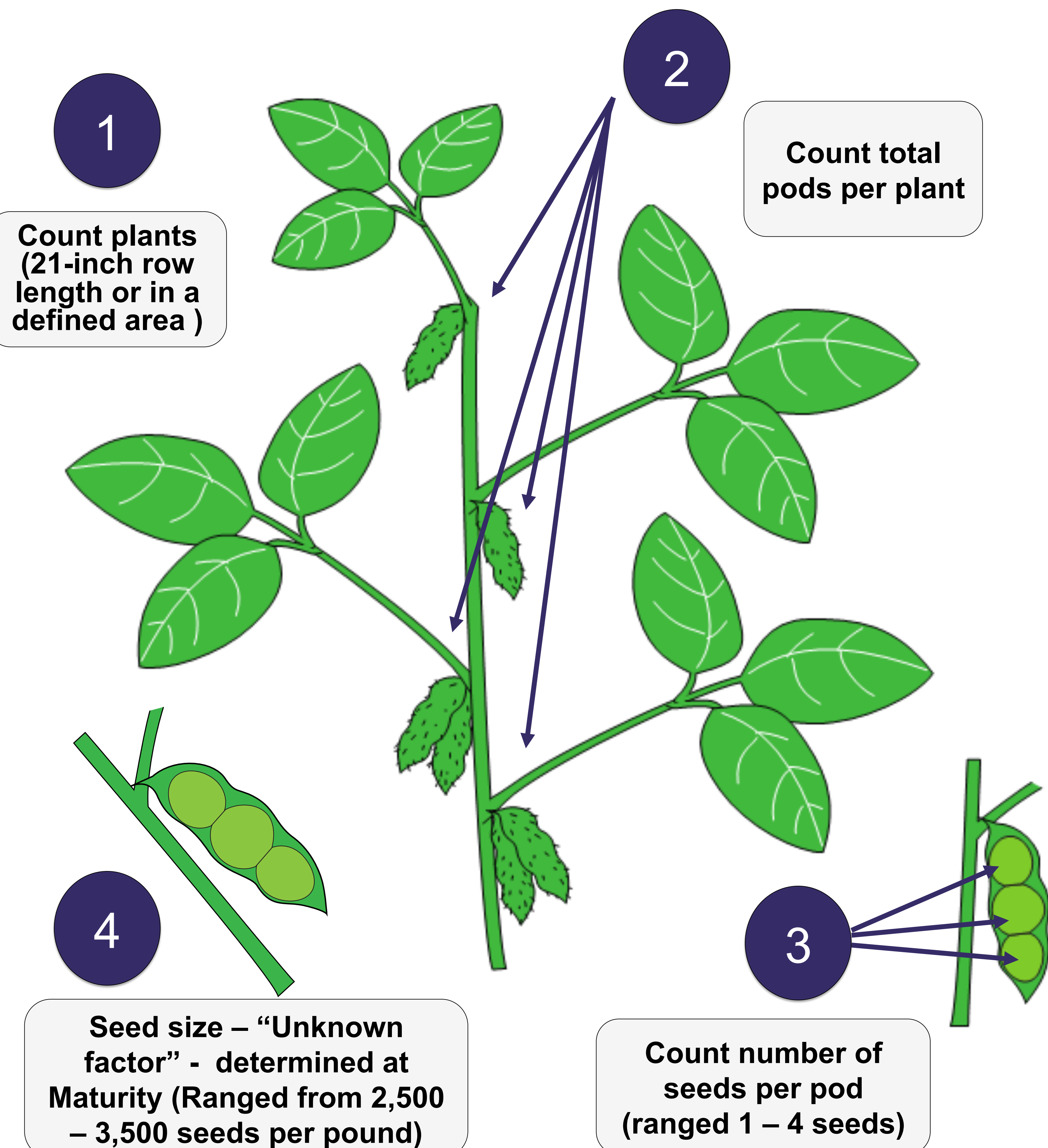# Soybean Yield® App: A New On-Farm Tool for Yield Estimation

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BACKGROUND

- Soybean yield estimation is time-consuming and labor-intensive.
- The seed weight component is the main "unknown" factor at the time of yield estimation. Thus, a study was developed to test a scientific framework for estimating seed weight and predicting yields.
- The figure below shows the traditional approach or steps utilized to estimate yield.

