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Pasture, Rangeland and Forage (PRF) Vegetation Index Insurance: A New Group Risk Plan Available in Wyoming

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Introduction:

Yield-based crop insurance programs include Multiple Peril Crop Insurance (MPCI) and Group Risk Plan (GRP) products. Under MPCI contracts, indemnity payments are triggered by low yields on an individual producer's insured acres. Under GRP contracts, indemnity payments are triggered by low yields in the area covered by the GRP contract in which the insured producer's operation is located (or by low values for proxy measures of yields such as rainfall, daily temperatures, or satellite measures of vegetation growth).

Multiple Peril Crop Insurance products are available to producers of alfalfa, alfalfa/grass and grass/alfalfa forage in all Wyoming counties. Beginning in the 2005 crop year, a GRP contract based on county-level net hay production was offered to provide protection against pasture and rangeland forage production loss in some eastern and central Wyoming counties. However, this contract was discontinued at the end of the 2008 production year and was replaced by a new Pasture, Rangeland, and Forage (PRF) Vegetation Index Insurance product in 2009.

The PRF Vegetation Index insurance product was offered in all Wyoming counties for the 2009 crop year and will be available in those counties for the 2010 crop year. The new product may be used by farm and ranch operators to cover losses of

grazingland production, or hayland production, or both. The sign-up date for the PRF Vegetation Index insurance product is November 30.

The PRF Vegetation Index insurance product allows producers to obtain indemnities when widespread reductions in pasture or forage production occur in a designated area called a *grid*. The insurance program is primarily intended for use by producers whose forage production (feed for livestock comprised of plants grown for haying or grazing) tends to follow the average growth patterns of the *grid*, a 4.8-mile by 4.8-mile area in which the producer's grazingland or hayland is located.

The Vegetation Index:

A vegetation index serves as proxy or indicator variable for pasture, range and hay production. The vegetation index employed is the called the Normalized Difference Vegetation Index commonly referenced as the NDVI. The NDVI is a temperature-constrained index. It is calculated using satellite data on plant greenness from the U. S. Geological Survey Earth Resources Observation and Science data center and grid specific daily temperature data collected by the National Oceanic and Atmospheric Administration.

The NDVI has to be computed by combining these two types of information because, in many ecological environments, some vegetation can remain green in very cold or very hot weather and not grow. This is especially an issue for pasture and rangeland species with thick canopies that prevent light from fully penetrating and reflecting back from all leaf surfaces. Thus, corrections for daily temperatures are made in computing final NDVI values. Mathematically the NDVI Index is given more weight when temperatures are close to the optimum for plant growth in a region and discounted when temperatures deviate from that optimum temperature. Optimum plant growth temperatures differ by grid, reflecting elevation differences between grids in a state.

Operational Procedures for PRF Vegetation Index Insurance:

First, a producer selects a “point of reference” identified by longitude and latitude that best represents the location of the forage acreage the producer wants to insure. This reference point determines the **GRID ID** for the grid whose NDVI forms the basis for the insurance the producer will purchase.¹ Historical data on the values of the NDVI for the **grid** is available to the producer and the producer’s insurance agent for each three month period or quarter from 1989 to the current year.² A specific code associated with each grid is contained in the actuarial documents for this insurance program. This information can be used by a producer to see how often a specific NDVI contract would have provided an indemnity payment over that period and what the size of the indemnity payment would have been.

The **crops** to which the PRF Vegetation Index program is applicable are defined as pasture, rangeland or forage. Two **crop types** are identified: **grazingland** and **hayland**. Grazingland is an area of forage established on land suitable and intended for grazing by livestock. Hayland is an established area of hay on land suitable and intend for haying.

The PRF Vegetation Index program can be used to insure against reductions in grazingland or hayland forage production. If the NDVI is sufficiently low relative to its average (or normal value), a producer will receive an indemnity. The NDVI for each grid is normalized so that an index value of 100 always represents the average value for the grid NDVI.

A producer does not have to insure all of the acreage of grazingland or hayland in a grid that is eligible for insurance. A producer chooses the acres to be insured. In addition, some acreage in the operation’s area of range land may be too steeply sloped, too far from water, or possess other characteristics that preclude livestock from grazing there. Such acreage is considered uninsurable by RMA and will not be insured. For similar reasons, some acres in an operation’s hayland area may not be considered suitable for being mechanically harvested as hay. RMA also considers those acres to be uninsurable.

