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Theme: Addressing Challenges Facing Humanity through Research and Innovation

Improvement of area accuracy in general boundary areas in Kenya: Case study of Juja – Kiambu County

by
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INTRODUCTION

The Preliminary Index Diagram

- Refers to a demarcation map prepared from **enlarged**, **marked** and **un-rectified** aerial photo graphs used together with adjudication record to register rights and interests on Adjudicated land areas.

- Trust land in Kenya constitutes about 70% of registered land, also known as "**Adjudication Area"**. Land registration in these areas is done using the PIDs. About 50% of land registration on these areas has been completed while 20% is yet to be done.

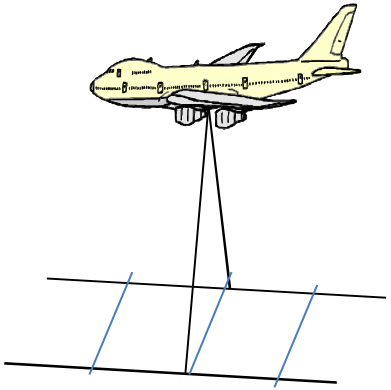
- The responsibility of producing the PIDs lies with the department of Survey of Kenya and collaborates with the department of Adjudication and Lands in the process of the registration of individual titles to land.

Problem Statement

- Currently the PIDs are produced from enlarged, marked and un-rectified aerial photographs.

- They contain distortions to parcel area which more than often is a source of land disputes especially resolving the gap between the documented and the actual parcel area.