1 Count plants (21-inch row length or in a defined area)

2 Count total pods per plant

4 Seed size – "Unknown factor" - determined at Maturity (Ranged from 2,500 – 3,500 seeds per pound)

3 Count number of seeds per pod (ranged 1 – 4 seeds)

How to improve the **seed size prediction** and **estimate yields** more accurately and in a interactive way?

OBJECTIVE

Develop a digital application to aid the forecasting of soybean yields before harvest, by improving the seed weight prediction.

SEED WEIGHT ESTIMATION

- The framework is based in an **allometric model** between the area of the pod organ, its final weight and the pod:seed weight ratio.
- A method was developed collecting more than **5000 pictures** of soybean pods (at different sections of the plant canopy) at the end of the growing season under different environmental conditions.
- Pod surface area estimation via imagery analysis was developed based on collecting imagery of soybean pods utilizing a **known-size square** ("blue square") as a reference for area calculation.
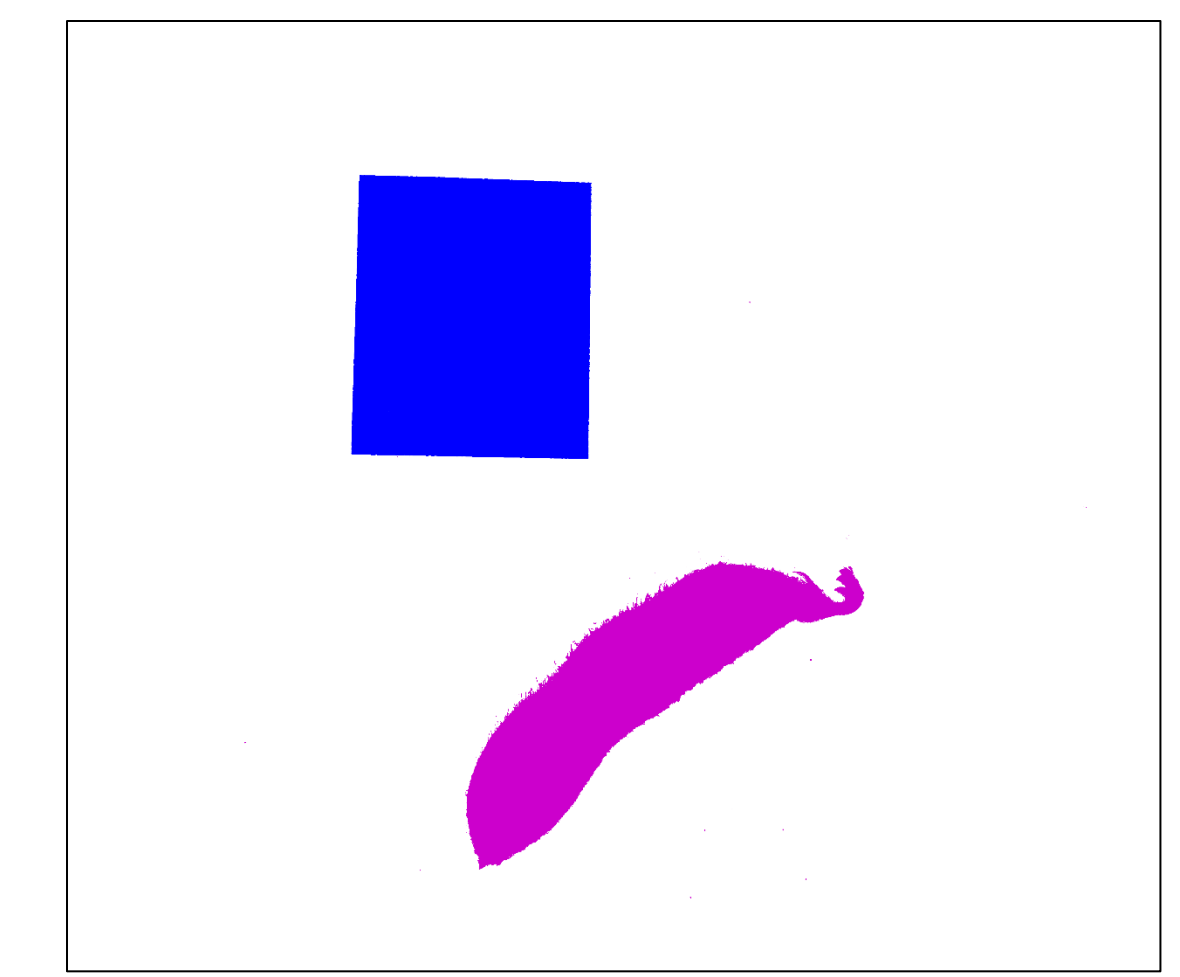
SEED WEIGHT ESTIMATION (CONTINUATION)