The **crop year** for PRF insurance begins on April 1 and ends on March 31 of the following calendar year. The crop year is divided into four quarterly periods that are described as **index intervals**. These intervals are defined as follows:

- Interval I:** April 1 through June 30;
- Interval II:** July I through Sept. 30;
- Interval III:** Oct. 1 through Dec. 31;
- Interval IV:** Jan. 1 through March 31.

For insurable acreage in a particular grid, a producer must select the interval(s) for insuring production. Some forage production has a mixture of plant species maturing at different times of the year. For instance, there may be early season grasses within an insurable grazingland parcel. If a Wyoming producer desires to insure against loss of forage, the producer must decide when there could be a decline in forage production. For example, no fall or winter precipitation could lead to low production of early season grasses in Interval I, April I through June 30. So a proportion of the rangeland parcel might be insured in Interval I. Similar analyses of other variables that affect forage production might lead a producer to insure against loss of late season range production in Interval III, October 1 through December 31.

If an area of rangeland in a particular grid has, say, 1,280 acres that are eligible for insurance, then no more than that number of total acres can be insured. However, those acres could be insured in different intervals; for example, a producer could insure 480 acres of forage with early season grasses in Interval I (April 1 through June 30) and 800 acres of other forage in Interval III (October 1 through December 31).

Basic PRF Vegetation Insurance Terms:

Several variables affect how much insurance coverage may be purchased for a particular area of a crop type in a specified grid. These variables, which are defined by RMA in the insurance policy, are as follows:

¹ A producer with a contiguous area of pasture or rangeland that spans two adjacent grids (A ad B) has the option of either insuring all of the area’s acres using either the NDVI for grid A or the NDVI for grid B. Alternatively, the producer can insure the acres in grid A using grid A’s NDVI and the acres in grid B using grid B’s NDVI. A producer that has two (or more) separate areas of pasture or rangeland can insure each separate area in the grid (or grids) in which that area is located.

² Historical data on NDVI values for all grids can be obtained from RMA at the following URL: <http://prfvi-rma.tamu.edu/run.epl>. Producers simply use drop down lists to identify their state, then their county, and then their grid.

Coverage Level – The *coverage level* is the percentage of the county base value selected by a producer for insurance coverage. A producer can choose a coverage level of 70, 75, 80, 85, or 90 percent of the county base value for the crop type being insured. Producers are required to insure *all grids* in a county at the same coverage level.

Productivity Factor – The *productivity factor* is a factor between 60 and 150 percent that a producer selects to reflect their operation’s forage productivity. Producers often select coverage levels and productivity factors to reflect the forage production value on the acreage they are insuring. For instance, if the producer realizes that his value of production is similar to the county base value, the producer may select a coverage value /productivity factor combination to provide a level of protection similar to the county base value for the crop type that is being insured.

Producer Share – The *producer share* is the operator’s share of forage production on the insured acreage. If a producer is an owner/operator, their share is likely to be 100 percent. But if a producer hays acreage on a 50/50 crop share basis, their share is 50 percent.

Dollar Value – The *dollar amount* of protection per acre is equal to the county base value per acre for the crop type times the coverage level selected times the productivity factor selected. The dollar amount of protection per acre for each crop type is the same for all insured acres.

Policy Protection per Unit – The *policy protection* per unit is the dollar amount of protection per acre multiplied by the insured acres and the producer’s share of the unit. Each grid has from one to four units, reflecting the number of index intervals in which insurance is purchased.

Policy Protection – *Policy Protection* is the sum of the policy protection per unit for all insured units.

To summarize, the above variables are involved in calculating the level of protection provided to a producer by a PFR Vegetation Index policy. The *county base value* is determined by RMA. The values of the variables used to calculate the *dollar value* of protection per acre (the *coverage level* and the *productivity factor*) are chosen by the producer. The *policy protection per unit* equals the per acre *dollar value* multiplied by the *acres to be insured* in the unit (chosen by the producer) and the *producer share* (determined by the contractual arrangements between the producer and landowner).

The PFR Vegetation Index policy utilizes the NDVI Index at the grid level in several ways to determine indemnity payments. The following variables are based on the NDVI for each grid.

