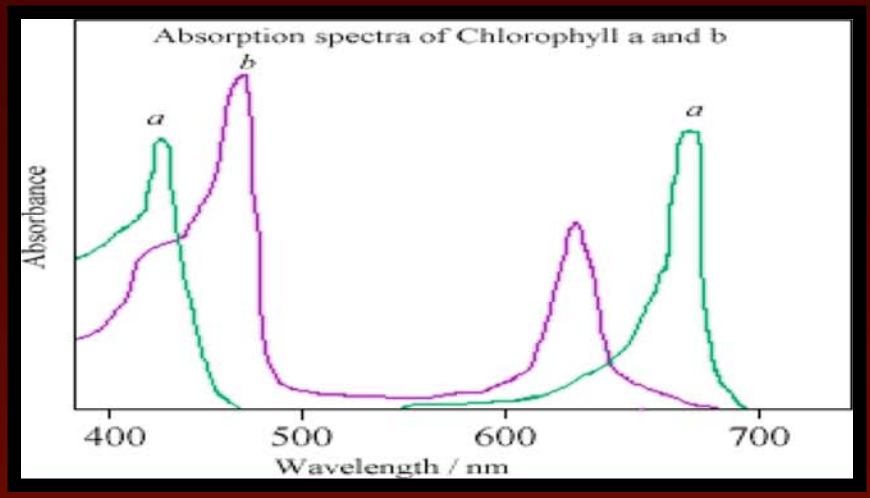
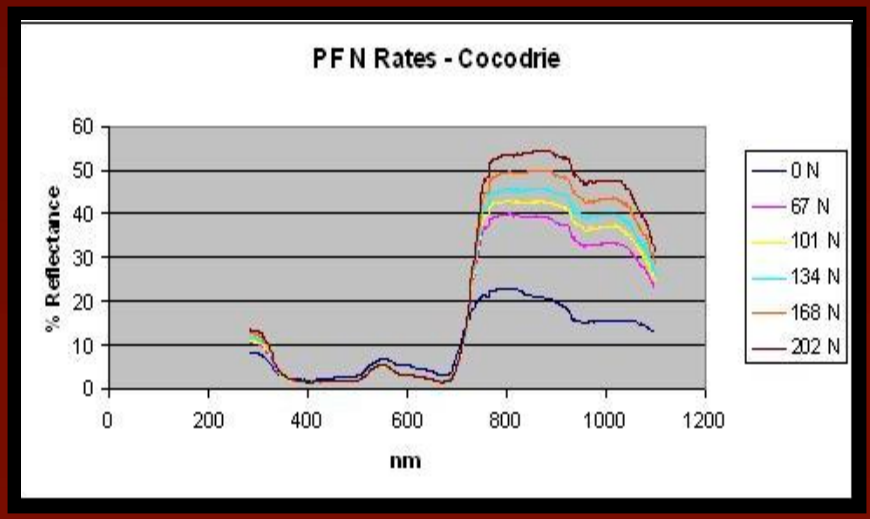
An Evaluation of Commercially Available Imagery of Rice Crop Canopy Affected by Nitrogen Nutrition

Walker, T.W.*, Satterfield, J.M., Bajwa, S.G.,
Norman, R.J., Harrell, D.L., Bond, J.A., Varco, J.J.

Introduction

- Chlorophyll content in plants are correlated with absorbance of red (650 nm) and blue (450 nm) energy
- Cellular structures reflect NIR energy (750 to 1000 nm)





Materials and Methods

- Aerial Imagery received from John Deere Agriservices at PD
  - 0.25 m resolution
  - Blue 450 +/- 40 nm
  - Green 550 +/- 40 nm
  - Red 650 +/- 40 nm
  - NIR 850 +/- 50 nm
- Green Normalized Difference Vegetative Index (GNDVI)
  - GNDVI = (NIR – G) / (NIR + G)

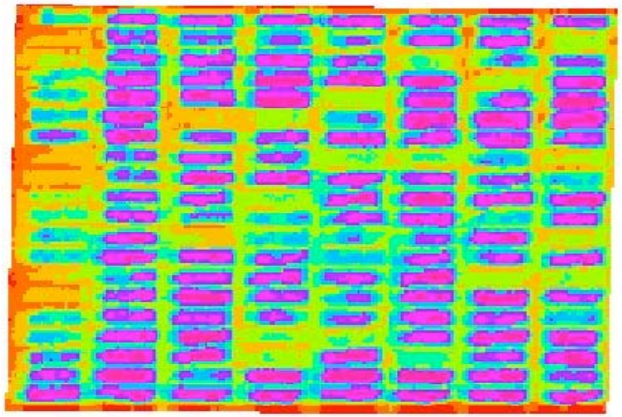
Results

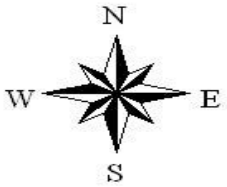
	Cocodrie	Wells	XL723
	Pearson's r for grain yield		
TDM	0.9080†	0.9237	0.8576
TNU	0.8712	0.9057	0.9328
%N	0.8087	0.8240	0.8278