The PID making process



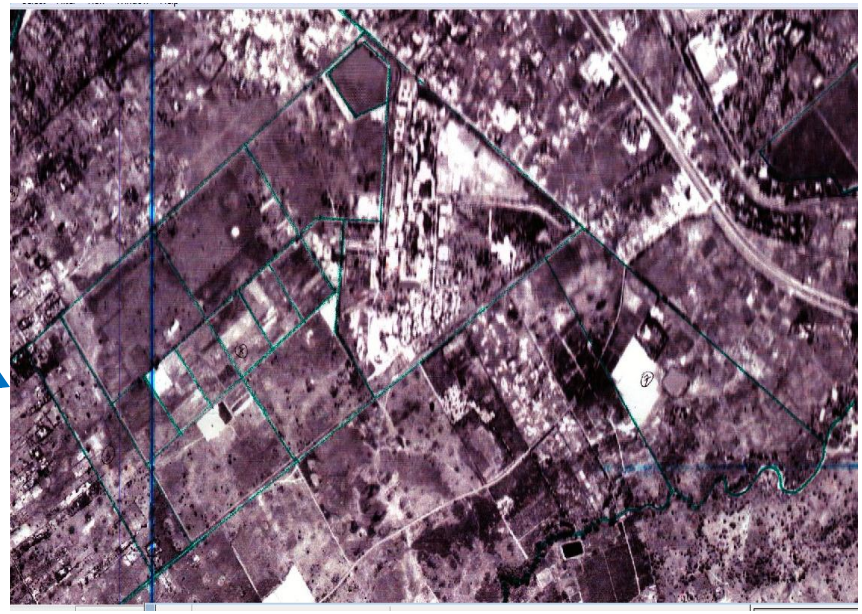
(1) Aerial photography

(2) Area photo 1:12,500

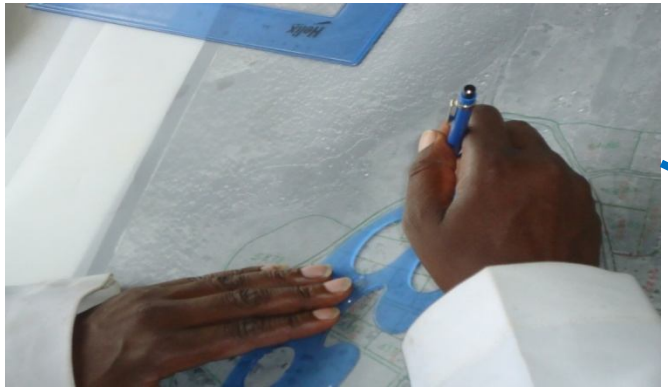
(3) Enlarged photo 1:2,500

PID making process .....ctd

(4) Enlarged photo marking at the field



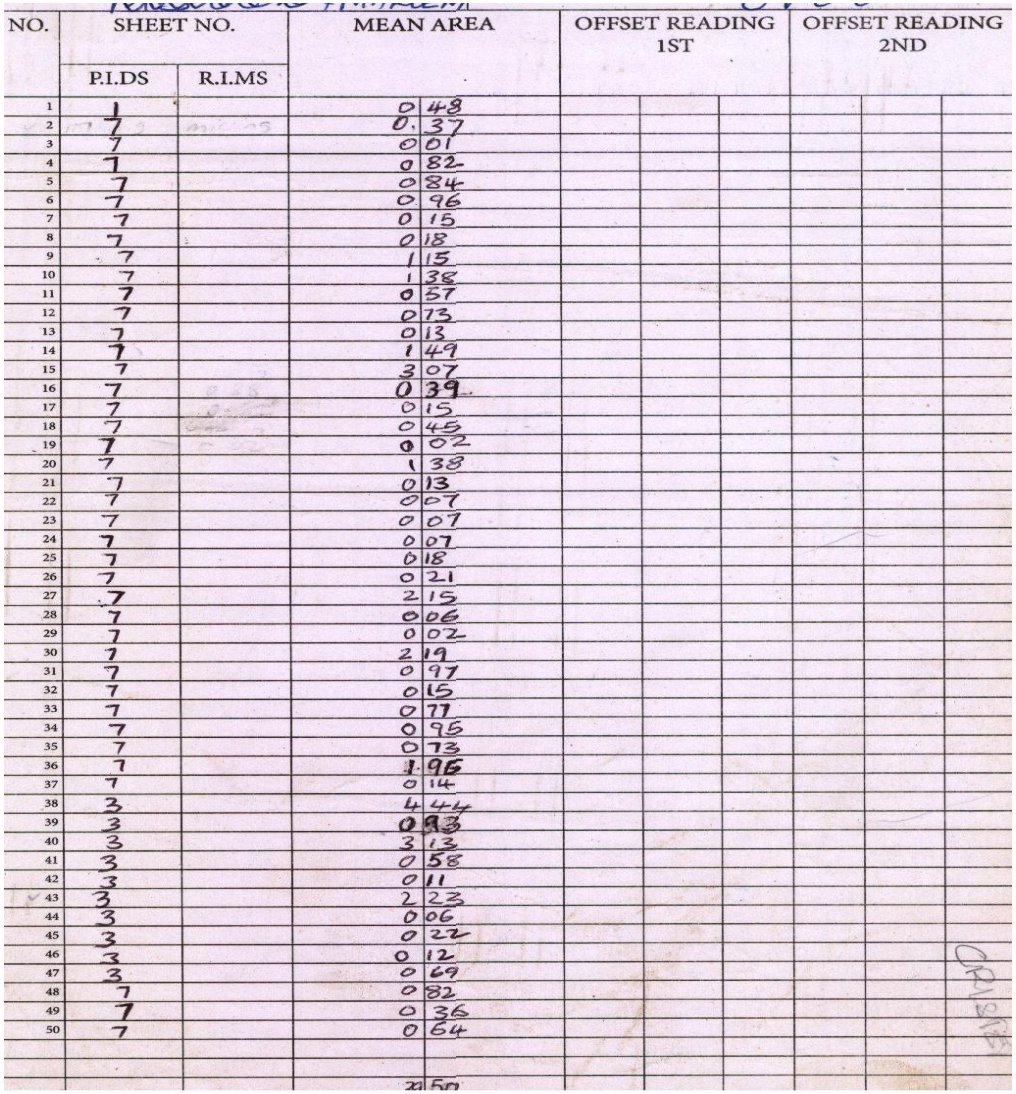
(5) Marked, enlarged aerial photo



(6) Tracing parcel details onto durafilm

(7) Area measurement with plannimeter

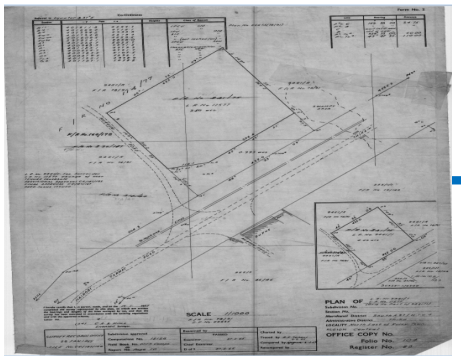
PID making process .....ctd



NO.	SHEET NO.		MEAN AREA	OFFSET READING 1ST	OFFSET READING 2ND
	P.I.DS	R.I.MS			
1	1		0 48		
2	7		0. 37		
3	7		0 01		
4	7		0 82		
5	7		0 84		
6	7		0 96		
7	7		0 15		
8	7		0 18		
9	7		1 15		
10	7		1 38		
11	7		0 57		
12	7		0 73		
13	7		0 13		
14	7		1 49		
15	7		3 07		
16	7		0 39		
17	7		0 15		
18	7		0 45		
19	7		0 02		
20	7		1 38		
21	7		0 13		
22	7		0 07		
23	7		0 07		
24	7		0 07		
25	7		0 18		
26	7		0 21		
27	7		2 15		
28	7		0 06		
29	7		0 02		
30	7		2 19		
31	7		0 97		
32	7		0 15		
33	7		0 77		
34	7		0 95		
35	7		0 73		
36	7		1 96		
37	7		0 14		