Expected Grid Index – The *expected grid index* is determined by the Federal Crop Insurance Corporation based on the mean (average) accumulated NDVI values by index interval calculated using the NDVI gridded data, corrected for temperature, normalized and expressed in a percentage. The expected value for a grid is therefore always equal to 100 or 100 percent. The *expected grid index* value is known prior to the November 30 sales closing date for this insurance product.

Final Grid Index – The *final grid index* value is determined by the Federal Crop Insurance Corporation based on the current NDVI values of each grid ID and index interval during the crop year. The *final grid index* value is expressed as a percentage.

An index value with a value that exceeds 100 indicates that the NDVI for the grid has an above average value. An index value of less below 100 indicates that the NDVI for the grid has a below average value. The *final grid index* value for each index interval is published after the close of that index interval.

Premium Calculations:

Premium calculations for a PRF Vegetation Index Insurance contract are similar to those of other group risk insurance products. The *premium rate* is quoted as a dollar amount per \$100 of insurance liability (the maximum indemnity payment under the provisions of the contract which equals the *dollar protection per acre* chosen by the producer). The *premium rate* is multiplied by an *adjustment factor* of 0.01 to express the premium rate on a per dollar of protection basis.

Premium subsidy rates are similar those for other group risk products and subsidy rates decrease as coverage levels increase (Table 1).

Table 1: Premium Subsidy Rates for Group Risk Insurance Products

Coverage Level (%)	Subsidy Rate (%)	Administrative Fee (per contract)
70	59	\$30
75	59	\$30
80	55	\$30
85	55	\$30
90	51	\$30

Premiums for PRF Vegetation Index Insurance contracts are calculated as follows:

$$\text{Total Premium per Unit} = \text{Dollar Protection per Acre} \times \text{Insured Acres/Unit} \times \text{Premium Rate per } \$100 \text{ insurance} \times \text{Adjustment Factor (0.01)} \times \text{Producer Share.}$$

$$\text{Premium Subsidy per Unit} = \text{Total Premium per Unit} \times \text{Subsidy rate.}$$

$$\text{Producer Premium per Unit} = \text{Total Premium per Unit} - \text{Premium subsidy per unit}$$

PRF Vegetation Index Insurance Indemnities:

Indemnities are paid to a producer when NDVI *final grid index* falls below the trigger grid index established by the producer.

Trigger Grid Index = Expected Grid Index x Coverage Level

Payment Calculation Factor = (Trigger Grid Index – Final Grid Index)/(Trigger Grid Index).

Based on these two variables, an indemnity per unit can be calculated.

Indemnity per unit = Policy Protection per Unit x Payment

Calculation Factor.

An insurance payment (indemnity) is due if the **Final Grid Index** is less than the **Trigger Grid Index**.

If an insured producer wants a relatively high Trigger Grid Index, the producer would choose a higher coverage level.

As the Final Grid Index values are calculated soon after the close of each index interval, insurance payments can be made in a timely manner.

A Wyoming Example:

A rancher has six sections (3,840 acres) of rangeland and 320 acres of irrigated grass/alfalfa hay in Fremont County, Wyoming. The rancher wants to insure

grazingland production and hayland production for 2009. He manages range and hayland production to sustain his cow-calf enterprise and does not lease range to others or sell hay in cash markets. Therefore, AGR-Lite, a whole-farm revenue insurance product, will not be an effective risk management tool for his operation. The rancher could use APH-based forage production insurance to cover hayland production risks. However, only PRF Vegetation Index Insurance can be used to address the risks of low forage production on the ranch’s grazingland. So the rancher decides to use PRF Vegetation Index Insurance to manage the production risks associated with both his range and grass/alfalfa hay production.

First consider the rancher’s rangeland insurance decision. His contract choices and the RMA determined parameters for rangeland insurance in Fremont county and the applicable grid are described in Table 2. Applying the parameters specified by RMA, and the producer’s productivity factor choice (110%) and coverage level choice (90%), he insures his rangeland forage for a policy amount of protection of \$ 33,139 (the maximum indemnity he would receive if the NDVI took on a value of zero). His out-of-pocket premium cost for this protection is \$3,653 plus a \$30 administrative fee.

Now consider the producer’s insurance decisions with respect to his 320 acres of irrigated grass/alfalfa hay. His contract choices and the RMA determined parameters for hayland insurance in Fremont county and the applicable grid are described in Table 3. He again chooses a coverage level of 90% and a production factor of 110%.

