PRINCIPAL PROJECTS

1. Management
   a. Perennial-type ranges
   b. Bitterbrush
      Result--Bitterbrush in California, 1943, Res. Note #34.
         Coop project Calif. Fish & Game, Browse revegetation

Remaining to round-out management projects:
   a. Perennial-type ranges
      1) Complete pilot test of rest-rotation grazing at Harvey Valley
         according to original plan.
      2) Complete studies on methods of appraising results under rest-
         rotation grazing.
         Trend: (1) vegetation composition and range condition
                (2) grazing capacity
                (3) livestock production
   b. Bitterbrush
      Complete studies on growth, reproduction, and formulate management
      principles.

2. Extension of management results--cooperation national forest administration.
   a. Explain rest-rotation management to top Forest Service personnel first--
      both research and administration--in W. O., Regions (ARF's and above),
      Director and Assistant Director PSW Station. Time required 2 days
      but can be handled in 1 if necessary.
   b. Train men in Regions--ARF's and below in groups of about 50. Time 8
      days per group.
   c. Train BLM and other interested people.

June 2, 1964
A. L. Hornay
STUDY PLAN
For
Evaluation of the Harvey Valley Allotment
Since 1952

The Problem:

The 1956 study plan for the study of rest-rotation grazing management set forth the purpose of the study and the main comparisons to be made. The purpose as stated was "to test the effectiveness of the Burgess Spring grazing plan (rest-rotation grazing) on a practical scale". Results from the test, both vegetation and cattle, were to be compared to results obtained under "conventional season-long grazing" on the Poison Lake Allotment. These comparisons have not been possible due to several factors:

1. Virtually none of the planned work on the Poison Lake Allotment was started and none was carried on a continuing basis.

2. Although studies were started on Harvey Valley to find the trend in range condition, the method first proposed for the study was changed in 1956.

3. The planned study of herbage yield and utilization has not been followed in a consistent manner.

4. Only a very limited amount of study has been done on seedling establishment, seed production and phenology of herbaceous species.

1/ The 1956 plan is attached to this plan.
5. Assessment of the value of the management system at Harvey Valley has been made difficult because of improvement of part of the allotment by cultural methods. Cultural improvement was an integral part of this demonstration as originally planned. Thus it is very difficult to know what portion of the effects on, either vegetation or cattle, are due to the grazing system and what part due to the cultural improvement.

6. Livestock records have been taken about as planned. However, in 1963 the season of use and livestock plan of grazing were changed in accordance with a plan submitted by the permittee on January 24, 1963 at a meeting in Chico.

Still, there is widespread interest in knowing what has transpired at Harvey Valley despite the shortcomings mentioned above. Range deterioration is still a major problem on mountain summer ranges in northeastern California much as it was when this study was started in 1952. The system of grazing, called rest-rotation grazing, developed at the Burgess Springs Experimental Range provided a way to restore run-down ranges to levels near maximum livestock production capacities.

The purpose of the demonstration of rest-rotation on Harvey Valley allotment is to find whether, on a practical scale, rest-rotation management (in conjunction with cultural range improvement practices) would produce an improvement in range health and better animal responses

---

2/ This livestock plan is attached to this study plan.

3/ Located in the present Harvey Valley Allotment, Lassen National Forest.
over a period of 20 years. After 10 years an appraisal of the
situation indicates that we have much to do to find out how well
rest-rotation management as applied at Harvey Valley is doing the
job for which it was designed.

Major Objectives and Scope of Evaluation:

The problem solution at this stage requires a three pronged
attack on three rather distinct phases. We should determine what
has happened in the past 10 years at Harvey Valley, make a present-
time comparison to nearby allotments and provide for a future evaluation
of Harvey Valley and nearby allotments. Objectives may be listed
as questions by these three phases:

Phase 1 - How much improvement in range condition and increase
in livestock production has taken place since rest-rotation
grazing was applied at Harvey Valley (from 1952 thru 1963)?

Phase 2 - What is the present (1964) status of range condition
in Harvey Valley relative to that on nearby allotments under
season-long management?

Phase 3 - At a future evaluation date (e.g. 1974), what change
in range condition and in livestock production has taken place
since 1964 on Harvey Valley relative to that on nearby allotments
still under season-long management?

