The problem 1. Do production system claims for eggs such as 'free range' sometimes mislead consumers? Is this the case for other claims, including 'barn' or 'cage' laid?

"Barn" is misleading as no one knows what that means. "Free range" is misleading because often the space is smaller than one would imagine. There are also brands that are better than free range but that isn't well known either.

2. If so, how much detriment have consumers suffered due to misleading production system claims for eggs?

In my case a lot. I only eat cruelty free eggs and diary and the labelling makes it very hard to know what to buy. Something saying "free range" hold no weight for me. It is specific enough and the term is used too loosely. Free range does not mean cruelty free in a lot of cases.

3. What detriment have producers and retailers suffered due to misleading production system claims for eggs made by competitors?

I would imagine there are farms doing the right thing who lose business to those claiming they do the same, when they don't. Or farms relying on people being ill informed on what the label means.

4. Do producers face significant uncertainty about how to ensure they do not make misleading production system claims for eggs?

I don't know what labelling standards apply and how readily available they are.