Table 2: Insuring Rangeland in Fremont County

Contract Data	Specification or Calculation	Value
County Base Value	Specified by RMA	\$ 8.72/acre
Production Factor	Producer selects a value from 60% to 150 % of the county base value to reflect the relative productivity of his rangeland	110 %
Coverage Level	Producer selects from alternatives of 70, 75, 80, 85, or 90 %	90 %
Dollar Amount per Acre	\$8.72/acre x 1.10 x 0.90	\$ 8.63/acre
Grid ID: 59854 Interval I Interval II Interval III Interval IV	A point of reference is used to determine the longitude and latitude of the sections being grazed to specify the producer’s grid ID. The rancher specifies acres by interval.	The range is early season, so all 3,840 acres are in interval I.
Premium Rate	Specified by RMA	\$22.50 per \$100 of protection or \$0.225 per dollar of protection
Unit Protection	\$8.63/acre x 3,840 acres x 100% share	\$ 33, 139
Policy Protection	Sum protection across all units (1 unit in this case)	\$ 33, 139
Total Premium	\$33,139 x 0.2250	\$ 7,456
Premium Subsidy	\$7,456 x 0.51	\$ 3,803
Producer Premium	\$7,456 – 3,803	\$ 3,653 (plus \$30)
Expected Grid Index Value: Interval I	Specified by RMA	100
Trigger Index	100 x 0.90	90

Table 3: Insuring Hayland in Fremont County

Contract Data	Specification or Calculation	Value
County Base Value	Specified by RMA	\$ 197.65/acre
Production Factor	Producer selects a value from 60 to 150 % to reflect the relative productivity of his rangeland	110 %
Coverage Level	Producer selects from alternatives of 70, 75, 80, 85, or 90 %	90 %
Dollar Amount per Acre	\$ 197.65/acre x 1.10 x 0.90	\$ 195.67./acre
Grid ID: 59854 Interval I Interval II Interval III Interval IV	A point of reference is used to determine the longitude and latitude of the 320 acres of hayland to specify the grid ID. The rancher specifies acres by interval.	The hayland is usually harvested twice between July 1 and September 30, so all 320 acres of hay is in Interval 2.
Premium Rate	Specified by RMA	\$7.00 per \$100 of protection or \$0.07 per dollar of protection
Unit Protection	\$ 195.67/acre x 320 acres x 100% share	\$ 62,614
Policy Protection	Sum protection across all units (1 unit in this case)	\$ 62,614
Total Premium	\$ 62,614 x 0.0700	\$ 4,383
Premium Subsidy	\$ 4,383 x 0.51	\$ 2,235
Producer Premium	\$ 4,383 – 2,235	\$ 2,148 (plus \$30)
Expected Grid Index Interval I	Specified by RMA	100
Trigger Index	100 x 0.90	90

Wyoming weather conditions in the fall of 2008 are hot and dry. Little snow pack accumulates in the winter and spring rains in 2009 are sparse. As a result, the Final Grid Index value for Interval I, the interval for which rangeland forage is insured, is 70. This value is less than the trigger index value of 90 chosen by the producer. So an indemnity will be paid on the rangeland forage insurance contract. There is also minimal stream flow and irrigation in 2009 is limited. The Final Grid

Index for Interval II, the interval for which hay production is insured, is therefore 65, also lower than the trigger index value of 90 chosen by the producer for the hayland insurance contract. So an indemnity will also be paid on the hayland insurance contract

The producer's rangeland indemnity is calculated as follows:

Rangeland Indemnity = Policy Protection per Unit x Payment Calculation Factor

$$= \$33,139 \times [(90 - 70)/(90)]$$

$$= \$33,139 \times 0.222$$

$$= \$ 7,363.$$

The producer's hayland indemnity is:

Hayland Indemnity:

$$= \$62,614 \times [(90 - 65)/(90)]$$

$$= \$62,614 \times 0.2777$$

$$= \$17,388.$$

Summary:

PRF Vegetation Index Insurance is now available in all Wyoming counties. It is the only multiple peril crop insurance available in the state for managing rangeland production risks.

PRF insurance is also available to address hayland production risks in all Wyoming counties for both nonirrigated and irrigated practices. Some producers may wish to compare PRF Vegetation Index insurance, a group risk plan, with the APH-based forage production insurance that is also available to Wyoming producers of alfalfa, alfalfa/grass, and grass/alfalfa hay production to determine which best addresses their production risk.



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