†all values are significant at $P < 0.0001$

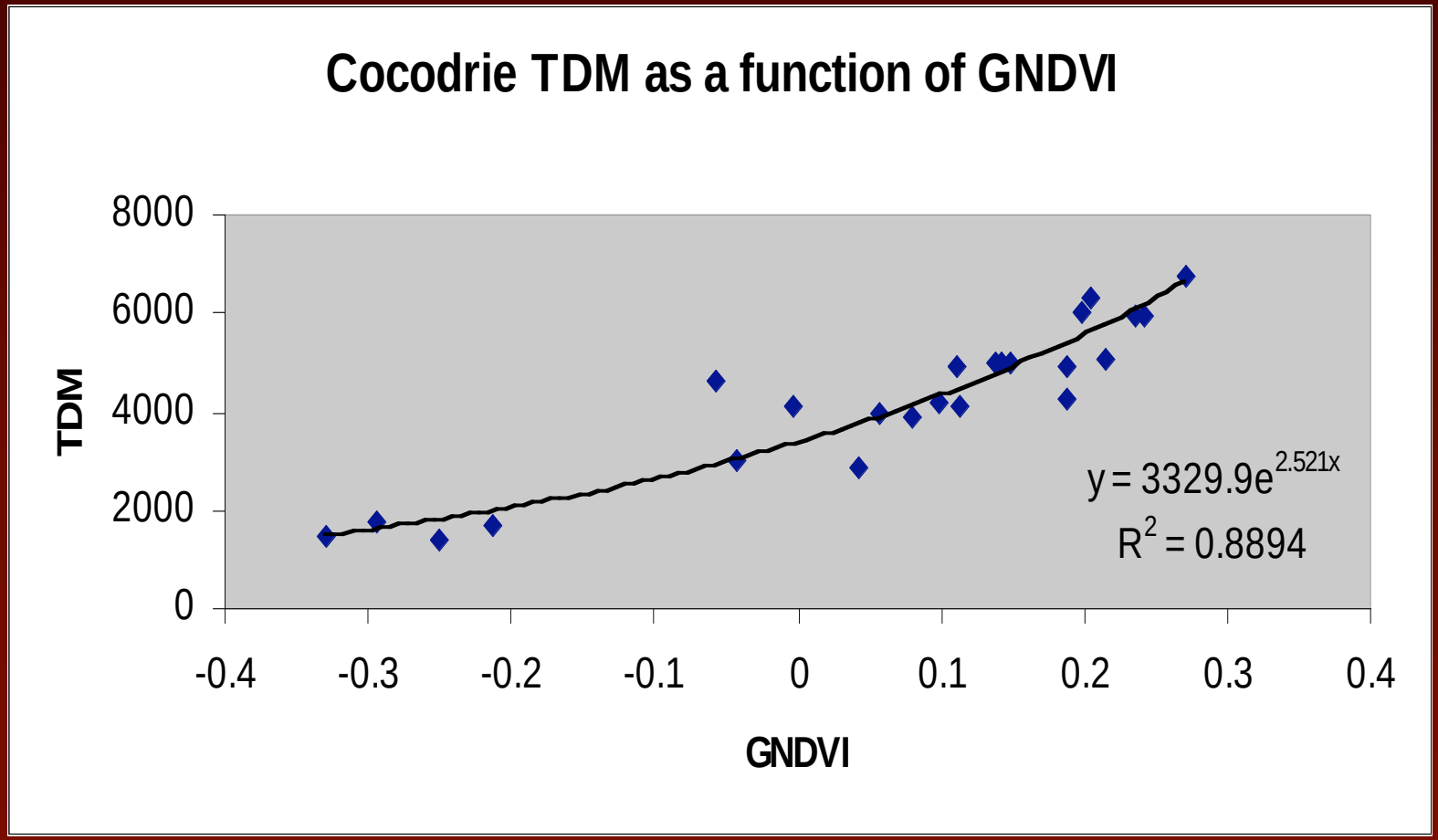
Results

Green NDVI
DREC 2007

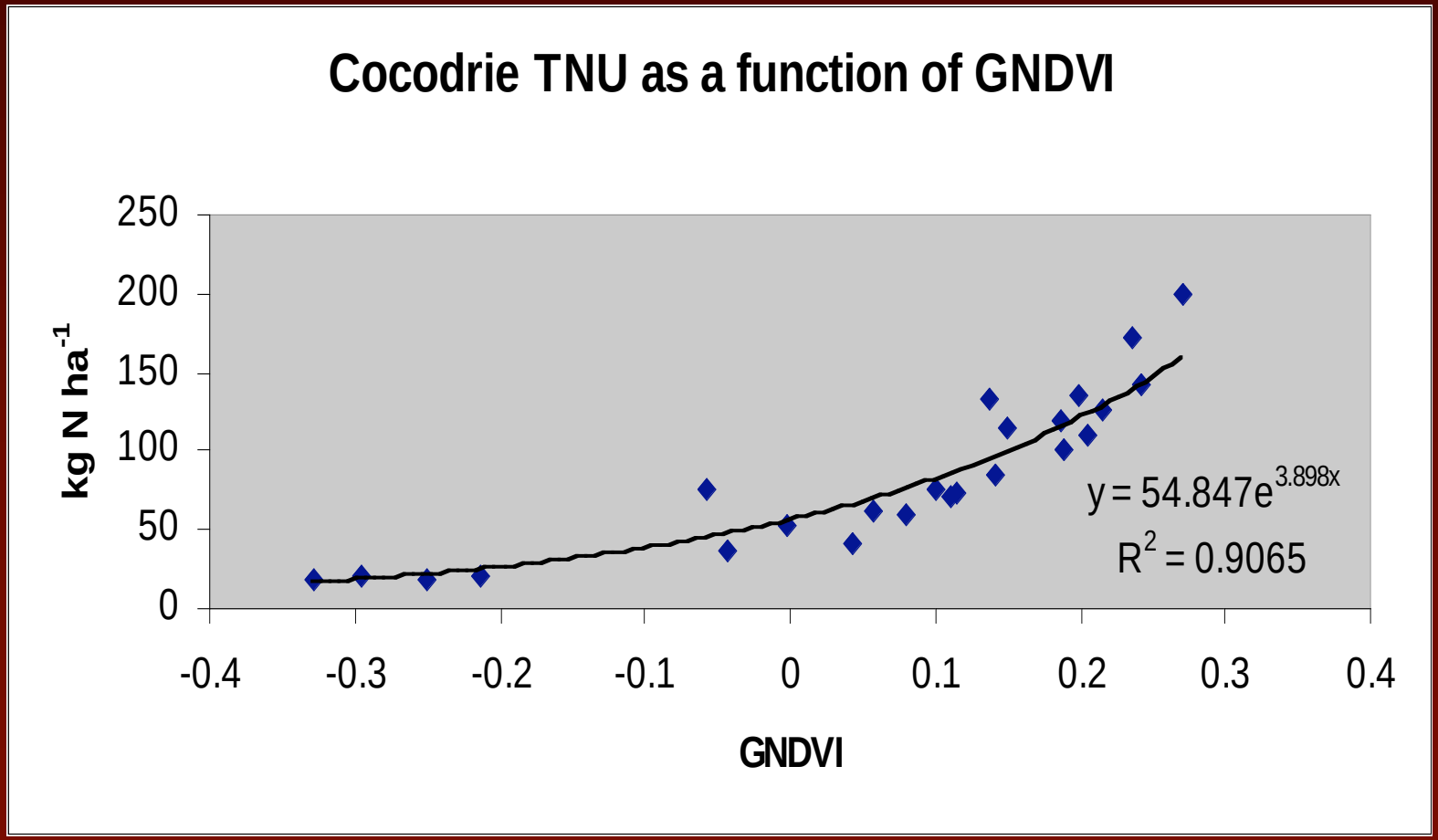




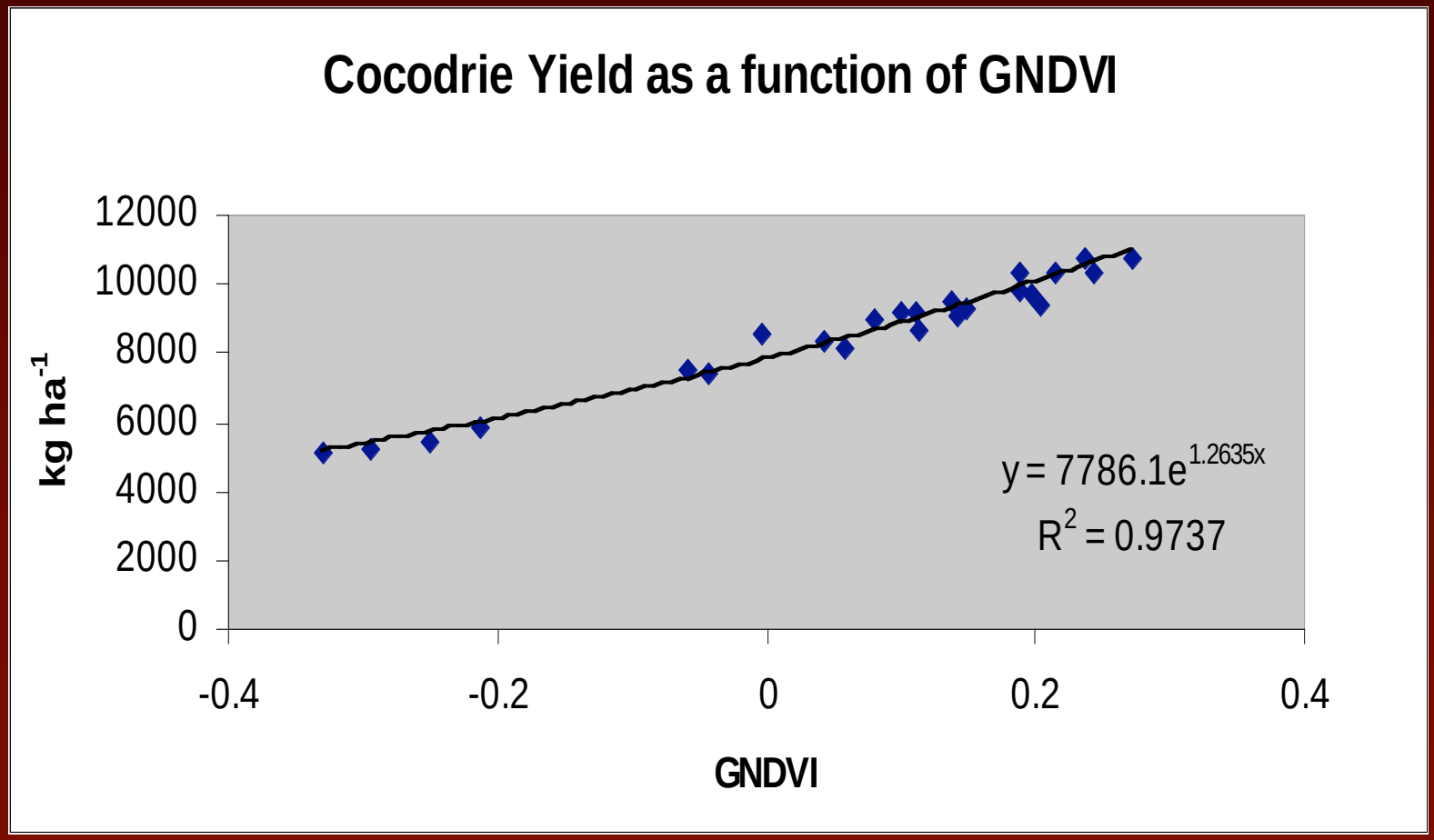
Results


Cocodrie TDM as a function of GNDVI
