Appendix 4

Using an Attainment Index in Farmer Participatory Research

The following discussion is based on the author's intuition, and for that reason it is not included in the main text of this manual. Although the approach described here differs from the approach of Reed et al. (1991), which has been used in the published literature, it may stimulate further thinking on this important subject.

The attainment index is a measure of the extent to which the overall performance of a particular variety or technological option meets all of the interests and needs of a farmer or group of farmers. Therefore an attainment index combines the two types of ratings—the demand and supply of characteristics—discussed previously.

It would seem intuitively obvious that a variety or other technology that performs very well for many important characteristics should be more desirable overall than one that performs very well for characteristics that are only somewhat important. Conversely, a variety or technology that performs poorly for many important characteristics should be less desirable than one that performs poorly for less important characteristics. The question, however, is how to combine both types of rating to generate *an ordinal measure* that makes it possible to rank the different varieties or technologies from more to less desirable.

The first possibility that comes to mind is simply to multiply the supply and demand ratings. The numbers associated with these ratings are in any case arbitrary, and what is important is their order, not their magnitude. Researchers could code the ratings by 1 = very important, 2 = somewhat important, 3 = not important, and 1 = very good, 2 = intermediate, and 3 = poor. Multiplying the ratings would give a scale between 1 and 9 (best to worst) for each trait, and it would be possible to sum across the characteristics. A drawback of this scale is that it would have many ambiguities. For example, it would imply that the combination "very important, poor" would be equal to "not important, very good." Obviously a variety that performs poorly for a very important characteristic is the worse case, and if a characteristic is not important, it is irrelevant whether a variety performs very well or poorly, but with this method the two cases would be equivalent. Furthermore, if a farmer considers many traits to be unimportant, the attainment index would be very large, indicating that he/she is dissatisfied with the variety, when in fact the opposite may be true.

A second possibility is to assign arbitrary scores but with certain properties to both types of rating. For ratings of the importance of characteristics, the scores, could be between 1 and zero (1 for "very important" and zero for "not important"). "Somewhat important" can be assigned an intermediate score such as 0.4. These scores maintain the order of importance, and the zero takes into account that it does not matter how a variety performs for a characteristic that is irrelevant. (The reason for choosing 0.4 for the intermediate rating will be explained later.)

For ratings of the performance of a variety for a characteristic, the scores could be between 1 and –1 (1 for "very good" and –1 for "poor"). The "intermediate/acceptable" rating can be assigned an intermediate score, such as 0.5. These numbers maintain the order of performance, and the –1 takes into account that a poor performance has a negative impact on the well-being of a farmer.

Both ratings can be combined in a matrix that produces an ordinal scale that runs from more to less desirable (Figure A4.1). For each cell in the matrix, the scores in the column and row are multiplied, generating an index that varies between 1 and –1. The ordinal scale is as follows:

> Very important–very good (1) > very important–regular performance (0.5) > somewhat important–very good performance (0.4) > somewhat important-regular performance (0.20) > not important–any performance (0) > somewhat important–poor (–0.5) > very important–poor (–1).

The score 0.4 was assigned to "intermediate importance" to produce the ordering shown above, following the assumption that it is more important or desirable to have an intermediate performance for a very important characteristic than to have a very good performance for a characteristic that is "somewhat important." Clearly it is more desirable to have (1) a variety that has an intermediate rather than a poor performance for a very important characteristic, rather than (2) a variety that has a very good rather than an intermediate performance for a somewhat important characteristic, or a variety that has an intermediate rather than a poor performance for a somewhat important characteristic.

Alternatively, one could assign an equal score to both intermediate ratings and

Supply weights \ Demand weights		Very important	Somewhat important	Not important
		1	.4	0
Very good	1	1	.4	0
Intermediate	0.5	.5	.2	0
Poor	-1	-1	-.4	0

Figure A4.1. Matrix of scores for an attainment index.

assume that a farmer is indifferent between the two cases presented above (i.e., it is equally desirable to have an intermediate performance for a very important characteristic, or a very good performance for a characteristic that is "somewhat important.")

Then, for each particular variety, the scores for each characteristic can be added to generate an overall weighted score of performance—the attainment index. The index reflects the overall desirability of a variety to the farmer who rated it.

Some farmers may consider some characteristics to be unimportant (therefore they will have a zero score), whereas other farmers may not. To take these differences into account, it is necessary to normalize the index. Otherwise, when two scores are compared, one may be very large—not because one of the varieties was more satisfactory, but simply because the farmer who rated it considered many traits to be very or somewhat important, whereas another farmer rating the same variety might consider fewer traits to be important (and may even have found the variety to be more satisfactory). It is important to divide the score by a "perfect" score (i.e., the score that would have been obtained if the variety had scored very well for all relevant characteristics, weighted by the importance of the characteristic). This means that the perfect score is simply the summation of all demand scores and that unimportant characteristics are not taken into account.

To get a measure of the desirability of a certain variety for a community as a whole, the attainment indices for the farmers in the community can be averaged. Researchers should be careful not to read too much into the actual scores, which are based on arbitrary numbers. As noted, the important point is the *ordering* of the varieties in terms of their desirability (ability to supply what farmers want).

An example of how to calculate this index using these scores follows. The data are taken from the man in

Table A4.1 Demand and supply ratings for several characteristics and two maize types grown by the man in household 4 used for calculating an attainment index, Santa Ana Zegache, Oaxaca, Mexico

	Importance		Performance			
Characteristic	Demand score		Blanco	Supply score	Negro	Supply score
nixtamal quality,	2	0.4	1	1.0	1	1.0
taste of tortilla,	1	1.0	1	1.0	1	1.0
yield stability,	1	1.0	2	0.5	2	0.5
ease of shelling	2	0.4	2	0.5	1	1.0
drought	1	1.0	2	0.5	1	1.0
wind	3	0.0	2	0.5	2	0.5
weeds	1	1.0	2	0.5	3	–1.0
cash	1	1.0	2	0.5	2	0.5
labor	1	1.0	2	0.5	2	0.5

Note: Demand and supply scores from Figure A4.1

household 4 of Tables A3.2 and A4.1 for the maize types Blanco and Negro. Table A4.1 presents the data.

For the variety Blanco:

(.4x1)+(1x1)+(1x.5)+(.4x.5)+(1x.5)+ (0x.5)+ (1x.5)+(1x.5)+(1x.5)= 4.1

The perfect score to be used for normalization would be:

(.4x1)+(1x1)+(1x1)+(.4x1)+(1x1)+ (0x1)+(1x1)+(1x1)+(1x1)= 6.8

Normalized score:

4.1/6.8= 0.603

For the variety Negro:

(.4x1)+(1x1)+(1x.5)+(.4x1)+(1x1)+ (0x.5)+(1x-1)+(1x.5)+(1x.5)= 3.3

The perfect score to be used for normalization would be:

(.4x1)+(1x1)+(1x1)+(.4x1)+(1x1)+ (0x1)+(1x1)+(1x1)+(1x1)= 6.8

Normalized score:

3.3/6.8= 0.485

Hence, Blanco is superior to Negro overall. However, it should also be pointed out that for ease of shelling and particularly for drought tolerance Negro is better (although it is much worse at tolerating weeds).

The normalized attainment index is more important for comparing different farmers, who naturally will differ in their demand for certain characteristics.