These major objectives will be answered by finding answers to
many specific questions which are considered in detail in later

4/ Much of phase 1 details are taken directly from the 1956 study plan.
sections of this plan. At that time methodology needed to answer each specific question will be discussed.

**Implications of Findings:**

Under no conditions is this evaluation meant to be an evaluation of the general system of management called rest-rotation grazing. It is an appraisal of conditions and trends of one allotment (Harvey Valley) where a specific demonstration of rest-rotation is being tried. The results from this study may contribute facts to any overall appraisal of rest-rotation grazing, but this study is not intended to be an all-inclusive appraisal of the system itself.

**Responsibilities:**

The evaluation job is the responsibility of Jack M. Reppert and Raymond D. Ratliff and will require their full time efforts until 1966. In addition support from 3 to 4 summer field assistants (1963, 64 and 65) is required. Also many people skilled in soils work, laboratory analysis, data processing and statistical analysis will be needed at times.

**Schedule:**

1. **1963, 64 and 65.** Evaluate past data, establish comparable study plots, measure soils and vegetation on these plots, analyze data, weigh cattle and publish. A full-time job for the present bunchgrass project. Note the project budget for costs.

2. **1966-72.** Weigh cattle, check utilization on comparable plots and start small supporting studies. A ½ time job for present sized bunchgrass project.
3. **1974, 75.** Remeasure the comparable plots, analyze the data and publish. Nearly a full time task for the present sized bunchgrass project.

**Major Publication Plans:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Likely Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>1964</td>
</tr>
<tr>
<td>1965</td>
<td>1966</td>
</tr>
<tr>
<td>1976</td>
<td>1976</td>
</tr>
</tbody>
</table>


3. Range condition in Harvey Valley relative to nearby allotments: with considerations of trend within Harvey Valley. Unknown outlet.

4. Range condition and trend and livestock responses under rest-rotation management and season-long use.
STUDY PLAN

For

Phase 1

The trend in Range Condition and Livestock Production since Rest-Rotation Grazing was Started at Harvey Valley (1952-1963).

Purpose: To find out whether vegetation and livestock trends are up, down or constant on Harvey Valley.

Objectives: (1) To determine the trend in range condition since original records were obtained, (2) to compile and evaluate livestock gains, and (3) to discuss and evaluate the effects of the rest-rotation system on the patterns of grazing use on the Harvey Valley allotment. We will study (1) the trend in range condition as shown by remeasurements of permanent transects (both those established by Hormay and those by the Lassen R. F.) in Harvey Valley, (2) cattle data, and (3) forage utilization records from Harvey Valley.

Methods: The field methods are described in Hormay's 1956 study plan and don't need further description here. The vegetation data will be analyzed on an individual permanent transect basis before any inspection of all the transect trends is made and a general conclusion attempted.
STUDY PLAN
For
Phase 2

Determination of Present (1964-65) Status of Range Condition in Harvey Valley Relative to that on Nearby Allotments.

Purpose: The determination of the present status of range condition in Harvey Valley and nearby allotments is the second of three phases mentioned above required to thoroughly evaluate rest-rotation grazing on the Harvey Valley Allotment. Although not the original intent, past work (since 1952) has been confined to measurement of vegetation and weights of cattle only on the Harvey Valley Allotment (1956 Study Plan by Horman). This may indicate trends on Harvey Valley but leaves a question of how these trends compare to those of nearby allotments. Before these comparative trends can be established this assessment of present range condition must be made on some sound comparable basis. Measurements can then be made on this same comparable basis at some future date (Phase 3) and a comparative trend determined. This final determination will have most meaning only if utilization records are kept on the areas studied both now and later.

Objectives: Two main questions must be answered in order to find the relative status of range condition between range sites in Harvey Valley and in outside allotments.

1. Are there sizable areas of important range sites (soil, site and vegetation factors considered) within Harvey Valley that have
their counterparts in outside allotments? If so, this will permit establishment of comparable study areas inside and outside of Harvey Valley. These areas will have the same basic potential for producing forage.

2. Are those soil and vegetation attributes which are responsive to grazing treatment substantially different when studied on a specific pair of comparable study areas?