TDM
8000
6000
4000
2000
0
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
GNDVI
y = 3329.9e^2.521x
R^2 = 0.8894

Results


Cocodrie TNU as a function of GNDVI
kg N ha-1
250
200
150
100
50
0
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
GNDVI
y = 54.847e3.898x
R2 = 0.9065

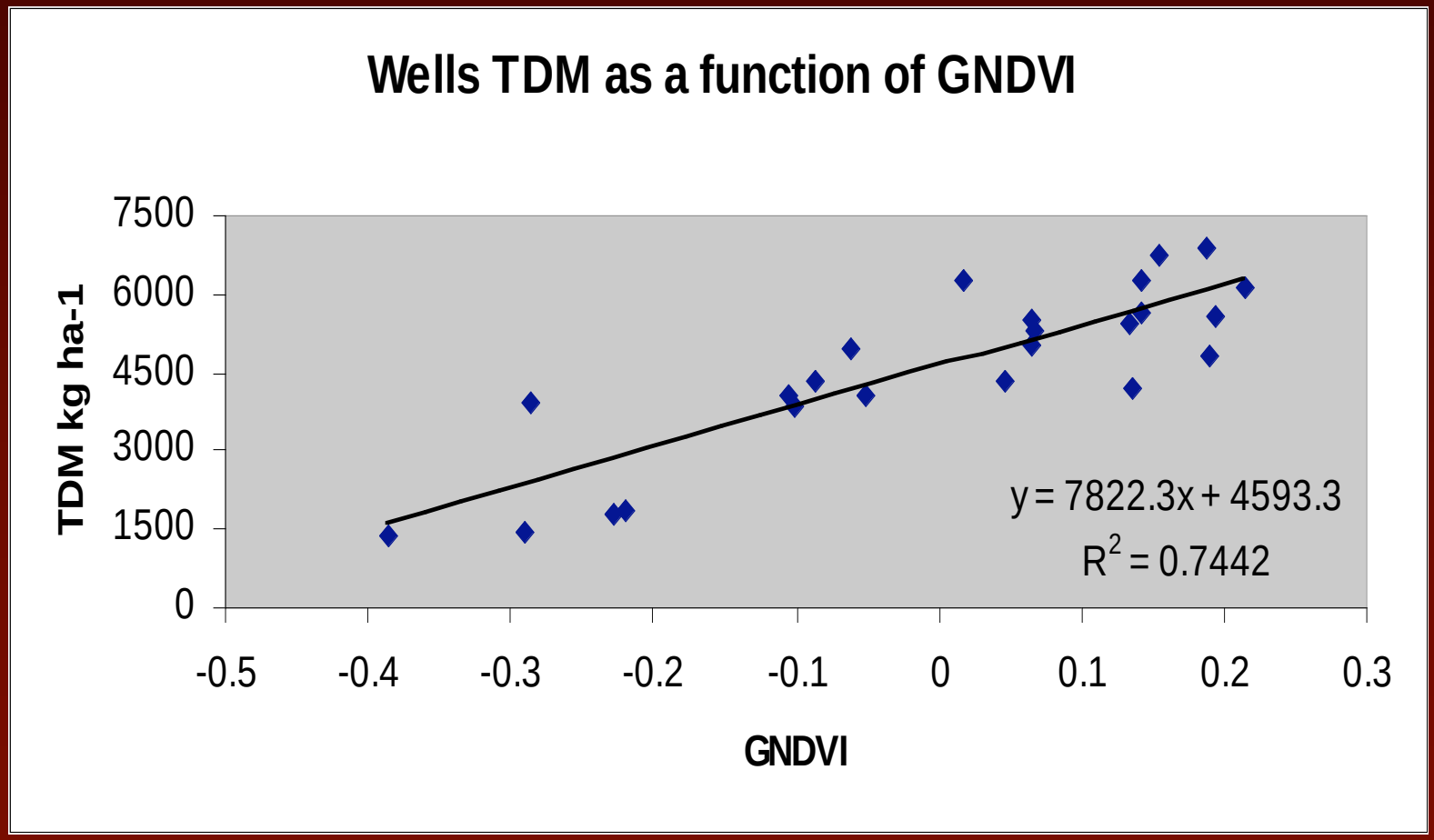
Results


Cocodrie Yield as a function of GNDVI
12000
10000
8000
6000
4000
2000
0
kg ha-1
-0.4
-0.2
0
0.2
0.4
GNDVI
y = 7786.1e1.2635x
R2 = 0.9737