38	3		4 44		
39	3		0 93		
40	3		3 13		
41	3		0 58		
42	3		0 11		
43	3		2 23		
44	3		0 06		
45	3		0 27		
46	3		0 12		
47	3		0 69		
48	7		0 82		
49	7		0 36		
50	7		0 64		

(8) Manual generation of area list

Ground Surveying Process



(1) Datum Plans & Recce

(2) Traverses & Boundary Picking

CONSISTENCY CHECKS

	B1	-	A45		FR 518/107	**B1**	**-11391.43**	**4017.29**
342	40 '	37.0 "		41.570	-12.966	A45	-11349.86	4004.32
	43.545						0.00	0.00
						A45	-11349.86	4004.32
	A45	-	A43					
201	54 '	28.0 "		-187.285	-75.317	A43	-11537.14	3929.01
	201.86						0.00	0.00
						A43	-11537.14	3929.01
	Bd	-	A38		FR 518/107	**Bd**	**-11312.52**	**3850.29**
3	18 '	24.0 "		4.050	0.234	A38	-11308.47	3850.52

(3) Area computations
Linear measurements
Angular measurements

OBJECTIVES

1. To make comparisons between parcel area obtained through aerial photography and that obtained through ground survey.

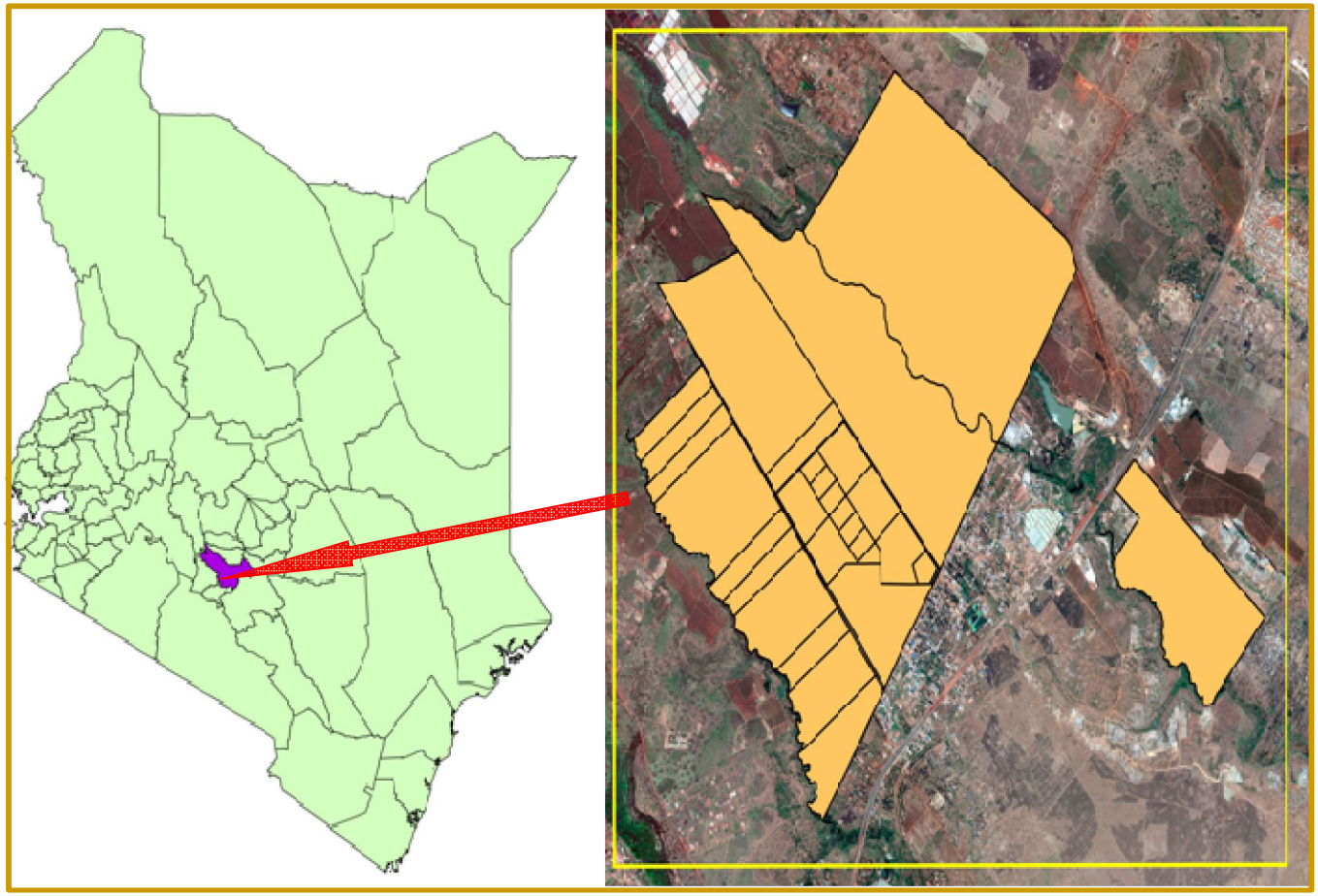
2. To investigate the effect of changes in acreage, slope and elevation on PID area accuracy.

