

Matrix Ranking: A Tool for Decision-Making and Prioritization¹

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Matrix ranking is an activity used to analyze and prioritize information. Commonly used by social scientists and community development workers, matrix ranking can facilitate discussion in a group when choosing the best course of action. Extension professionals often work with community groups who may benefit from this type of analysis. Agents can use matrix ranking to promote critical thinking in group settings. By ensuring participants thoroughly consider multiple comparisons or criteria, extension professionals can facilitate prioritization or decision-making.

Matrix ranking provides a clear way to think through complex decisions (Narayanasamy, 2009). Groups of agents and administrators could also use the approach among themselves to prioritize programming needs. This approach allows for creativity and discussion while maintaining a quantifiable objectivity; this is achieved by utilizing a qualitative prioritization system that yields numerical values suitable of being compared and ranked (Harder, 2013). Agents may find matrix ranking useful in the following contexts:

- Prioritizing issues (i.e. where to focus efforts)
- Choosing a course of action from several appealing options

For example, matrix ranking has been used to help cooperatives of farmers choose a variety to grow by comparing traits of several varieties (Drinkwater, 1993).

Participants

Although an individual may use matrix ranking to support decision-making, this technique is typically employed in group settings through a facilitation process. Participant groups vary widely and can be selected in many different ways. For example, as commonly done for Extension programs (Warner & Galindo, 2014), community leaders could be identified and asked to participate in the decision-making process. Participants may also be selected based on geographical distribution (for example, they are all residents of a particular community) or based on demographics or other characteristics.

The participants should reflect the diversity of the population to ensure multiple points of view are represented by the outcome. If conflict or reluctance to share minority opinions is likely, the activity can be completed in smaller groups and then shared with the whole group (Narayanasamy, 2009). Participant groups could be made more homogeneous by splitting groups by sex, age, interests, or other demographics. Written input could also be collected anonymously. Discussion should be encouraged throughout the activity, and all participants should have an opportunity to speak if they desire. Care must be taken to ensure all participants are heard and are comfortable.

Many procedures for matrix ranking exist. This article describes two methods: **pairwise ranking** and **ranking and**

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scoring. The topic of interest can either be pre-determined by the facilitator (normally in response to a previously identified relevant issue, need, or gap that needs to be addressed) or determined through a discussion with the participants. Options for handling disagreement—such as through majority vote or consensus building—could also be pre-determined or left to the participants.

Pairwise Procedure

Pairwise ranking is a systematic way to compare various options by comparing the options in pairs. A list of possible options is constructed and placed in a matrix table (see Figure 1 for an example of a matrix table). Each item is compared to the other items individually and then the number of times it was chosen is summed. The item with the largest sum is deemed to be the most important item. Below are step-by-step instructions for pairwise ranking. Each step is accompanied by a real-world example of how that step might be carried out.

1. Step one: Identify the decision that needs to be made.

- A town in a rural area is deciding how to appropriate civic improvement funding, and community members ask their UF/IFAS Extension agent to facilitate the decision at a public meeting.
2. Step two: Develop a set of possible solutions, actions, or priorities.
- The local government has presented the following options to the community: 1) build a recreational park, 2) repave 3rd Avenue, 3) give grants for local business owners to improve store fronts, 4) expand the public library, or 5) restore the old railway depot.

3. Step three: Create a matrix using the set of options. List the options as headings of both the rows and columns, then add two extra columns for ranking and scoring (Figure 1).

Option	Option					Score	Rank
	1 Recreational park	2 Repave 3 rd avenue	3 Grants for storefront improvements	4 Expand library	5 Restore railway depot		
1 Recreational park							
2 Repave 3 rd avenue							
3 Grants for storefront improvements							
4 Expand library							
5 Restore railway depot							

Figure 1. Example pairwise ranking matrix.

4. Step four: Cells on the diagonal (for example, row 1 x column 1) are blanked out because an option is not compared to itself. Row 1x column 2 compares Option 1 (recreational park) and Option 2 (repave 3rd Avenue), and the number of the preferred option should be written in the cell. The group should discuss the pairs of options presented by each cell and choose which is preferable.

- In the first row of our example, participants chose Option 2 over Option 1, then Option 1 over Option 3, Option 4 over Option 1, and lastly Option 1 over Option 5 (Figure 2).

Option	Option					Score	Rank
	1 Recreational park	2 Repave 3 rd avenue	3 Grants for storefront improvements	4 Expand library	5 Restore railway depot		
1 Recreational park		2	1	4	1		
2 Repave 3 rd avenue							
3 Grants for storefront improvements							
4 Expand library							
5 Restore railway depot							

Figure 2. Pairwise ranking step four matrix.

5. Step five: Complete the pairwise comparisons in the other rows (Figure 3). Here, the participants chose Option 2 (repave 3rd Avenue) over Options 3, 4, and 5. The other rows were also completed. The cells below the diagonal repeat comparisons that have already been made, so they are left blank.

