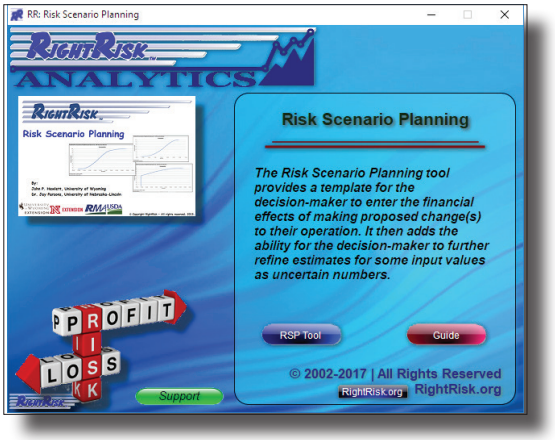
Applied Risk Analytics

Evaluating Pasture, Rangeland, Forage - Rainfall Index Coverage

Producer Ben Burwell* is worried about forage production in his Platte County Wyoming. pasture. He is looking for alternatives to manage the risk of low (or no) production that can happen in dry years. He is considering the purchase of Pasture, Rangeland, Forage Rainfall Index (RI-PRF) insurance coverage on 1,200 acres of non-irrigated range.



RI-PRF is designed to offer protection against revenue losses resulting from decreased forage production, using a rainfall index to indicate low precipitation levels. The policy uses grid areas approximately 17x17 miles as part of the rainfall index determined by the National Oceanic and Atmospheric Administration (NOAA) and divided into eleven, 2-month index intervals. Rainfall over the intervals is estimated using NOAA data. Note that actual precipitation received at a specific location within a grid area does not influence coverage.

RightRisk Analytics
Tools and guides are available at no cost at the website https://RightRisk.org

Production intervals selected must be non-consecutive with no more than 70 percent of the resulting coverage in any one interval. For instance, where the April-May interval is selected, the next closest interval available would be June-July. Coverage levels range from 70-90 percent of the county base value. Producers can select a productivity factor of up to 150 percent of the county base value as well. This feature allows individuals to better-tailor coverage based on forage productivity and other factors. Indemnities are

ARA-20201013.201
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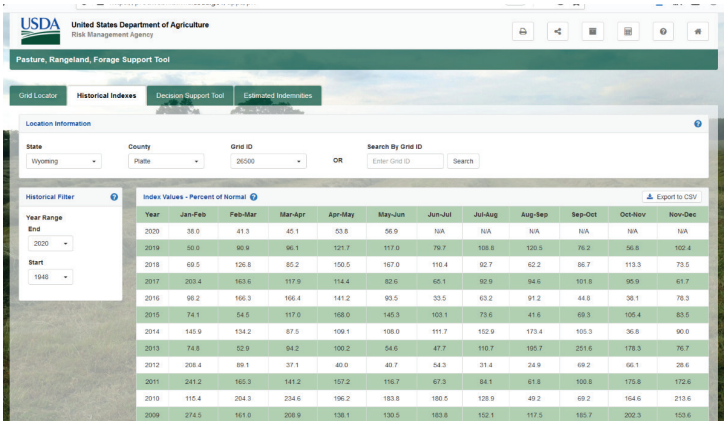
paid where the actual rainfall index falls below the insured coverage level.

Establishing RI-PRF Coverage

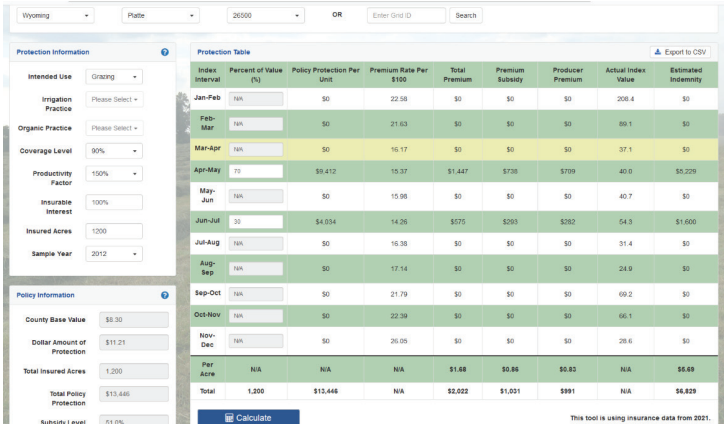
Several resources provided by the USDA - Risk Management Agency (RMA) can assist producers to explore RI-PRF coverage and determine how it may fit an individual operation. PRF support tools are found at: **prodwebnlb.rma.usda.gov/apps/prf#.** The tool is divided into four sections: Grid Locator, Historical Indexes, Decision Support Tool, and Estimated Indemnities.

Table 1. RI-PRF Historical Indexes for Grid ID 26500



The **Grid Locator** allows the user to identify locations and subsequent grid ID number on a map or to look up locations by coordinates. Once a grid number is identified, users can select the **Historical Index** tab to display index values for each year back to 1948, as well as for each interval period (Table 1). This offers historical trends for past precipitation and allows producers to compare their own historical data for similar time/interval periods.

