



# BRIEFING

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## Pasture, Rangeland and Forage (PRF) Rainfall Index Insurance: A New Group Risk Plan Available in Montana

Vincent H. Smith, James B. Johnson, & John P. Hewlett

Agricultural Marketing Policy Center  
Linfield Hall  
P.O. Box 172800  
Montana State University  
Bozeman, MT 59717-2920  
Tel: (406) 994-3511  
Fax: (406) 994-4838  
email: [ampc@montana.edu](mailto:ampc@montana.edu)  
Web site: [www.ampc.montana.edu](http://www.ampc.montana.edu)

*Contact:*

**Vincent H. Smith**  
[vsmith@montana.edu](mailto:vsmith@montana.edu)  
406-994-5615

**James B. Johnson**  
[jamesjohnson@montana.edu](mailto:jamesjohnson@montana.edu)  
406-994-5606

**John P. Hewlett**  
*University of Wyoming*  
[Hewlett@uwyo.edu](mailto:Hewlett@uwyo.edu)

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### Introduction:

Yield-based crop insurance programs include Multiple Peril Crop Insurance (MPCI)<sup>1</sup> and Group Risk Plan (GRP) products. Under MPCI contracts, indemnity payments are triggered by low yields on 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).

MPCI products are available to producers of alfalfa, alfalfa/grass and grass/alfalfa forage in all Montana 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 eastern and central Montana counties. However, this contract was discontinued at the end of the 2008 production year and, in 2009, a new Pasture, Rangeland, and Forage (PRF) Rainfall Index Insurance product will be offered in all Montana counties. The new product may be used by farm and ranch operators to cover losses of

grazingland production, or hayland production, or both.

The PRF Rainfall Index insurance product allows producers to obtain indemnities when rainfall is below average, resulting in widespread reductions in pasture or forage production in a designated area called a *grid*. The GRP insurance product is primarily intended for use by producers whose forage production (feed for livestock comprised of plants grown for haying or grazing) is closely linked to rainfall, as measured by a rainfall index, for a *grid*. Each grid is area of approximately 12 miles by 12 miles in which the producer's grazingland or hayland is located.

### Rainfall Indexes:

A rainfall index serves as a proxy or indicator variable for pasture, range and hay production in a specific area. The rainfall indexes employed in the PRF Rainfall Index program are based on data collected and maintained by the United States National Oceanographic and Atmospheric Administration (NOAA). For each grid, precipitation amounts are gathered on a daily basis from multiple nearby weather stations

<sup>1</sup> In this briefing paper, the term MPCI refers to the original class of insurance products offered by RMA that provide insured producers with indemnities when their yields fall below the yield guarantees (often called trigger yields) they establish for an insured crop by selecting a coverage level for their Actual Production History proven yields. The per acre indemnity received by a producer is equal to the difference between the crop's yield guarantee and the yield the producer obtains for the insured crop multiplied by the producer's elected price level.

(which may be located in or adjacent to the grid of interest). Data from multiple weather stations are interpolated by NOAA to obtain daily precipitation estimates for each grid. These data, reported in the *Unified Rain Gauge Dataset* (URD), have been collected by NOAA since 1948. Each observation, a composite value for a specific grid that cannot be traced to a single point (weather station), is subject to a series of validation checks before being included in the data set.

These data are used to establish six rainfall indexes for each grid, one index for each of six two-month intervals in a twelve month period. These periods are called *index intervals*. The six index intervals for counties in Montana are:

<b>Index Interval I</b>	February 1 – March 31
<b>Index Interval II</b>	April 1 – May 31
<b>Index Interval III</b>	June 1 – July 31
<b>Index Interval IV</b>	August 1 – September 30
<b>Index Interval V</b>	October 1 – November 30
<b>Index Interval VI</b>	December 1 – January 31

The index for each grid in each interval is constructed by first calculating the expected average precipitation for the grid during that interval using historical data in the URD. The index value for a given interval in a given year is the ratio of actual precipitation to the expected average or normal precipitation for the grid in that interval, expressed as a percentage.