Step 1: Weigh the pod
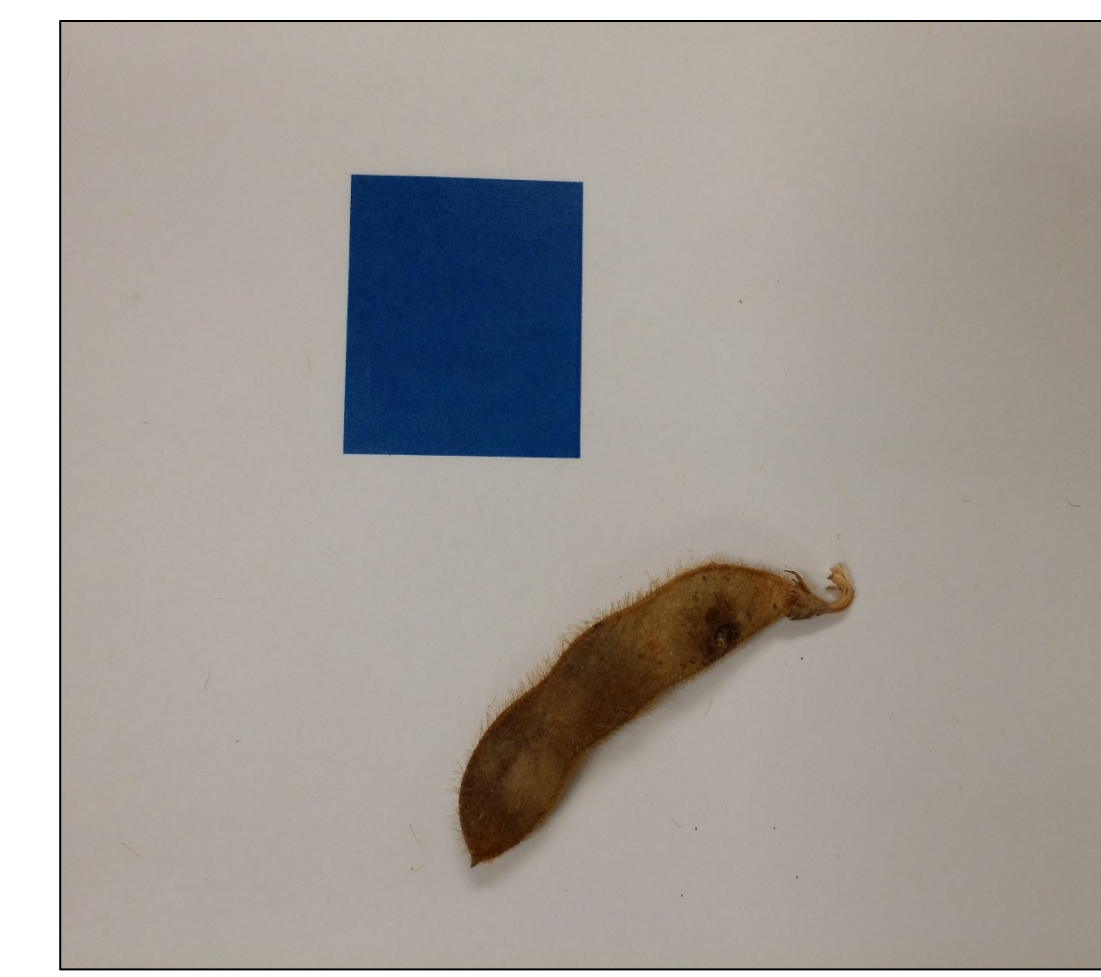
Step 2: Take a picture of the pod