**Methods (in general):** The first task is to find and establish pairs of study areas of the same potential for producing forage. This means among other things, the same soil series and general vegetation type. It also includes the general character of the area (slope, evaluation, etc.) and the likelihood that it will be substantially grazed.

Several general facts need to be mentioned about these comparable study areas. First, those comparable areas must easy to find will be along common allotment boundary fence. These boundary plots, although important, may not be the most important grazing areas. Secondly, comparable study areas in the interior of the allotments, although more important as grazing areas, areas, are more difficult to locate because of basic soil and site differences that occur over the miles that separate them. Thirdly, Harvey Valley is really 5 range units which have benefited more or less from 10 years of rest-rotation depending on weather year - rotation cycle and inherent potential to improve. Finally, some important grazing areas are at
a significantly higher elevation (adjacent to the fir type versus the more common relation to the pine type).

This, then, is a more complex situation than it might first appear. Our course of action will be to first establish boundary study areas and then as many interior and higher elevation study areas as time will permit. These established areas will be studied intensively during the 1964 field season then additional interior plots should be located for study in 1965. It would be most desirable to have a battery of interior plots in 3 range units—one where rest-rotation has the best chance of improving range condition, one where the chance is least and one in between. Because of the difficulty in locating these areas (they may be 10 miles apart) it will be 1965 before they can be studied.

The comparable study areas will be one-half acre in size, with corners permanently located for future study. Measurement of soil and vegetation factors (described in detail in this plan) will be made at random intervals along random transects.

Appropriate tests will be made to determine whether measured differences are significant. Each pair of plots will be studied first as a separate entity. Then sets of plots on the same vegetation type will be studied to determine if the same general response has occurred. Finally the results of all tests will be inspected to see if any general statement can be made about relative range condition between Harvey Valley and nearby allotments. It should be pointed
out that while we may be able to establish the relative status of range condition from this study it is doubtful if we can say exactly how and why this difference (or sameness) has occurred. This is because utilization on these study areas during the past 10 years is almost unknown (we do know of years of no cattle use in Harvey Valley). Also we don't know relative conditions at the start of rest rotation grazing in Harvey Valley. Measurement of grazing treatment (utilization and season of use) on these study areas and remeasurement at a future date will be required to properly find out how change in condition is related to grazing treatment.
STUDY PLAN

For

Phase 3

Change in range condition and in livestock production has taken place since 1964 on Harvey Valley relative to that on nearby allotments still under season-long management. (To be done at a future date, e.g., 1974)

**Purposes:** First, to find out if rest-rotation grazing is improving the condition of the range resource in Harvey Valley relative to present conditions on both Harvey Valley Allotments and nearby allotments. Secondly, to relate these trends to livestock responses.

**Objectives:** The main objectives of the Phase 3 evaluation to be made about ten years after the Phase 2 study are (1) to determine the condition of the range resource in Harvey Valley relative to nearby allotments under season-long management, and (2) to determine the change in the condition of the range resource, since the 1964 evaluation, in Harvey Valley relative to the changes on nearby allotments. We will make the same kinds of studies on the same sites as in the first evaluation.

Secondary objectives of the second evaluation are (1) to evaluate records of livestock gains on Harvey Valley obtained since the first evaluation, (2) to compare livestock gain records from the two evaluations, and (3) to determine the trend in range condition in Harvey Valley since the first evaluation.

**Methods:** The permanent study areas measured in the 1964 evaluation will be remeasured during the 1974 evaluation using the more appropriate
attributes and methods from the 1964 study. Livestock records in Harvey Valley will be continued and some started in outside allotments.

Between the 1964 and 1974 evaluations, four activities will be carried on.

1. Yearly livestock weight records.

2. Yearly determinations of utilization and season of use on comparable study plots.


4. Supporting vegetation studies with their objective the determination of whether the various grazing treatments employed in the rotation are functioning with respect to their purposes. We will study (1) plant vigor, (2) seed production and viability, (3) seed planting by cattle, and (4) seedling numbers and survival. In addition to vegetation studies we will investigate (1) changes in infiltration rate and (2) changes in soil structure which may result from the various grazing treatments. The studies have only tentative study plans as yet but these will have been approved before the studies are started.
Bunchgrass Project FS-FSW-1703

List of Active Studies

Studies:

1. Evaluation of rest-rotation grazing on the Harvey Valley Allotment.

Main Objectives

a. Does appraisal of past vegetation and livestock data collected from 1952 through 1963 at Harvey Valley indicate any trends in range condition or livestock weight gains?

b. What is the present (1964) status of range condition on selected sites in Harvey Valley relative to that on nearby allotments under season-long management?

c. At a future date (1974) what are the conditions and trends in both vegetation and livestock since 1964 on Harvey Valley and nearby allotments?