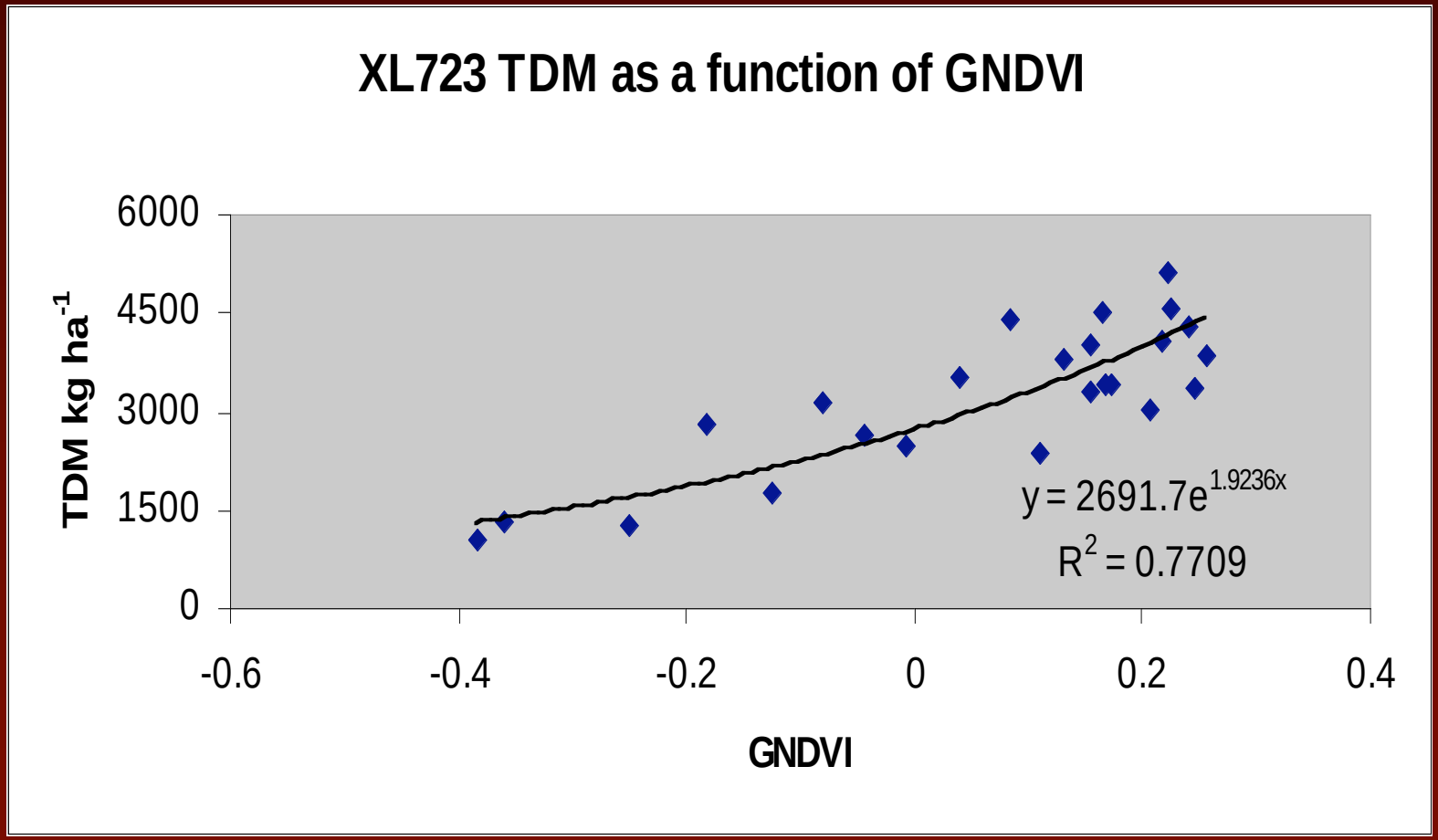
Summary

- Grain yield demonstrated strong positive correlation with TDM and TNU
- TDM for three cultivars was related to GNDVI with relatively high coefficients of determination ($R^2 \geq 0.74$)
- TNU for three cultivars was related to GNDVI with relatively high coefficients of determination ($R^2 \geq 0.80$)
- Grain yield for three cultivars was related to GNDVI with relatively high coefficients of determination ($R^2 \geq 0.90$)