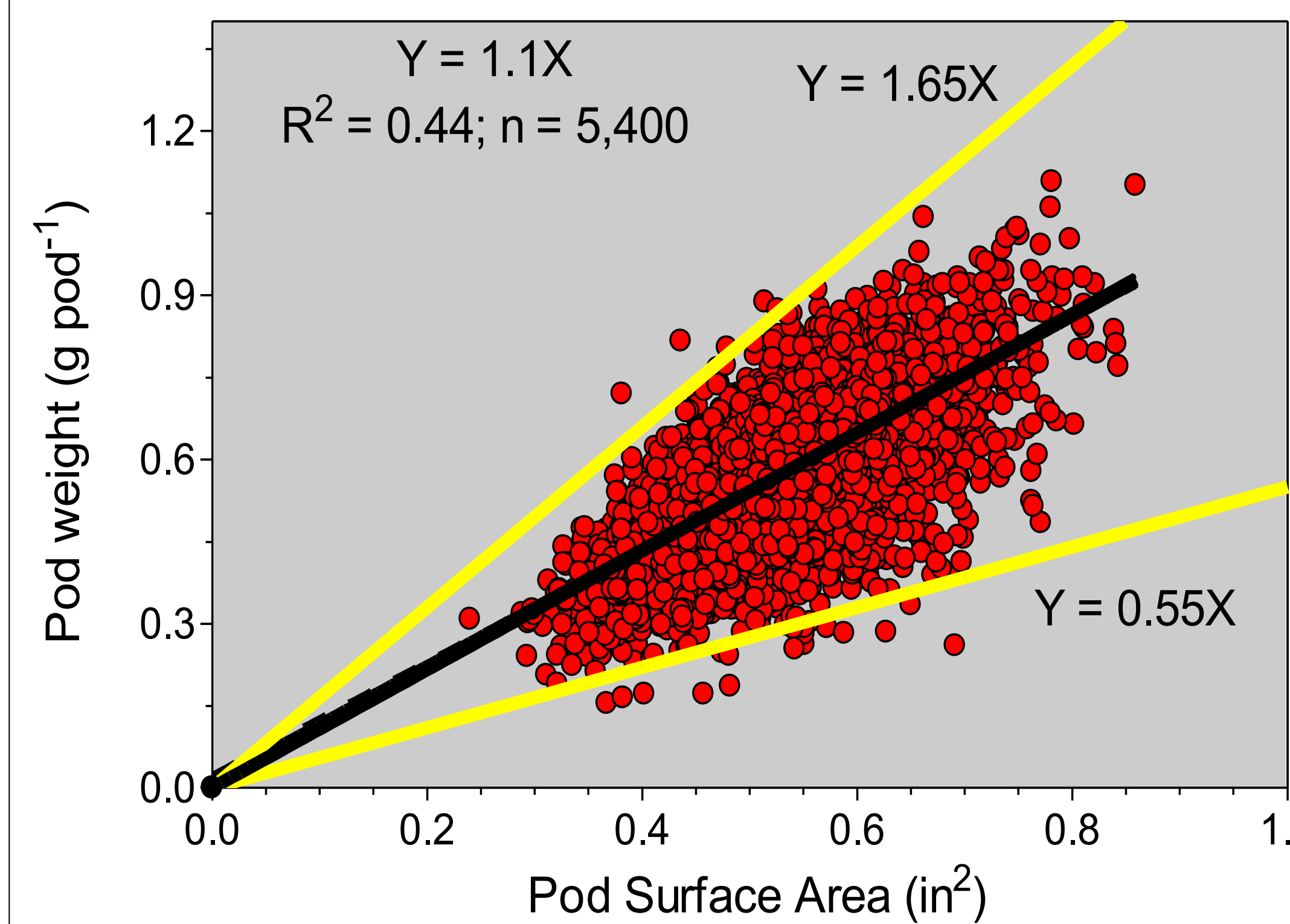
Step 3: Calculation of pod surface area