Man-Days of Time Per Year

<table>
<thead>
<tr>
<th></th>
<th>Field</th>
<th>Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists (Reppert &amp; Ratliff)</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Temporary Assistants (4)</td>
<td>160</td>
<td>120</td>
</tr>
<tr>
<td>Programmer</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Statistician</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Secretary</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Consultants and Cooperators</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>408</td>
<td>484</td>
</tr>
</tbody>
</table>

\* Based on 1964 fiscal year.
Funds: These figures are based on what was received and spent during F.Y. 1964.

<table>
<thead>
<tr>
<th>Breakdown</th>
<th>Project Funds (407/513-01-55-2)</th>
<th>Regional Office Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 scientists' salaries&lt;sup&gt;1/&lt;/sup&gt;</td>
<td>$17,149</td>
<td></td>
</tr>
<tr>
<td>2/5 of a secretary</td>
<td>1,608</td>
<td></td>
</tr>
<tr>
<td>temporary salaries&lt;sup&gt;2/&lt;/sup&gt;</td>
<td>1,853</td>
<td>$3,370</td>
</tr>
<tr>
<td>1/3 of Susanville office operations</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>professional meetings</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>Harvey Valley evaluation&lt;sup&gt;3/&lt;/sup&gt;</td>
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<td></td>
</tr>
<tr>
<td>(vehicles, equipment, supplies, Berkeley trips, consultation)</td>
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<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$28,157</td>
<td>$3,370</td>
</tr>
</tbody>
</table>

(complete total - $31,527)

<sup>1/</sup> This did not include Hormay in 1964. Regional office detailed Bill Sanderson of Lassen N.F. to Harvey Valley evaluation for two months.

<sup>2/</sup> An additional $1,500 budgeted to Hormay is not shown here.

<sup>3/</sup> Because of personnel ceilings we were unable to spend as much for temporary salaries as we planned. Therefore $1,000 of this was transferred to other projects and not used on this one.

2. Rest-rotation versus season-long management in logged-over ponderosa pine.

Objectives:

Will rest-rotation management result in more rapid establishment of vegetation, greater increases in vegetation, and longer maintenance of vegetation in logged-over ponderosa pine than season-long management?
<table>
<thead>
<tr>
<th>Man-Days of Time Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>2 (Ratliff)</td>
</tr>
</tbody>
</table>

**Funds:** The funds required each year are so small since the $115 installation in 1962, that they need not be considered.

3. Growth, reproduction and management of bitterbrush in northeastern California. Hormay's study that has run since 1935 and will continue active during the 1964 field season. Contact Hormay for details.
AIRMAIL

Director
Bureau of Land Management
Washington 25, D. C.

Dear Sir:

Thank you for your letter of May 22 signed by Acting Assistant Director Edwin Zaidles regarding Gus Hormay's rest-rotation grazing program.

Mr. Hormay has been ill and out of the office so we haven't had an opportunity to discuss his schedule with him. As soon as he returns we will write you.

Sincerely yours,

JOHN R. McGUIRE, Director

By RZ6
Research Problems Confronting the Bunchgrass Project

1965 - 1970

Items 1, 2 and 3 are within the present problem selection: Evaluation of Harvey Valley results and testing of Harvey Valley rest-rotation grazing system against season-long use.