Plots of index values are presented (Figure 1) for Index Interval I

(February 1 – March 31) and Index Interval III (June 1- July 31) for a representative grid (grid number 15226) in Roosevelt County for the period 1948 to 2008. In the same year, values for one interval index may be very different than for another index. For example, in 2006, the index value for Interval I was 134.5 but the index value for Interval III was 63.<sup>2</sup> A producer who insured some acres of rangeland or hayland under the PRF Rainfall Index program in Interval III would have received an indemnity for production losses on those acres. However, if the producer had insured other acres in Interval I, those acres would be viewed as not having experienced a production loss that would be eligible for an indemnity.

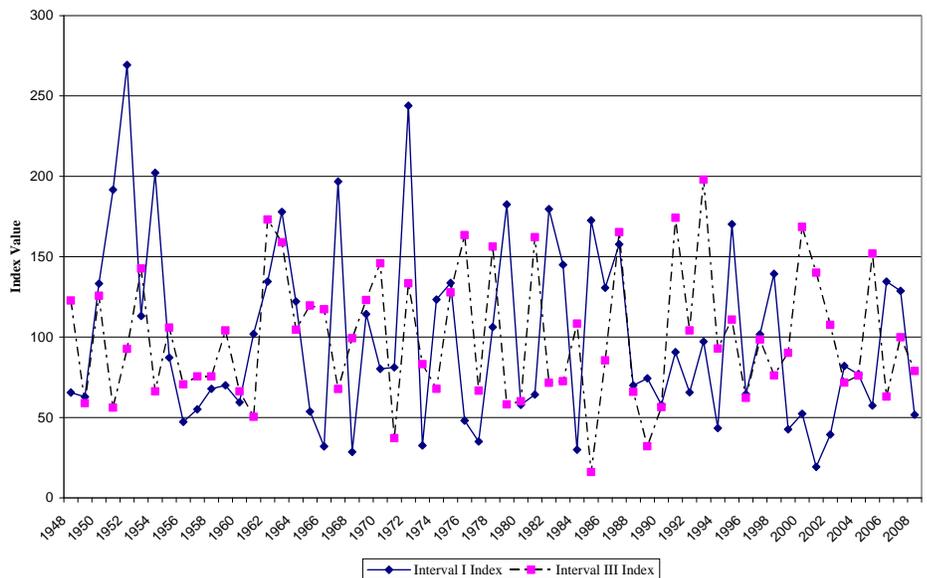
**Operational Procedures for PRF Rainfall Index Insurance:**

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 rainfall index forms the basis for the insurance the producer will purchase.<sup>3</sup> A specific code associated with each grid is contained in the actuarial documents for this insurance program. Historical data on the values of the rainfall indexes for the *grid* are available to the producer and the producer’s insurance agent for each two month index interval from 1948 to the current year.<sup>4</sup> This information can be used by a producer to see how often a specific rainfall index 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 Rainfall Index program is applicable are defined as *pasture, rangeland* or *forage*. Two *crop types* are identified: grazingland and hayland.

**Figure 1: Index Values for Intervals I and III in Grid 15226 in Roosevelt, County, MT: 1948-2008**



<sup>2</sup> The formula for the value for an interval rainfall index in a given year is as follows: index = (current precipitation/average precipitation) x 100.

<sup>3</sup> A producer with a contiguous area of pasture or rangeland that spans two adjacent grids (A and B) has the option of either insuring all of the area’s acres using the rainfall indexes for grid A, or the rainfall indexes for grid B. Alternatively, the producer can insure the acres in grid A using grid A’s rainfall indexes and the acres in grid B using grid B’s rainfall indexes. 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.

<sup>4</sup> Historical data on rainfall index values for all grids can be obtained from RMA at the following URL: <http://prfri-rma.tamu.edu>. Producers use drop down lists to identify their state, then their county, and then their grid.

**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 intended for haying.

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

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 a ranch operation's area of rangeland may be too steeply sloped, too far from water, or has other characteristics that physically preclude livestock from grazing there. Such acreage is considered uninsurable by RMA and will not be insured. For similar reasons, some acres in a ranch operation's hayland area may not be considered suitable for being mechanically harvested as hay. These acres are also considered to be uninsurable by RMA.

In Montana, the **crop year** for PRF Rainfall Index insurance begins on February 1 and ends on January 31 of the following calendar year. The crop year is divided into six two-month intervals called **index intervals**, as discussed above.