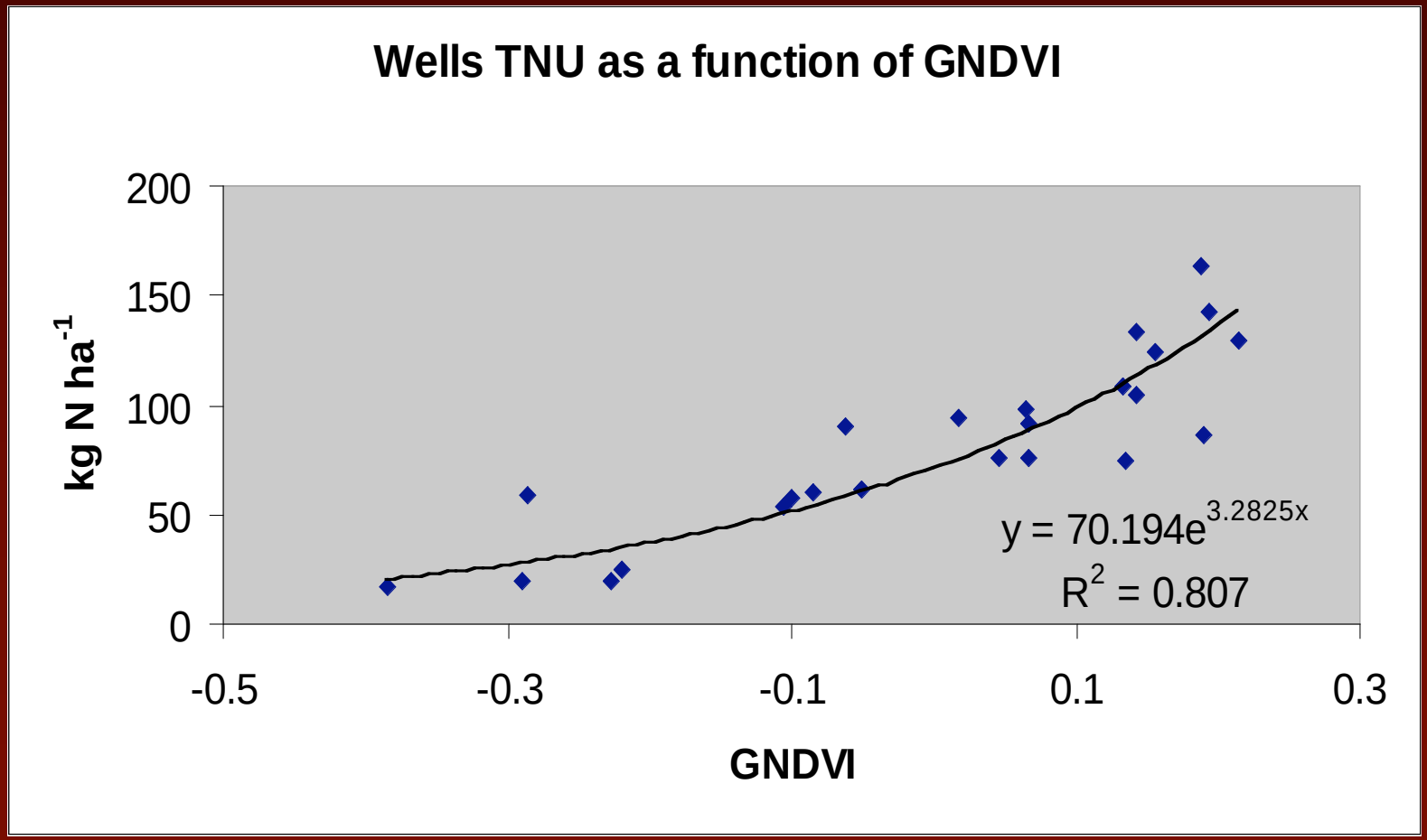
Results


Wells TDM as a function of GNDVI
TDM kg ha-1
7500
6000
4500
3000
1500
0
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
GNDVI
y = 7822.3x + 4593.3
R2 = 0.7442