1. Harvey Valley Evaluation

2. Harvey Valley Records for 1974 Evaluation
   Evaluation: a. cattle
   b. utilization
   c. season of use
   d. precipitation records

3. The Workings of Rest-Rotation Grazing
   a. plant vigor
   b. seed production and viability
   c. seedling numbers, survival and rest to aid establishment
   d. seed planting by cattle
   e. infiltration and soil structure

4. The place of livestock within intensive management of second growth stands of timber.
   a. succession after intensive thinning
   b. succession after harvest following thinning
   c. the above after debris pickup by forest products
   d. intensity of thinning in relation to forage production, utilization, and timber production

5. Value of cultural improvement of ranges and types of management.
   a. management of ranges only partially improved
      1. control of distribution; salt, H2O, supp. feed, fence, palatability, fertilizer, repellents
2. Cost of improvement versus value in livestock product
3. Effect of improvement (e.g. seeding) on native range

b. Improvement and management of very tough sites e.g., hard pans, loose soils, etc.
c. Value of control of undesirable plants—e.g., marginal timber and Wyethia.
d. Special erosion control problems e.g., stream bank stabilization on Last Chance Creek (Plumas) granite.
e. Meadow improvement: drainage, seeding, irrigation, etc.

6. Controlled grazing study of rest-rotation grazing and/or development of other systems at Harvey Valley or Wiley Ranch. Tests of rest versus seasonal deferment should be included.

<table>
<thead>
<tr>
<th>Native Range Units 4 &amp; 5</th>
<th>Improved Range Units 1 &amp; 3</th>
<th>Buffer Range Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redesigned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvey Valley</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment Range</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rather than an allotment sized study as above, this could be on a small individual fenced site basis.

7. Value of certain forage spp. e.g., Pine Creek hair sedge, Wyethia. Then deciding what plants to manage for e.g. BLM - annual vs. perennial.

8. Vegetation measures for administrative decision making - utilization, readiness.

9. Relation of speciation to soil characteristics.

10. Rodent ecology - when are they a benefit or a problem.

11. High elevation (ecology of) sheep and cattle range on Plumas-Tahoe (granite) and Modoc (Basalt).

12. Soil and its potential under different climates and after fire.
Office Memorandum • UNITED STATES GOVERNMENT

TO: E. G. Dunford, Assistant Director

FROM: Jack N. Reppert, Susanville

DATE: June 8, 1964

SUBJECT: Research (Bunchgrass Project)

The review June 5 of progress on the Harvey Valley evaluation resulted in these four goals being set for this project.

1. Complete a preliminary report by the spring of 1965. This report will contain an appraisal of past data (1954-63) from Harvey Valley plus the 1964 comparable plot data comparing Harvey Valley range condition to nearby allotments.

2. Make a joint decision (include R-5 and WO) in the spring of 1965 to either accept or turn down our recommendation to make a second evaluation at a future date (e.g. 1974).

3. Locate additional study areas late this summer (1964) in main grazing areas of outside allotments to fill out what we know to be sizable holes in our present blanket of comparable study areas. Range condition will be measured on these additional study areas during the 1965 summer field season.

4. Make a final report by the spring of 1966 including the additional findings of the 1965 field season.

We are keeping with our original plan of making a report after this field season, but at the same time we are making provisions next field season to fill a serious shortage in our outside allotment comparisons.

One thing now jeopardizes our chances of meeting the third and fourth obligations. For both project men to move at the same time from this location to Berkeley (it is planned for November, 1964) will result in two major disadvantages.

1. Our Susanville soils "lab" will have to fold up for this move right when we are operating it. It will need to run from September, 1964 to December, 1964 (texture analysis) and then from June, 1965 to September, 1965 (bulk density).

2. We will be without a reliable man on the ground who can give the required continuous crew supervision and make critical research sampling decisions during the 1965 field season (mid-April to early November). We will again have a 3 to 4 man crew during the spring and summer of 1965.

The solution is to have Ray Ratliff remain at our Susanville location until the 1965 field season is completed. My plans to come into Berkeley in November, 1964 will remain unchanged. After I arrive my main function will be to see that we get the past data digested and into the spring-of-'65 report.

I hope that I have convinced you that this is the best solution to this situation. To me, it is imperative to the Harvey Valley evaluation.

Jack N. Reppert

cc: K. W. Parker
The "relation" I spoke of needed approval soon because they will want to sell the house rather soon if he must come in the fall. I informed Ken Riche of this matter as well as our obligation to expect. Perhaps you can discuss it with him to report. Perhaps you can discuss it with him at S.F.E.R. This is not when you see him at S.F.E.R. Think of an attempt to put you on a spot by bringing up an old issue. It is a case of the evaluation taking up an old issue. It is a case of the evaluation taking up another field season and needing a man, how to handle it. It is a new issue, needing a new decision. This made it up; you take your turn.