3. To develop a procedure for the improvement of PID area accuracy.

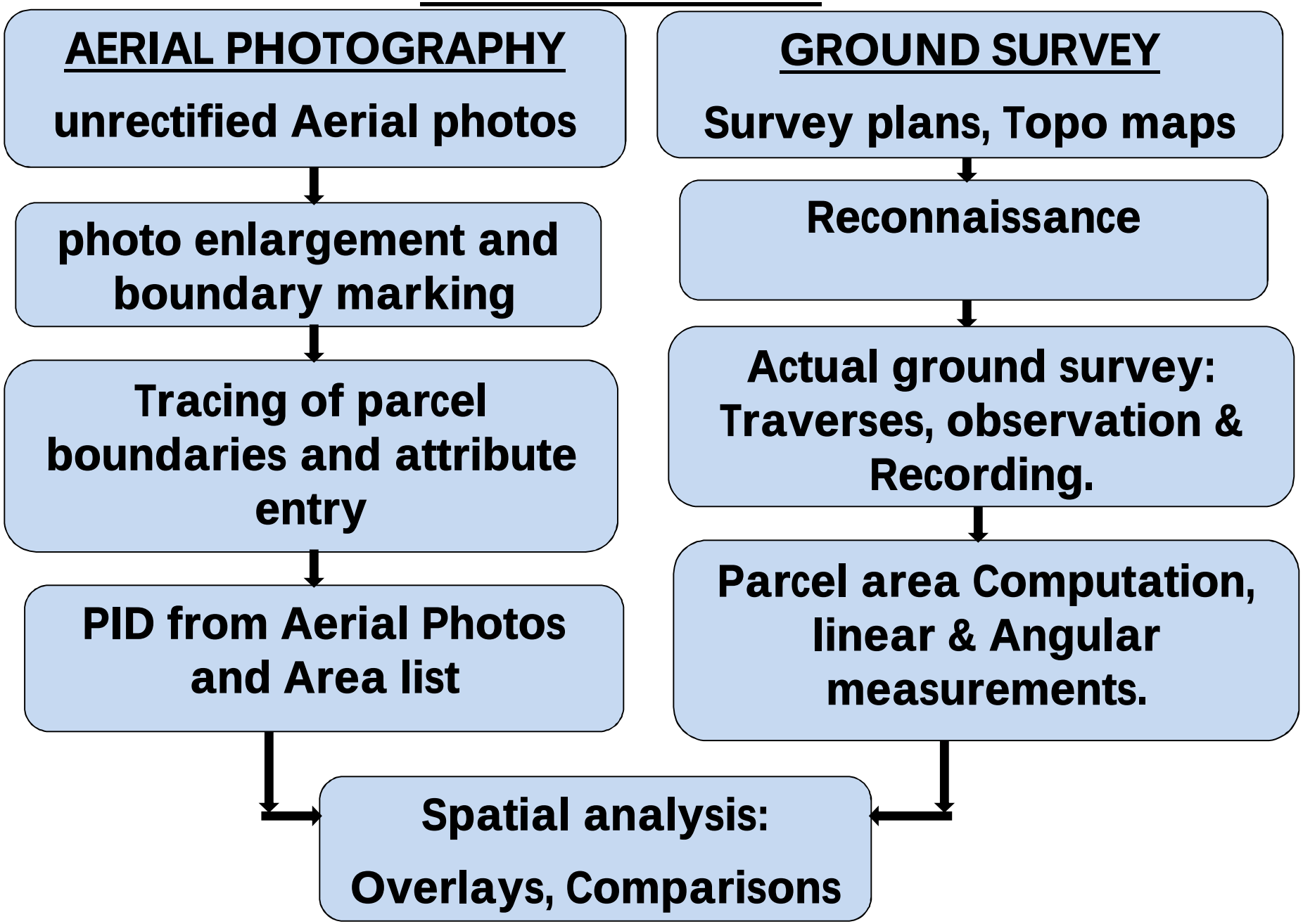
AREA OF STUDY

The area of study is Juja situated about 36 km North East of Nairobi city;

The area covers about 64km^2 within coordinates S 1° 02' 40'' - S 1° 07' 20'' and E 37° 05' 04'' - E 37° 04' 50''.