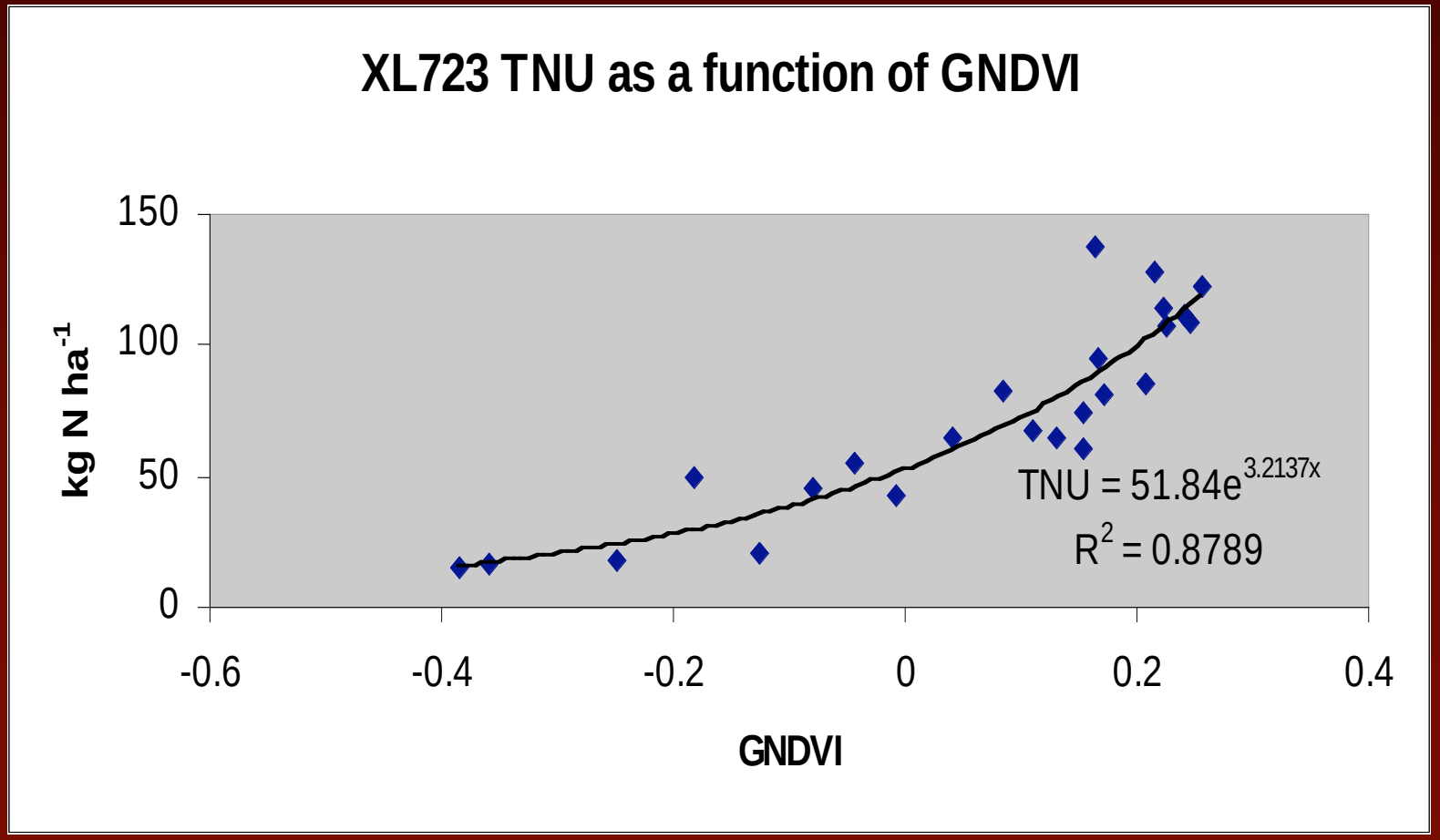
Results


XL723 TDM as a function of GNDVI
TDM kg ha-1
6000
4500
3000
1500
0
-0.6
-0.4
-0.2
0
0.2
0.4
GNDVI
y = 2691.7e1.9236x
R2 = 0.7709

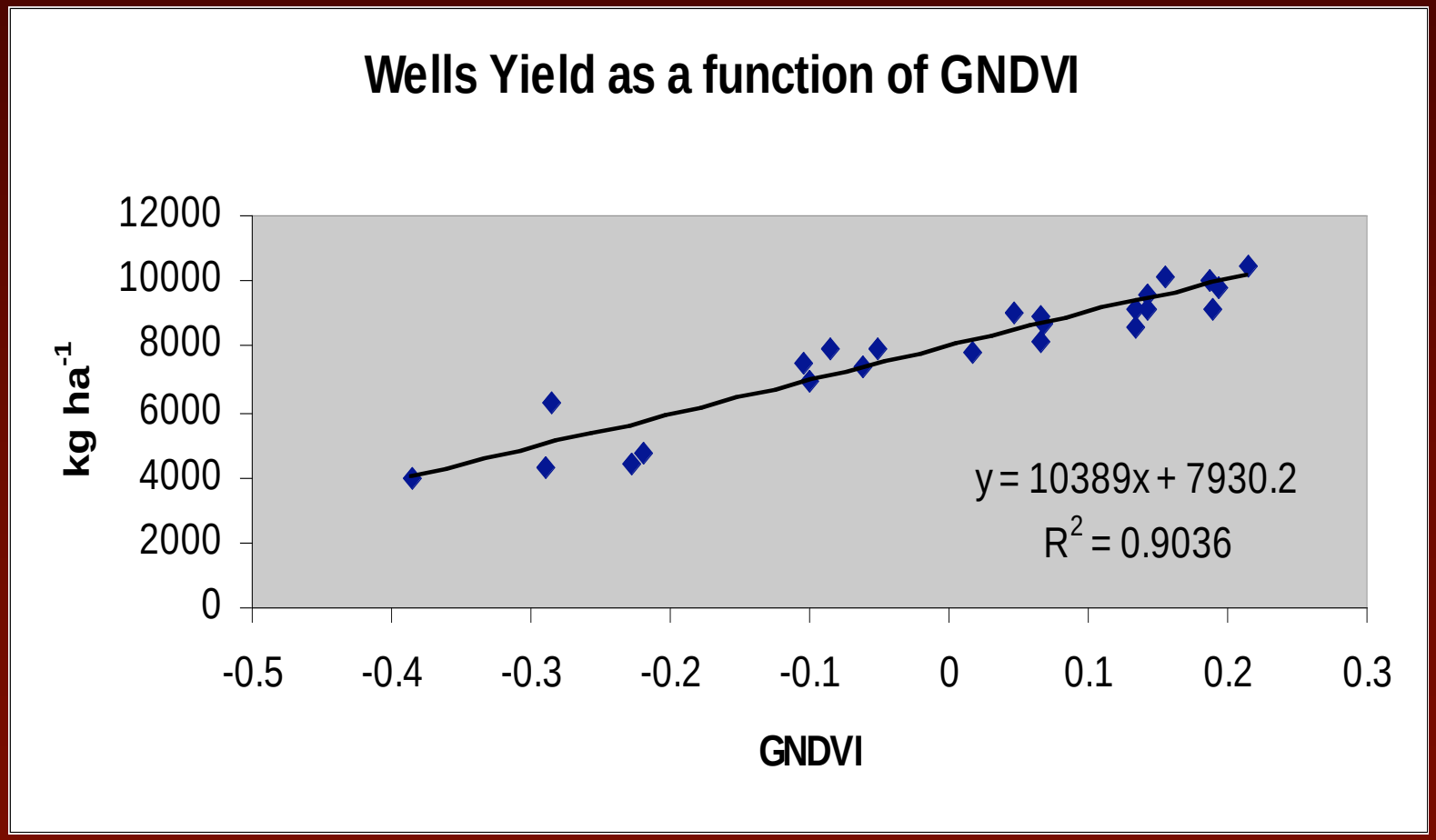
Results


Wells TNU as a function of GNDVI
kg N ha-1
200
150
100
50
0
-0.5
-0.3
-0.1
0.1
0.3
GNDVI
y = 70.194e3.2825x
R2 = 0.807