Signature

REPLY (Use this space for reply. Sign and date. Retain part 2 to sender. Retain part 1.)

It is raining and snowing something terrific at Honey Valley this morning - has been even snow on fields left.

Talk us!
Harvey Valley -

Discussion of past rotation system
Change in 1963 season to cared made of permute.

A. Sue Horsney - Study Plan 4/23/56

1. Test effect of B.S. grazing plan (R.R)
2. Compare both vegetation and cattle results
   to conventional season long grazing.

B. Companion - Not made
   a. Poison take work not started
   b. Change in method in H.V.
   c. No consistent yield and util.
   d. Little study and need fist. pro. plan
   e. Diff. cultural improvement.

C. But still widespread interest.
I. Past Work
   A. Measured
      1. Cattle units
      2. Veg data: perm. transects
      3. Photos
      4. LNF, C+T transects

   B. Objective
      How much improvement in range cond. and increase in livestock prod. since R-R at HV: 1952-63?

II. Today: 1963, 64, 65
   A. To measure
      1. Soil (H.V. and
      2. Veg (nearby allotments)

   B. Objective
      What is present (64-65) status in R.S. in H.V. relative to that on nearby allotments made under season long use (in selected study area).

III. Future: 1965-74
   A. To measure same as 64
      1. Soil (To be remeasured
      2. Veg
      3. Plus Precip, Cattle util. 5 year average each year.
Objective

At a future date what change condition and livestock production has taken place since 64 in H.V. relative to nearby allotments still under season long use.

In 1963 remeasured all permanent transects — 108
Also using excludes. All in Berkeley to be processed by ADP. All data needs to be transferred for punching (Trances is on this job)

Now to judge trend in veg based on transects
C+T transects — Phil Lord has one in each of the 5 levels.

Cattle data 1st records 1954
Weighed each year since. Haven't been consistent in classes of cattle. 1961 to present weighing replacement heifers and cattle to be sold.

Photos Sparse as far as transects are concerned
One has a good record of transects.
Utilization

1960-62 Done by estimating percent of ungrazed plants. Prior to this has used his own visual estimate.

Phase II Current work

Compare selected sites in H.V. with adjoining allotments. Prosing in soil potential. (Areas ½ acre) Find plot in H.V. and look for comparable one outside. Along fence line this job has been relatively easy. More difficult to compare plots in H.V. interior with anything to be found outside.

Factors used to judge comparability

- Look for areas with the same vegetation type.
- Characterization record for sites include:
  - Soil type
  - Horizons of soil depth, root zone abundance
  - Vegetation types
  - Aspect
  - Diet to fresh water
  - Surface rock cover
  - Accessibility, to cattle
  - Timber cover
- Other sites to which this one is comparable.
Soil samples from plots analyzed by Bouyoucos method. For texture.
Depth of horizons.
Color.
$	ext{pH}$, pH trend.

Remove gravel by weight to get percent gravel.

Final rating made on 18 factors:
- Most weighed (A)
- 4 second importance
- 5 third

Things to be measured on plots to be considered comparable.
What things are going to be changed by grazing?
Range condition.
Bulk density (same and get roots).% by volume.
Compaction.
Soil samples analyzed for NPK.
Basal cover of veg by sample pins.
Plant vigor, length of longest veg shoot out of each third.
Size class distribution density.
Seedling frequency - in breed and page areas.
Collect cores of bunch grass and grow to determine
weight development and development of roots.

Measure yield using 15 to 40 soybean lines.

Needs to keep H.V. evaluation steady going.

Have to locate 15 to 25 more paired plots in the intercropping situation.

Immediate needs: FY '65

2 Temporary employees

R.O. has committed $2500. Need $2000 more.

3-man months needed to maintain H.V. between phases II and III.

20+ plots already picked out and will proceed with these starting June 8.

Get weights from another allotment comparable to H.V.

Need cattle of comparable breeding and class.

Research will come up with a report by spring of 1965.

Decide by this time whether or not to go on.

Try to get more comparable plots and shoot for final report (published) in spring of 1966.