METHODOLOGY

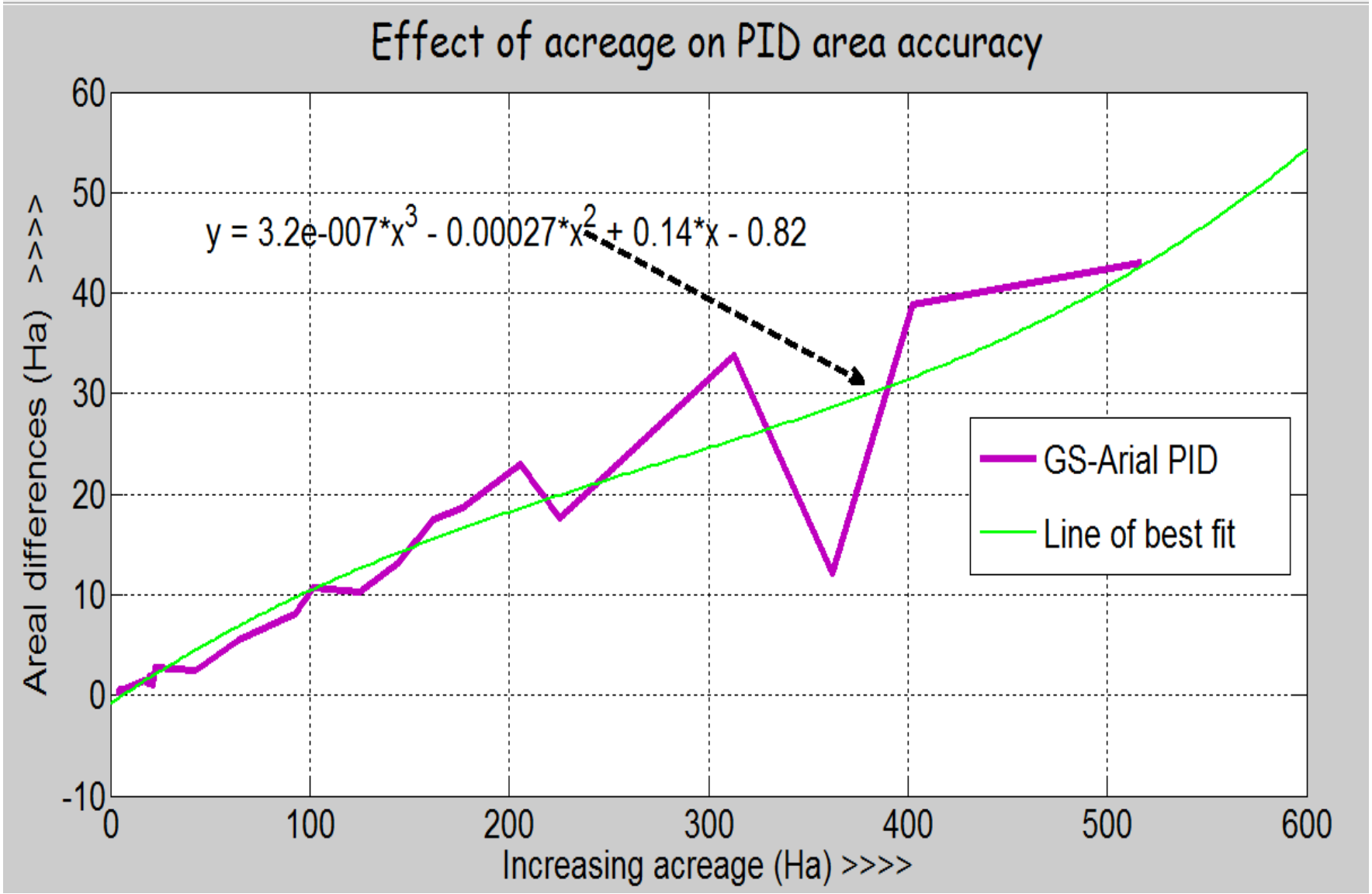


RESULTS

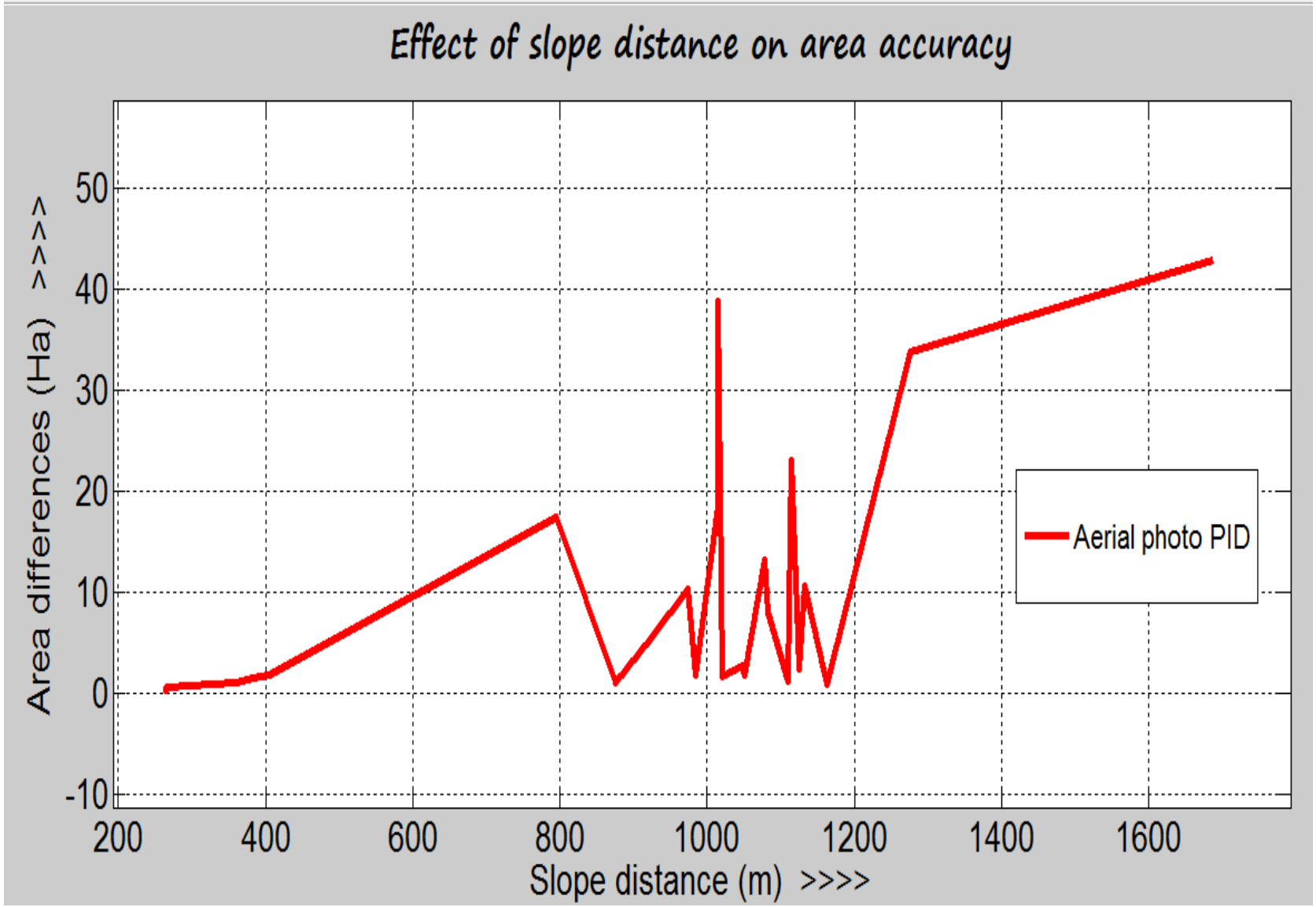
Comparison

Parcel_No	GS Areas	Aerial PID Areas	GS-ArealPID
1	161.80	144.29	17.51
2	517.61	474.62	42.99
3	312.83	278.99	33.84
4	205.73	182.68	23.05
5	19.77	18.03	1.74
6	176.68	158.10	18.59
9	402.18	363.39	38.79
10	92.96	84.84	8.12
11	20.12	18.95	1.17
12	64.17	58.69	5.48
13	19.64	17.79	1.85
14	21.06	19.28	1.78
15	101.77	91.09	10.68
16	21.37	20.37	1.00
17	21.22	19.95	1.28
18	22.40	19.64	2.77
19	42.59	40.13	2.46
20	144.36	131.19	13.18
21	124.99	114.65	10.35
42	21.06	19.14	1.92
46	2.94	2.64	0.31
47	4.56	4.16	0.40
48	4.57	3.95	0.62
49	4.57	4.13	0.44
50	4.54	4.22	0.32
51	19.25	18.09	1.16
52	4.55	4.01	0.54
53	4.61	4.01	0.60
54	17.03	15.56	1.48
Mean			**214.07**
RMS			**14.63**