Under the PRF Rainfall Index program, a producer cannot insure more than 70 percent of the ranch operation's eligible acres for a specific crop type (grazingland or hayland) in any one interval. Thus a producer must select at least two intervals to insure all eligible acres in a county. In addition, a producer must insure a minimum of 10 percent of the eligible acres in each interval they select. For example, a producer could insure 70 percent of the

eligible rangeland acres in Interval I, 20 percent in Interval II, and 10 percent in interval III. The producer could not insure 75 percent of the eligible rangeland acres in Interval I, 20 percent in Interval II, and 5 percent in Interval III because too many acres would be allocated to Interval I and too few acres would be allocated to Interval III.

For grazingland or hayland acreage in a particular grid, a producer must select the intervals 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 Montana producer wants to insure against loss of forage, the producer must decide when there could be a decline in forage production. For example, limited precipitation in Interval VI (December 1 – January 31) could lead to low production of spring season grasses in the next crop year. So a proportion of the rangeland parcel might be insured in Interval VI. Concerns about rainfall variability in late summer and the need for forage prior to weaning calves could lead a producer to insure against loss of range production in Interval IV (August 1 to September 30).

If an area of rangeland in a particular grid has, say, 1,200 acres that are eligible for insurance, then no more than that number of total acres can be insured. However, those acres must be insured in at least two different intervals; for example, a producer could choose to insure 720 acres (60 percent of total acres) in Interval I (February 1 through March 31) and 480 acres (40 percent of total acres) in Interval III (June 1 through July 31).

#### **Basic PRF Rainfall Insurance Terms:**

Several variables affect how much insurance coverage may be purchased for a particular parcel of a crop type in a specified grid. These variables, which have specific definitions, are as follows:

**County Base Value** – The **county base value** is the dollar value of an acre of

grazingland or hayland forage production in a county. County base values for grazingland and hayland are different. For example, in Roosevelt County, the 2009 county base value for grazingland is \$7.92 per acre and the 2009 county base value for hayland is \$146.98 per acre.

**Coverage Level** – The **coverage level** is the percentage of the county base value a producer selects for insurance coverage on forage production. 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 combination of coverage level and productivity factor values 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, his share is likely to be 100 percent. But if a producer hays acreage on a 50/50 crop share basis, his 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 multiplied by the coverage level and productivity factor selected by the producer.

The dollar amount of protection per acre for each crop type is the same for all acres in a county.

**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. A unit consists of the insured acres in a grid. A rancher with insured acres in two different grids has two insured units.

**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 Rainfall 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 *dollar value* multiplied by the *acres to be insured* (chosen by the producer) and the *producer share* (determined by the contractual arrangements between the producer and landowner).

PFR Rainfall Index insurance utilizes rainfall indexes at the grid level in several ways to determine indemnity payments. The following variables are based on the rainfall indexes for each grid.

**Expected Grid Index** – The *expected grid index* is determined by the Federal Crop Insurance Corporation based on the precipitation data provided by NOAA, as discussed above. The expected value for a grid is therefore always equal to 100 or 100 percent and 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 rainfall index values for 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 rainfall index for the grid has an above average value. An index value of less than 100 indicates that the rainfall index 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 Rainfall 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

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

levels increase (Table 1).

**Table 1: Premium Subsidy Rates for Group Risk Insurance Products**

Premiums for PRF Rainfall 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 Rainfall Index Insurance Indemnities:**

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

$$\text{Trigger Grid Index} = \text{Expected Grid Index} \times \text{Coverage Level}$$

If an insured producer wants a relatively high Trigger Grid Index, they will choose a relatively high coverage level.

The amount of the indemnity is determined by a *payment calculation factor*, defined as:

$$\text{Payment Calculation Factor} = (\text{Trigger Grid Index} - \text{Final Grid Index}) / (\text{Trigger Grid Index}).$$

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

$$\text{Indemnity per unit} = \text{Policy Protection per Unit} \times \text{Payment Calculation Factor.}$$

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

**A Montana Example:**

A rancher has 3,840 acres (six sections) of rangeland and 320 acres of irrigated grass/alfalfa hay in Roosevelt County, Montana. 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 Rainfall 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 Rainfall Index Insurance to manage the production risks associated with both his range and grass/alfalfa hay production. He needs forage in April, May, June, and July, and so chooses to insure 50 percent of his rangeland in Interval I (February 1 – March 31)

and 50 percent in Interval II (April 1 – May 31).

