AMIES II - Final Meeting
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amies II

Scenario Development for Sustainable Land Use

in the Greater Caucasus, Georgia

Technical efficiency of potato and dairy farming in mountainous Kazbegi district, Georgia

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- questionnaire was developed for major farming activities
- questionnaires were tested and interviewers were trained
- combination of respondent-driven and stratified sampling methods was employed
  - former included every producer who during the team visit was at home and did not object to interview
  - latter comprised producers of "new" crops, strawberry and lettuce
- survey was carried out by Rati Shavgulidze + Hiwis in June/July 2015
- 154 producers were interviewed

distribution of the surveyed farmers in targeted villages

#	Village	# of Producers
1	Sioni	51
2	Pkhelshe	31
3	Sno	27
4	Kanobi	16
5	Akhaltsikhe	12
6	Arsha	10
7	Goristsikhe	3
8	Garbani	2
9	Gergeti	1
10	Vardisubani	1
Total		154

VolkswagenStiftung

- Questionnaire was revised and simplified
  - 57 producers were surveyed using original questionnaire, and 97 producers were surveyed using revised/ simplified questionnaire
- It was a very strong impression that respondents were under-reporting feedback plus many "no-responses"
- It seemed difficult for producers to identify their plots on the maps; moreover the process was very time-consuming, and it was decided to drop it
- Depending on availability, both female and male representatives of the households were interviewed; only in one case spouses have participated together in the interview

gender of surveyed producers			
female	male	female/male	total
79	74	1	154

- With the exception of two households, all were involved in potato production
- Most of the households were involved in potato and dairy farming, or just in potato production
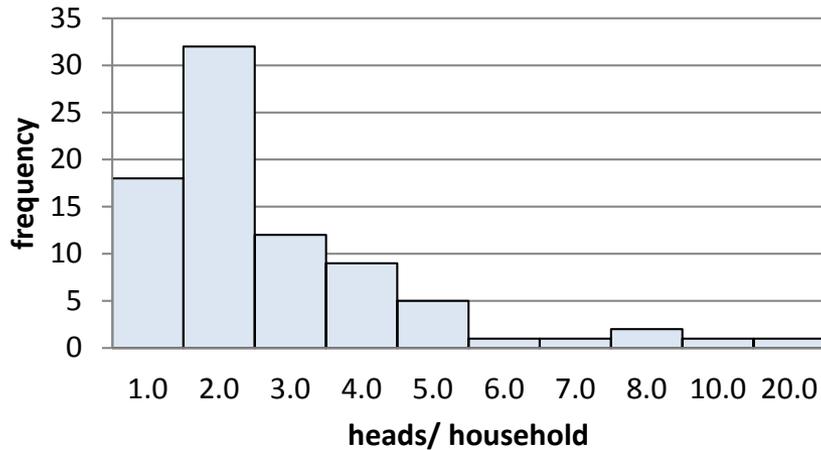
surveyed producer farming activities

activities pursued	# of producers
potato, dairy	70
potato	53
potato, lettuce, dairy	9
potato, lettuce	6
potato, strawberry	5
dairy	2
potato, dairy, beekeeping	2
potato, strawberry, dairy	2
lettuce, beekeeping	1
potato, dairy, sheep	1
potato, lettuce, beekeeping	1
potato, sheep	1
potato, strawberry, beekeeping	1