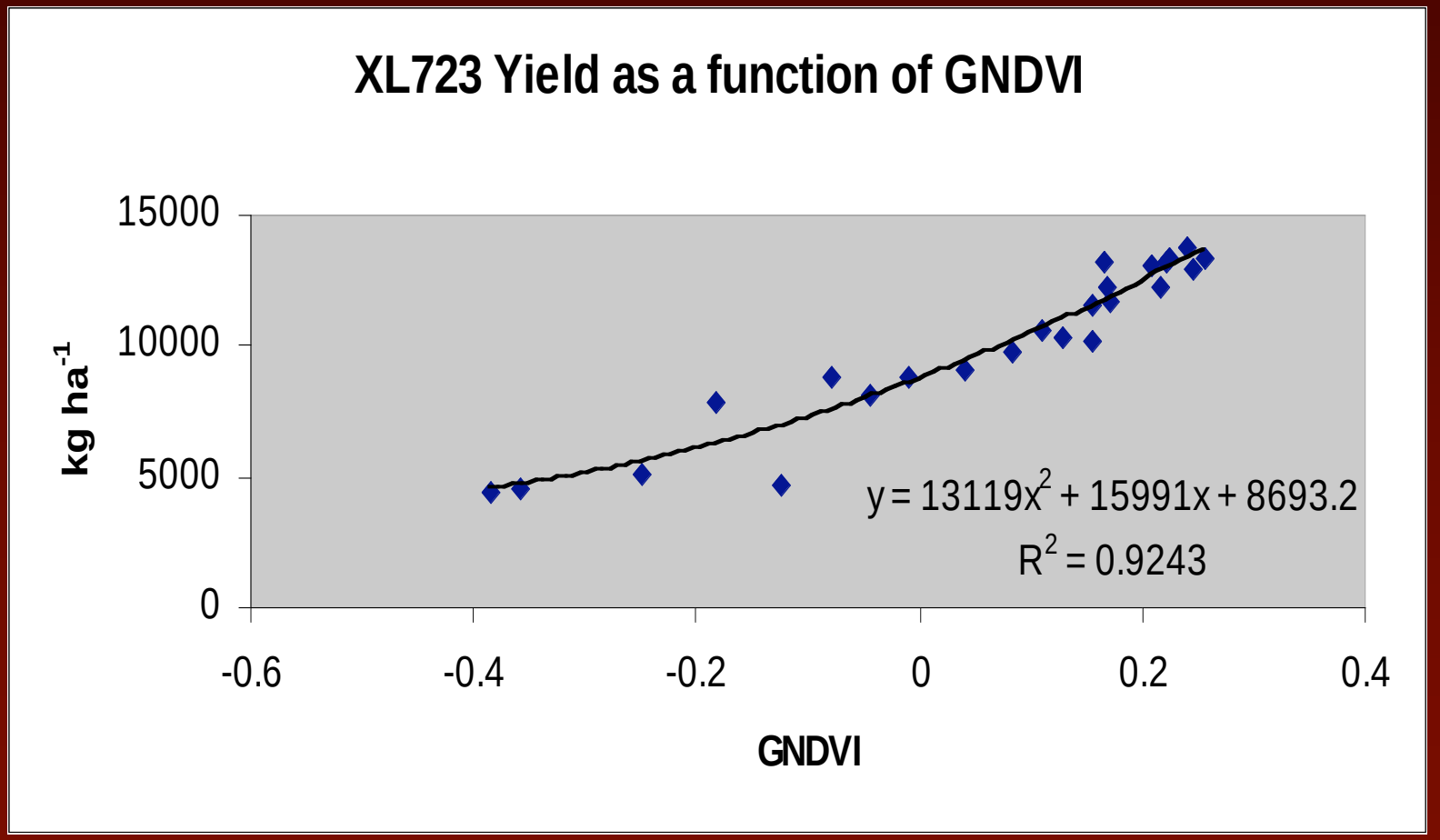
Results


XL723 TNU as a function of GNDVI
kg N ha-1
150
100
50
0
-0.6
-0.4
-0.2
0
0.2
0.4
GNDVI
TNU = 51.84e3.2137x
R2 = 0.8789

Results


Wells Yield as a function of GNDVI
kg ha-1
12000
10000
8000
6000
4000
2000
0
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
GNDVI
y = 10389x + 7930.2
R2 = 0.9036

Results


XL723 Yield as a function of GNDVI
15000
10000
5000
0
kg ha-1
-0.6
-0.4
-0.2
0
0.2
0.4
GNDVI
y = 13119x2 + 15991x + 8693.2
R2 = 0.9243