First consider the ranch manager's rangeland insurance decision. His contract choices and the RMA-determined parameters for rangeland insurance in Roosevelt County and the applicable grid are described below (Table 2). Applying the parameters specified by RMA, and the producer's productivity factor choice (110 percent) and coverage level choice (90 percent), he insures his rangeland forage for a policy amount of protection of \$30,196 (the maximum indemnity he would receive if the rainfall indexes took on values of zero in both Interval I and

Interval II). 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 Roosevelt County and the applicable grid are described below (Table 3). He again chooses a coverage level of 90 percent and a production factor of 110 percent, and also insures 50 percent of his hayland in Interval I and 50 percent in Interval II.

Montana weather conditions in the early spring are dry but precipitation in late spring is above average. As a result, the Final Grid Index values for the intervals for which rangeland forage is insured are as follows:

Interval I Index Value = 60  
Interval II Index Value = 125

The **Final Grid Index Value** of 60 for Interval I is less than the **Trigger Index** value of 90 chosen by the producer for both the rangeland and hayland contracts. So an indemnity will be paid on the rangeland and hayland insurance contracts for that interval. The Final Grid Index of 125 for Interval II is larger than the trigger index value of 90. So no indemnity will be paid for that interval on either the rangeland or hayland contracts.

The producer's rangeland indemnity for Interval I is calculated as follows:

**Rangeland Indemnity = Policy Protection for Interval I x Payment Calculation Factor For Interval I**

= [1,920 acres x \$7.92] x [(90 – 60)/(90)]

= \$15,053 x 0.333

= \$5,018

**Table 2: Insuring Hayland in Roosevelt County**

Contract Data	Specification or Calculation	Value
County Base Value	Specified by RMA	\$ 146.98/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	\$ 146.98/acre x 1.10 x 0.90	\$ 144.54/acre
Grid ID: 59854 Interval I Interval II Interval III Interval IV Interval V Interval VI	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 June 1 and August 31, so 50% of the 360 hayland acres is harvested insured in Interval I and 50% is insured in Interval II
Premium Rate	Specified by RMA	<u>Interval I:</u> \$22.40 per \$100 of protection or \$0.224 per dollar of protection <u>Interval II:</u> \$18.10 per \$100 of protection or \$0.181 per dollar of protection
Unit Protection	\$ 144.54/acre x 320 acres x 100% share = \$ 46,253	<u>Interval I:</u> 50% of \$46,253 = \$23,176.5 <u>Interval II:</u> 50% of \$46,253 = \$23,176.5
Policy Protection	Sum protection across all units (1 unit in this case)	\$ 46,253
Total Premium	<u>Interval I:</u> \$23,176.5 x 0.224 <u>Interval II:</u> \$23,176.5 x 0.181 <b>Total</b>	\$ 5,192 \$ 4,195 \$ 9,387
Premium Subsidy	\$ 9,387 x 0.51	\$ 4,787
Producer Premium	\$ 9,387 – \$4,787	\$ 4,600 (plus \$30)
Expected Grid Index Interval I	Specified by RMA	100
Trigger Index	100 x 0.90	90

The producer's hayland indemnity for Interval I is:

**Hayland Indemnity = Policy Protection for Interval I x Payment Calculation Factor For Interval I**

$$= \$46,253 \times [(90 - 60)/(90)] = \$46,253 \times 0.333$$

$$= \mathbf{\$15,835.}$$

**Summary:**

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

**Table 3: Insuring Hayland in Roosevelt County**

Contract Data	Specification or Calculation	Value
County Base Value	Specified by RMA	\$ 146.98/acre
Production Factor	Producer selects a value from 60 to 150 % to reflect the relative productivity of his rangeland	110 %
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Premium Subsidy	\$ 9,387 x 0.51	\$ 4,787
Producer Premium	\$ 9,387 - \$4,787	\$ 4,600 (plus \$30)
Expected Grid Index Interval I	Specified by RMA	100
Trigger Index	100 x 0.90	90



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