$Y = 1.1X$
$R^2 = 0.44; n = 5,400$
$Y = 1.65X$
$Y = 0.55X$

Figure 1. Relationship between pod weight and pod surface area.

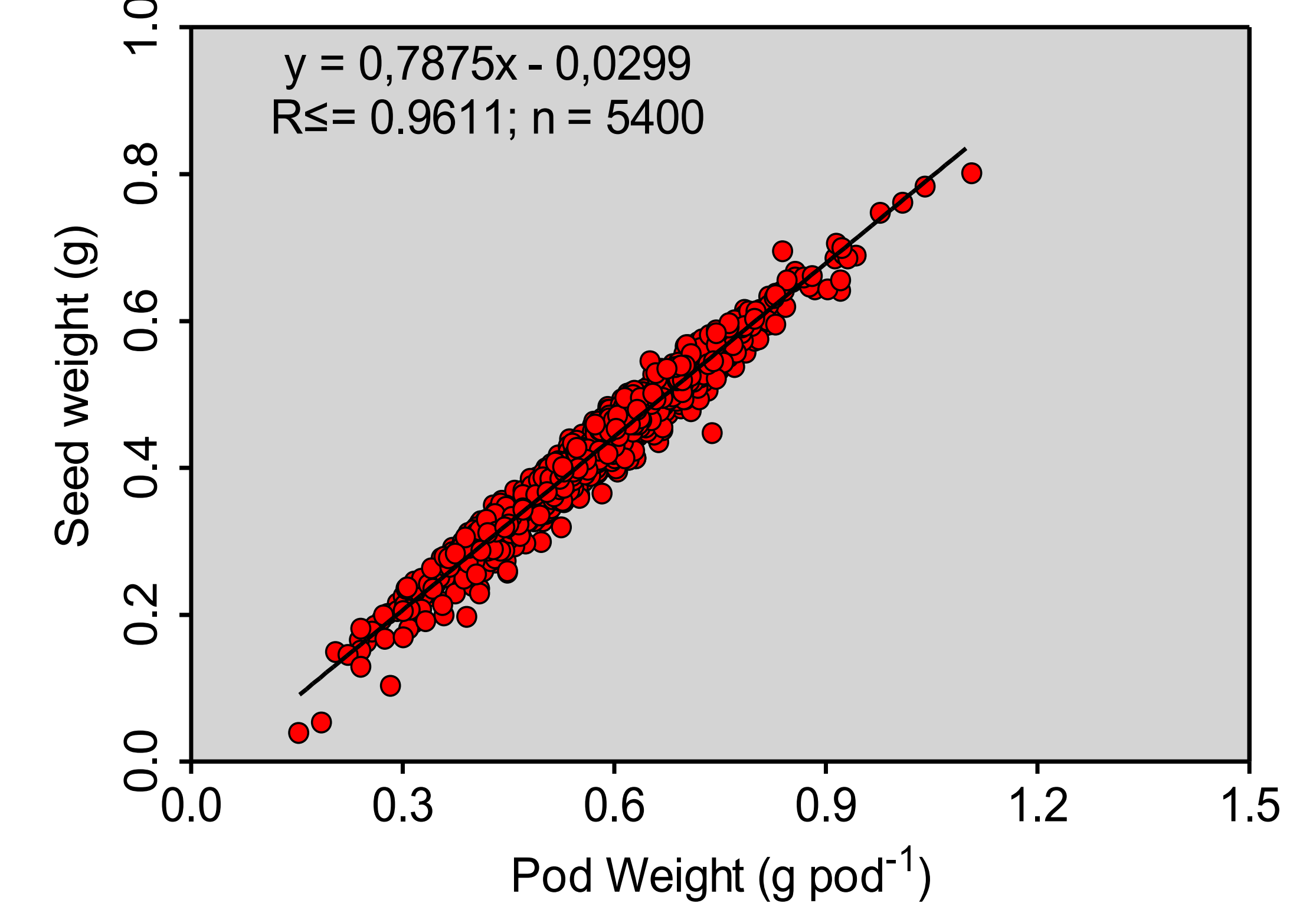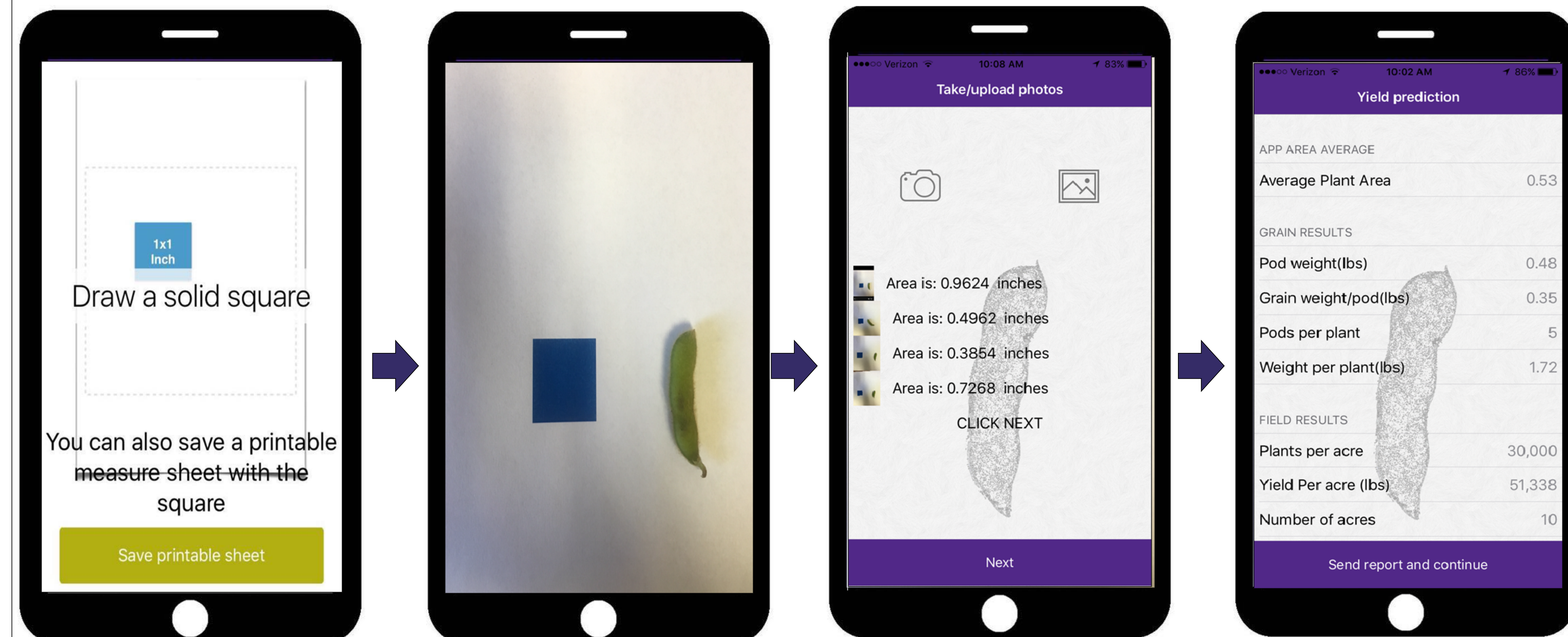$y = 0.7875x - 0.0299$
$R \le = 0.9611; n = 5400$

Figure 2. Relationship between seed and pod weight at the end of the season.

SOYBEAN YIELD® APP: MAIN FEATURES

Recommendations

- Count and enter number of plants, row spacing and number of pods in **10 plants**.
- Pictures of pods should be based on **representative** areas of the field (include variation).
- Number of sampling areas should be based on the field variability: +variation, +samples.
- The process of pod collection can start from **R4 (Full Pod)/R5 (Beginning Seed)** stages.

CONCLUSIONS

- Soybean Yield® App is a more precise digital on-farm tool to increase seed weight prediction power and improve yield estimation before harvest.
- This methodology considers an important yield component that it is not properly addressed in the "conventional" yield estimation methods, the **seed weight estimation**.