Option	Option					Score	Rank
	1 Recreational park	2 Repave 3 rd avenue	3 Grants for storefront improvements	4 Expand library	5 Restore railway depot		
1 Recreational park		2	1	4	1		
2 Repave 3 rd avenue			2	2	2		
3 Grants for storefront improvements				4	3		
4 Expand library					4		
5 Restore railway depot							

Figure 3. Pairwise ranking step five matrix.

6. Step six: Add the number of times an option was selected as preferred over another option and place the number of times in the score section for the corresponding row. For example, Option 1 was chosen twice throughout the matrix, so its score is two. Option 2 was chosen once in the first row and three times in the second row, for a total score of four (Figure 4).

Option	Option					Score	Rank
	1 Recreational park	2 Repave 3 rd avenue	3 Grants for storefront improvements	4 Expand library	5 Restore railway depot		
1 Recreational park		2	1	4	1	2	
2 Repave 3 rd avenue			2	2	2	4	
3 Grants for storefront improvements				4	3	1	
4 Expand library					4	3	
5 Restore railway depot						0	

Figure 4. Pairwise ranking step six matrix.

7. Step seven: Rank the options by the score they receive with the largest score being ranked first (Figure 5).

Option	Option					Score	Rank
	1 Recreational park	2 Repave 3 rd avenue	3 Grants for storefront improvements	4 Expand library	5 Restore railway depot		
1 Recreational park		2	1	4	1	2	3
2 Repave 3 rd avenue			2	2	2	4	1
3 Grants for storefront improvements				4	3	1	4
4 Expand library					4	3	2
5 Restore railway depot						0	5

Figure 5. Pairwise ranking step seven matrix.

8. Step eight: Use the rankings to create discussion with stakeholders and decision makers about the issue and the next steps that need to be taken. Do they agree that repaving 3rd Avenue is the most advantageous option?

Ranking and Scoring Procedure

Ranking and scoring uses a similar process, but the rows are criteria by which the options are ranked. This procedure is better for weighing pros and cons across multiple criteria. Say, for example, that an Extension agent is working with a group of producers who are selecting one of four fruit varieties. The producers have discussed fruit quality, frost tolerance, and market price as their principal concerns. The following matrix ranking procedure is used to facilitate making the decision.

1. Step one: List the options (i.e. varieties) as columns and the criteria by which they will be judged as the rows.

- The agent shows the matrix to the participants. The four fruit varieties are listed as columns, and the criteria are listed as rows (Figure 6). To make the process more

participatory, participants could be asked for additional options or criteria.

	Variety #1	Variety #2	Variety #3	Variety #4
Fruit quality				
Frost tolerance				
Market price				
Total score				

Figure 6. Example ranking and scoring matrix.

2. Step two: Rank the options from first to last for each criterion.

- The agent facilitates discussion about how the varieties compare in terms of each criterion, and then each variety is ranked from best to worst in a step-by-step fashion. Focusing on the criterion of fruit quality, the group decided #4 had the best fruit quality (ranked as 1), followed by #1 and #2. Variety #3 had the lowest fruit quality (ranked as 4). Next, varieties were ranked based on frost tolerance and then market price (Figure 7). In the event of a tie, varieties could be assigned the same ranking.

	Variety #1	Variety #2	Variety #3	Variety #4
Fruit quality	2	3	4	1
Frost tolerance	4	3	1	2
Market price	1	3	4	2
Total score				

Figure 7. Ranking and scoring step two matrix.

3. Step three: After all rankings are made, totaling the ranks gives each option a score, with the better the options having lower scores. Total scores for the example are shown below (Figure 8).

4. Step four: The facilitator should use the total scores to encourage further discussion rather than basing the decision solely off the matrix. Variety #4 appears most advantageous in this example, but discussion should continue because ranking procedures may be biased or misinterpreted (Maxwell & Bart, 1995). For instance, if frost is not a concern of the growers, Variety #1 may be best due to the high fruit quality and market price.

	Variety #1	Variety #2	Variety #3	Variety #4
Fruit quality	2	3	4	1
Frost tolerance	4	3	1	2
Market price	1	3	4	2
Total score	7	9	9	5

Figure 8. Ranking and scoring step three matrix.

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Conclusion

Matrix ranking is a versatile tool. Extension agents and other professionals can use it to facilitate decision-making and prioritization. Pairwise ranking compares possible options in pairs, while ranking and scoring compares options across multiple criteria or traits. Participants should be allowed to influence the process by suggesting problems or issues to be ranked or the criteria by which to rank options. Additional information on matrix ranking techniques can be found in Narayanasamy (2009) and Hawkins (n.d.). Two basic scoring techniques have been described, and more complicated scoring procedures are described in the references.

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