(a) Acreage

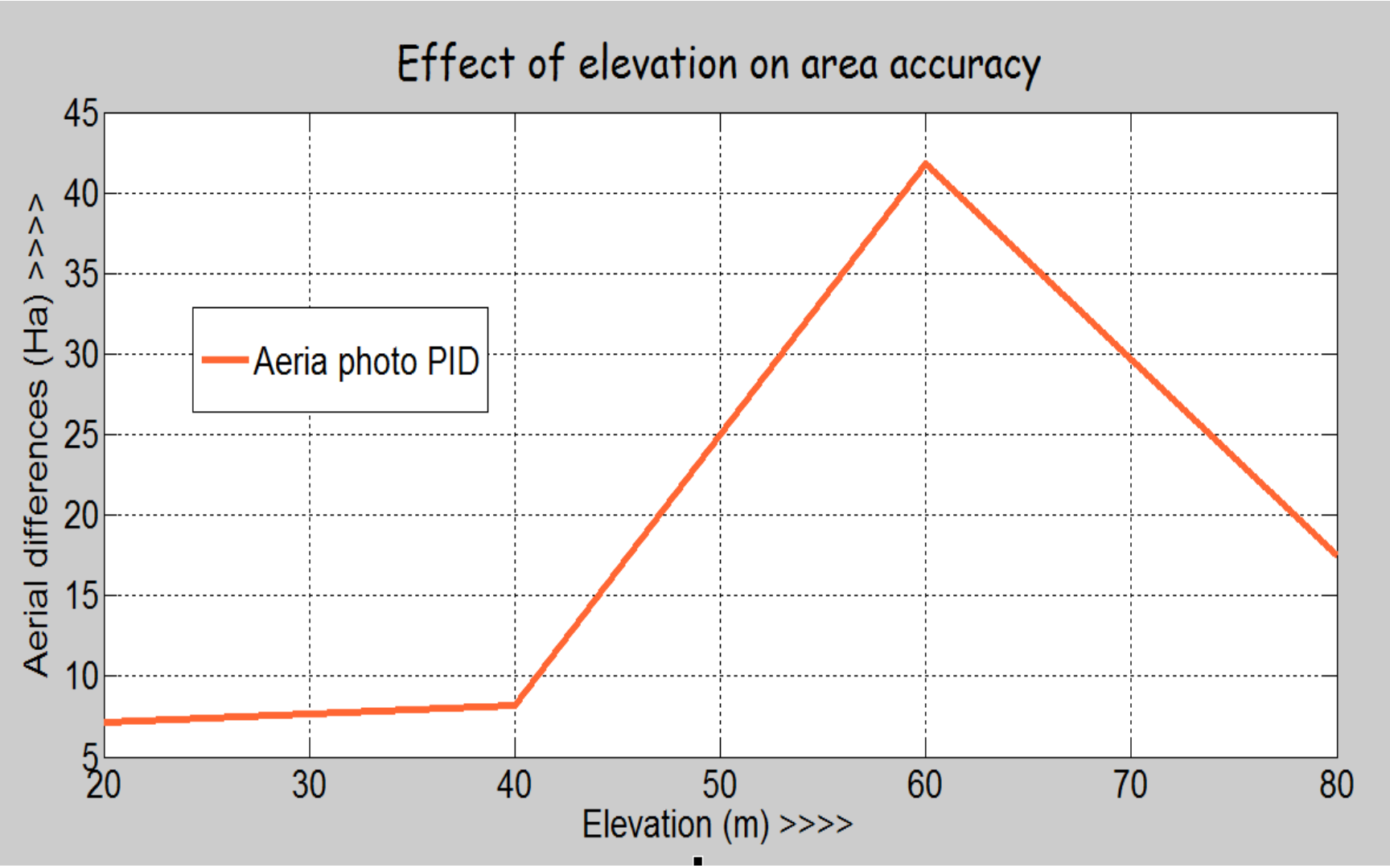

Effect of acreage on PID area accuracy
y = 3.2e-007*x^3 - 0.00027*x^2 + 0.14*x - 0.82
GS-Arial PID
Line of best fit
Areal differences (Ha) >>>>
Increasing acreage (Ha) >>>>
60
50
40
30
20
10
0
-10
0
100
200
300
400
500
600