Table 2. RI-PRF Protection Table for Grid ID 26500



The **Decision Support Tool** allows producers to select their protection intervals and desired level of coverage, keeping in mind that intervals cannot be consecutive and none may total more than 70 percent of the total value. The tool generates the estimated overall coverage along with producer premium costs, and allows comparison of different levels of coverage with that of previous years. These values are expressed as a percentage of normal; less than 100 equates to lower than average precipitation.

Ben's land falls in grid ID number 26500. Table 1 displays the historical index values back to 2009 for grid 26500. The interval periods where moisture is crucial to Ben's forage production are April-May and June-July (remember intervals cannot be consecutive). With the earlier spring moisture being most critical, Ben chooses the maximum coverage level for this interval, 70 percent, and the remaining 30 percent in the June-July interval.

Moving to the Decision Support Tool, Ben enters this interval selection and the tool generates a county base value of $8.30/acre, Table 2. Ben considers 2012 a dry year for comparison, so he enters 2012 for the sample year and maximum coverage (90 percent coverage level with a productivity factor of 150 percent). The resulting coverage

Table 3. Index Values for Grid #26500 (1948-2020)

Interval	April-May	June-July
Average Value	99	99
Maximum Value	232.3	225.1
Minimum Value	24.7	24.5

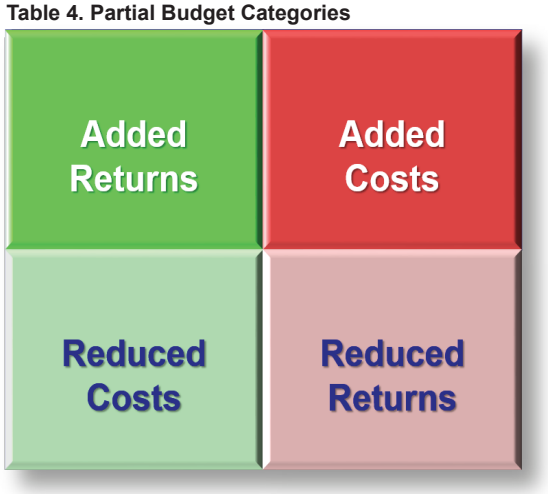
totals $13,446 or $11.21 per acre, with a premium cost of $991 or $0.83 per acre, including subsidies. Using 2012 data gives in an **Estimated Indemnity** of $6,829 (or $5.69/acre).

Further Analysis

Thus far, Ben knows he can purchase $13,446 in RI-PRF coverage for $0.83/acre. This seems like a reasonable cost to cover losses associated with decreased precipitation. The other questions Ben is puzzling over include: "How effective would this coverage be?" "What is the likelihood an indemnity might be paid?" and "What does the historical data suggest is the most likely outcome of purchasing this policy considering the cost over time?"

Normal partial budgeting analysis, accounting for revenues and expenses, may not adequately answer these questions. The *Risk Scenario Planning Tool* (RSP) from RightRisk.org allows decision makers to account for the inherent variability in the budgeting process. Mr. Burwell could use historical averages for indemnities in his budgeting, but wonders if this approach would be accurate given the assumptions he is using.

Table 4. Partial Budget Categories



RSP Tool Analysis

Mr. Burwell first accesses the RMA decision support tool to locate the data needed for the RSP analysis. He selects the Historical Indexes tab and downloads Index Value data (for grid #26500) to a spreadsheet. The high, low, and average index values are listed in Table 3. Ben next does the same under the Indemnities Tab, downloading indemnity data to his spreadsheet. Over the 72-year timespan, the total value of indemnities minus the premiums paid is $61,144, with the highest individual year of $6,627 and a value of -$991 for years with no indemnity received, only premiums paid.

Table 5. Risk Scenario Planning Tool with Burwell Partial Budget Ranch Data

RightRisk — Partial Budget For: RI-PRF Coverage for Burwell Ranch

Positive Effects				Negative Effects			
Added Returns	**Quantity**	**Value**	**Total**	**Added Costs**	**Quantity**	**Value**	
Grid ID: #26500 insurable value		$ 13,446.00	$ -	RI-PRF per acre premium, 90/150 coverage	1	$ 991.00	$ 991.00
April-May interval: index value	99		$ -				$ -
April-May interval: percent of value (%)	70		$ -				$ -
April-May interval: indemnity payment	0	$ 13,446.00	$ -				$ -
			$ -				$ -
			$ -				$ -
June-July interval: index value	99		$ -				$ -
June-July interval: percent of value (%)	30		$ -				$ -
June-July interval: indemnity payment	0	$ 13,446.00	$ -				$ -
			$ -				$ -
Total Added Returns			$ -	**Total Added Costs**			$ 991.00
Reduced Costs	**Quantity**	**Value**		**Reduced Returns**	**Quantity**	**Value**	
			$ -				$ -
			$ -				$ -
			$ -				$ -
			$ -				$ -
			$ -				$ -
			$ -				$ -
			$ -				$ -
			$ -				$ -
			$ -				$ -
			$ -				$ -
Total Reduced Costs			$ -	**Total Reduced Returns**			$ -

