Ghana Yield Gap Analysis

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Recommendations

- Largest yield gap is the technical yield gap, followed by the economic, allocative and technical efficiency yield gaps.
- Policies that close the allocative or economic yield gaps are very important. For example, subsidy programs which lower the cost of nitrogen will help to close the allocative yield gap.
- Determinants of inefficiency (still to come).

Outline of analysis

- Working within the yield gap decomposition framework.
- Stochastic frontiers analysis.
- So far only a Cobb Douglas production function.
- Limited to simpler models somewhat by the quality of the data.

Data

- Main data source is the EGC-ISSER Ghana Panel Survey.
- One year of data covering 2009-10.
- We focus only on the major season as input use is low in the minor season.
- We find the quality of the data to be lower than the LSMS-ISA surveys. in general, and this results in a simpler analysis than Ethiopia.

Summary statistics

Variable	Mean	Median	SD	Skewness	Min	Max
yld	724.4	466.2	934	4.883	0.956	13318
N	4.788	0	15.06	5.131	0	185.3
area	1.414	1.214	1.254	2.3	0.02	9.01
lab	880.4	615.4	1247	12.02	41.02	28763
asset	263.3	46.95	830	9.717	0	13408
herb	0.198	0	0.399	1.517	0	1
mech	0.279	0	0.449	0.986	0	1
elevation	197	190.2	93.82	0.443	-5.4	507.2
SOC2	7.558	6.927	3.751	2.117	1.535	30.77
phdum2	0.854	1	0.354	-2.001	0	1
yesN	0.18	0	0.384	1.668	0	1

Method

- Cobb Douglas production curve
- We may experiment with more complicated production functions but initial results are not promising.
- Decomposition of the yield gap

Frontier yield response model

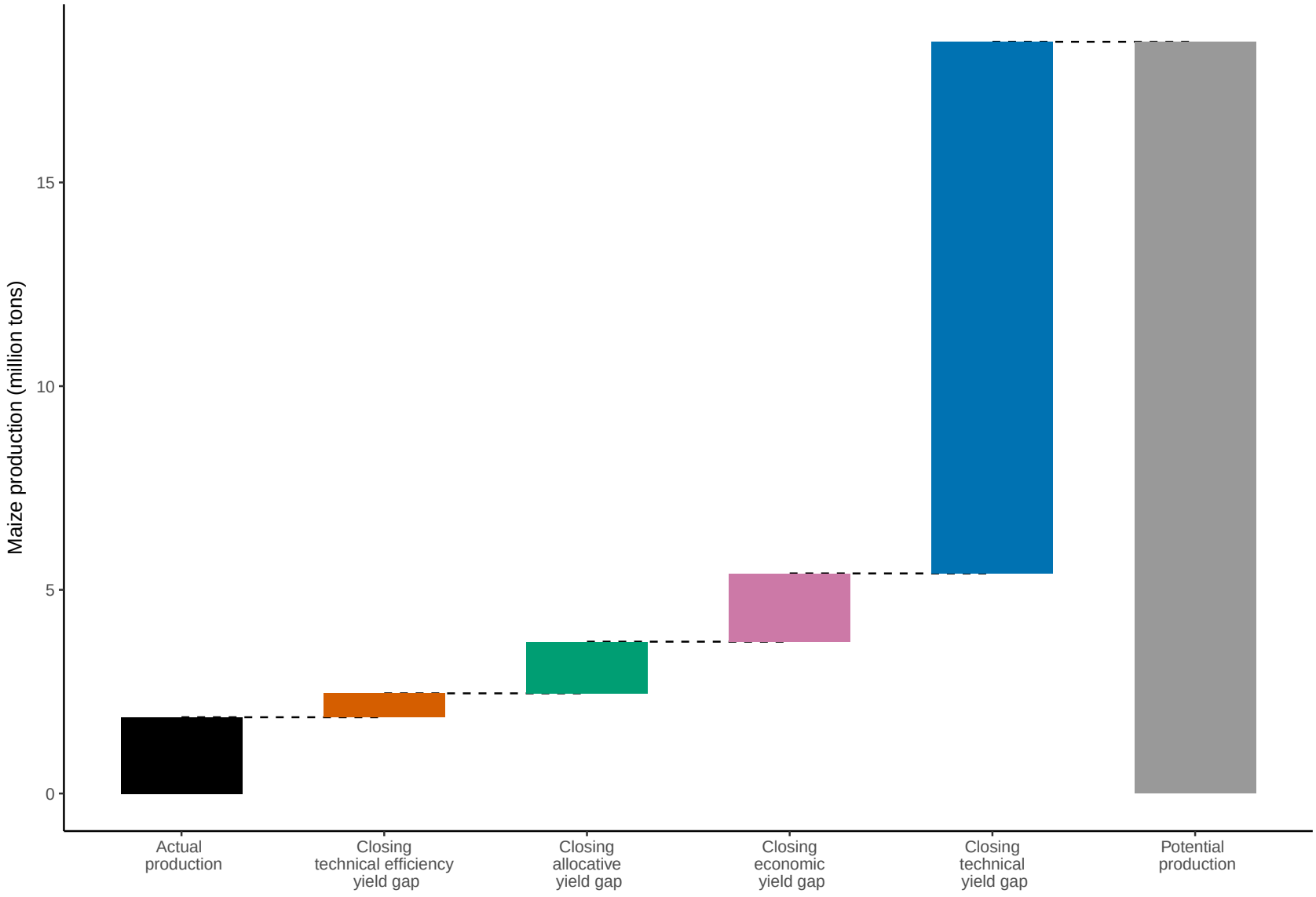
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	6.384	0.553	11.55	0
logN	0.167	0.025	6.803	0
loglab	0.022	0.089	0.242	0.809
logasset	0.019	0.016	1.188	0.235
logarea	-0.458	0.084	-5.436	0
herb	0.31	0.071	4.375	0
mech	0.378	0.073	5.211	0
elevation	0	0	1.204	0.229
SOC2	-0.008	0.009	-0.853	0.394
phdum2	0.263	0.084	3.14	0.002
sigmaSq	2.387	0.142	16.8	0
gamma	0.823	0.025	32.67	0

