plausibility & consistency (by experts), but not probability or likelihood)	Y	Vetting step: used Y/N; impact on ultimate decision?	Done as part of the farm sensitivity analysis[ii] to temper the data coming from the Integrated Farm Systems Model.
Apply	Identify implications (such as bottlenecks, challenges, shortages, emergent needs, or new capabilities) for each scenario.	Y		Included in the details of the 2x2 matrix.

Apply	Develop, test & prioritize a suite of relevant actions for the scenarios.	Y	Documented on slide 16. See next cell. Presumably, the output from the brainstorming process undertaken by focus group 2. Test or application of the 2x2 matrix scenario bldg. tool. (Would have different graphs; e.g. how does the matrix work for 1 scenario or all scenarios to address frequency).	
Apply	Assess actions, strategic moves, and highlight areas of risk to map a strategy.	Y		Options were categorized for the relevant actions by using a method adapted from the Global Business Network (GBN). (slide 28): 
Monitor	Select indicators to monitor from the scenarios	Y	This visual is the documentation we have for this part of the process.	See factors included in management options (slide #16). See above.
Monitor	Scan & monitor changes in the environment	N		No evidence
Monitor	Communicate scenarios & workshop outcomes	N		No evidence
Monitor	Prepare &	N		No evidence

	produce workshop deliverables			

[ii] Background information on sensitivity analysis: The parameter values and assumptions of any model are subject to change and error. Sensitivity analysis (SA), broadly defined, is the investigation of these potential changes and errors and their impacts on conclusions to be drawn from the model (e.g. Baird, 1989). SA can be easy to do, easy to understand, and easy to communicate. It is possibly the most useful and most widely used technique available to modellers who wish to support decision makers. The importance and usefulness of SA is widely recognized. Source: http://dpannell.fnas.uwa.edu.au/dpap971f.htm .