Total Positive Effects (Added Returns + Reduced Costs)	$ -	**Total Negative Effects** (Added Costs + Reduced Returns)	$ 991.00

Net Benefit of: RI-PRF Coverage for Burwell Ranch $ (991.00)

Risk Scenarios

Uncertain Value 1		Include	Uncertain Value 2		Include
Description	Cell		Description	Cell	
April-May Index value (1948-2017)	C8		June-July Index value (1948-2017)	C13	
Current Value (Most Likely)	99		Current Value (Most Likely)	99	
Minimum Value	24.7		Minimum Value	24.5	
Maximum Value	232.3		Maximum Value	225.1	

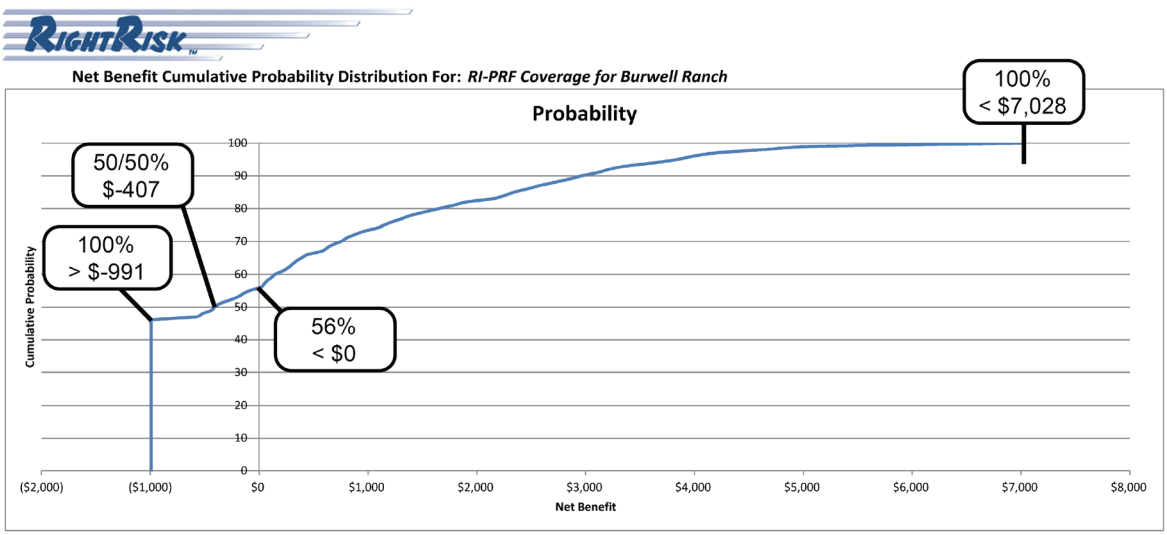
Run Graph

The RSP tool is setup as a typical partial budget with four categories: added returns, reduced costs, added costs, and reduced returns, Table 4. Under added costs, Ben enters the premium ($0.83/acre, or $991 total). The added returns for this scenario would result where an indemnity is paid. To reflect that in the RSP tool, Ben enters a formula (=IF(C8<90,(100-C8)/100*C9/100,0)) which calculates the indemnity payment only when the index value drops below the coverage level. He enters $13,446 for the insured value (both intervals) and the average index value (99), as well as the percent of value covered under each interval (70 and 30, respectively), Table 5.

Under the Risk Scenarios section of the tool, Ben records the uncertain variables as index values from each interval and checks the box to include them in the analysis. He enters the maximum, minimum, and most likely values for each interval calculated from the downloaded spreadsheet data (Table 3).

Clicking Run causes the RSP tool to simulate 1,000 possible outcomes to generate a probability graph showing a range of possible values (Table 6). Mr. Burwell learns from the analysis that the outcomes from purchasing an RI-PRF policy could range from $-991 (the premium with no indemnity) to a high of $7,028 ($8,019 indemnity minus $991 premium). He also notes that, given his estimates, the tool predicts that the policy will offer a positive payout about 44 percent of the time (56 percent chance of net returns below zero). With these results in hand, Ben feels much more comfortable purchasing the policy, realizing that receiving a check when precipitation levels are low will help to offset lower grazing forage production.

Table 6. Net Benefit Cumulative Probability Distribution for RI-PRF Coverage for Burwell Ranch.



Uncertain Value 1: April-May Index value (1948-2017)
Uncertain Value 2: June-July Index value (1948-2017)

** The Burwell operation is a case study example created to demonstrate RightRisk tools and their applications. No identification with actual persons living or deceased, places, or agricultural operation is intended nor should be inferred.*