Yield gaps by zone

Table 3: Relative yield gap

ZONE	TEYG	AYG	EYG	TYG	YG
ASHANTI	2	8	6	83	100
BRONG AHAFO	3	8	10	79	100
CENTRAL	3	6	15	76	100
EASTERN	4	6	12	78	100
GREATER ACCRA	4	4	15	77	100
NORTHERN	5	11	7	77	100
UPPER EAST	7	7	10	76	100
UPPER WEST	4	7	12	77	100
VOLTA	4	9	13	74	100
WESTERN	2	5	11	82	100
Total	4	8	9	78	100

National Yield gap decomposition



Economic yield assumptions

- Nitrogen capped at 200 kg/ha - link to nutrient gap project?
- Assets increased by 50% - is this reasonable?
- labour increased by 50% - is this reasonable?
- All farmers assumed to use herbicide
- All farmers assumed to use some form of mechanization in production process (tractor etc.)
- Other suggestions?
- Still to incorporate the GYGA variables in the analysis. This includes water-limited potential yield. Currently Pw = 15229 for all of Ghana!

Next steps

- Add exogenous determinants of technical inefficiency. Policy implications.
- Calculate the marginal effects of exogenous determinants of technical inefficiency.
- Add the GYGA variables to control for growing conditions.
- Experiment with other functional forms - limited success so far.
- Endogeneity and heterogeneity? Data does not appear to be of sufficient quality to bear advanced techniques.

Recommendations/Conclusions

- Smallholder farmers report very small yields compared to other countries e.g. Ethiopia, median is 466 kg/ha, consequently the frontier yield is also low 600 kg/ha.
- Largest yield gap is the technical yield gap, followed by the economic, allocative and technical efficiency yield gaps.
- Mean efficiency $= 0.43$
- Policies that close the allocative or economic yield gaps are very important. For example, subsidy programs which lower the cost of nitrogen will help to close the allocative yield gap.
- Determinants of inefficiency (still to come).