(b) Slope distance

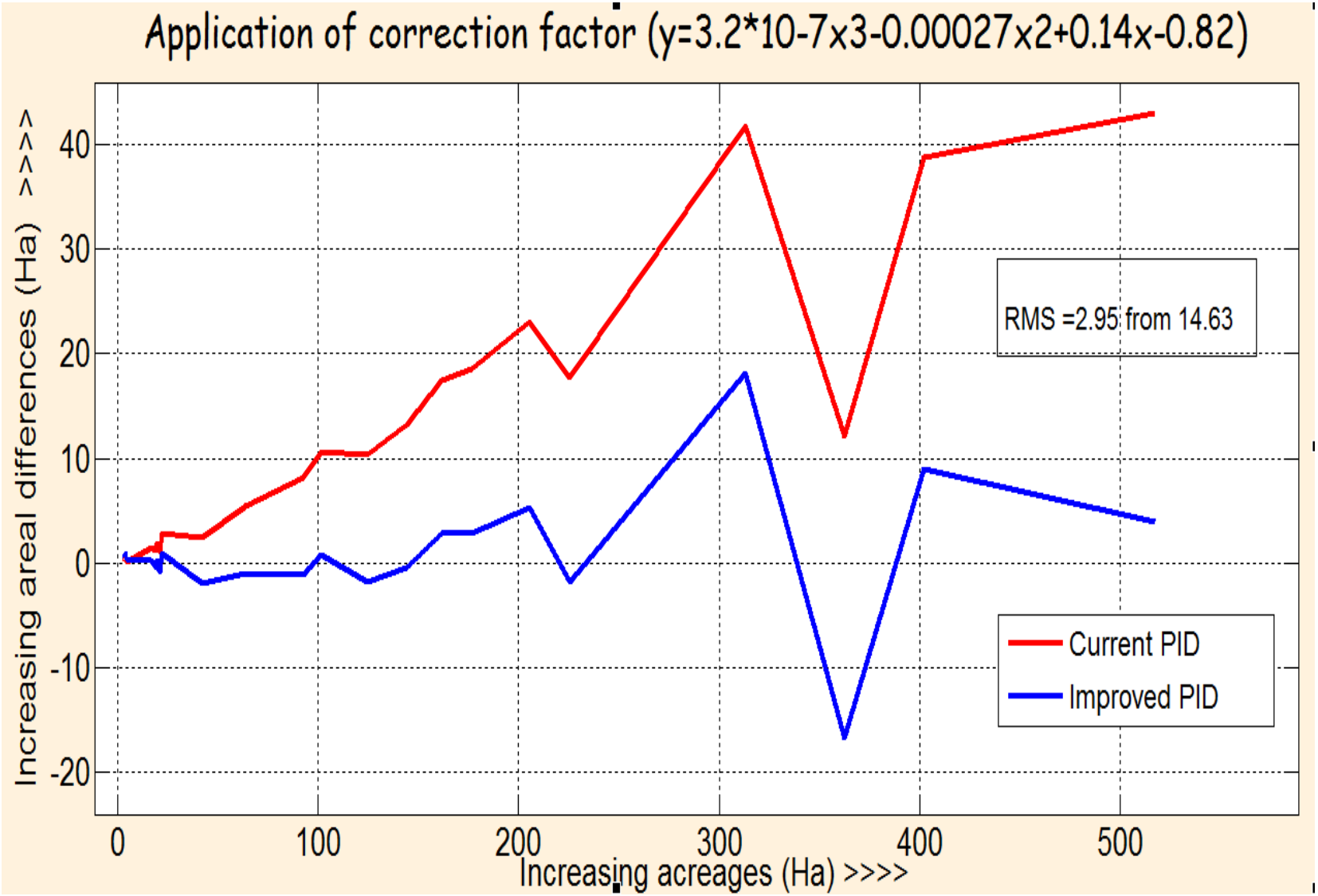


(c) Elevation

RESULTS.....ctd



Correction factor



CONCLUSIONS AND RECOMMENDATIONS

- There are significant variations between PID areas and Ground survey areas.
- The RMS of variations between PID areas and Ground surveyed areas **±** 14.63 Ha.
- The application of generated correction factor $y=3.2*10^{-7}x^3$ **$-0.00027x^2+0.14x-0.82$ (where x= acreage)** reduces the current PID area error to RMS **± 2.95** from **± 14.63** (80%).
- In the absence of resources to implement other better methods e.g. satellite imagery technique, the correction equation obtained out of aerial photo technique can be used to easily obtain more correct parcel acreage.

- We shall consider effects of slope and elevation in our future studies.

THANK YOU ALL

Questions and Comments !!!