dairy cattle
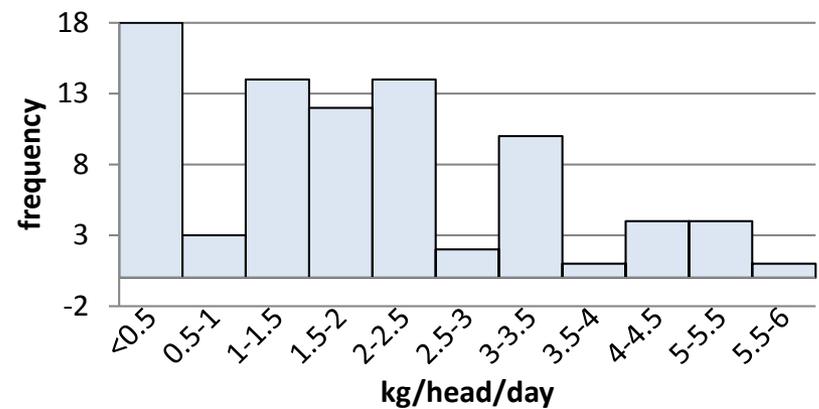
grass land area
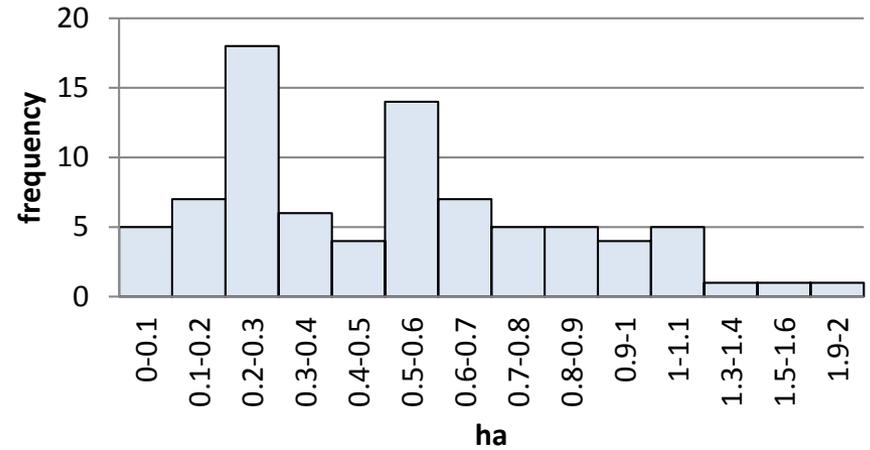
hey feeding rate
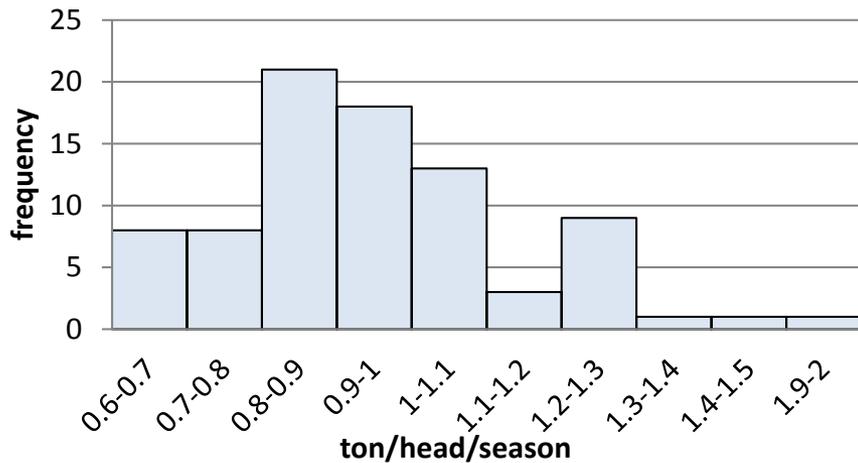
bran feeding rate

Results

Dairy Farming

Descriptive Results

- estimated average gross margin 0.36 GEL/liter

- estimated gross margin ratio - 46%

- imputed family labor input and costs (milking, cleaning, feeding, etc.)

- imputed input costs (hey, transportation, etc.)

- Self-consumed output valued at market prices

gross margin

9
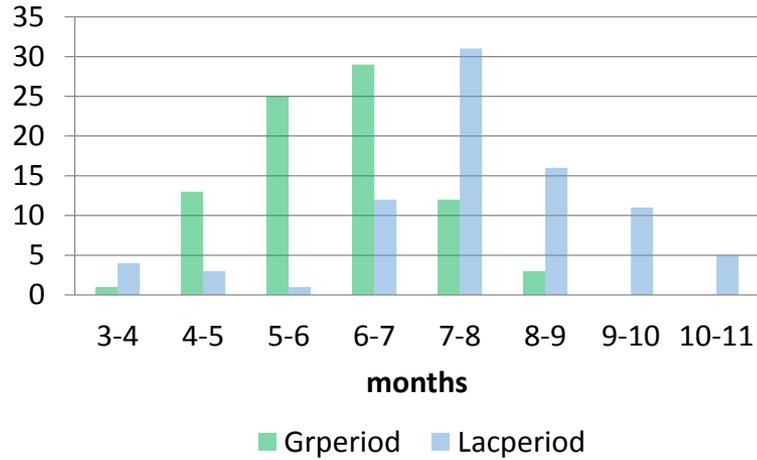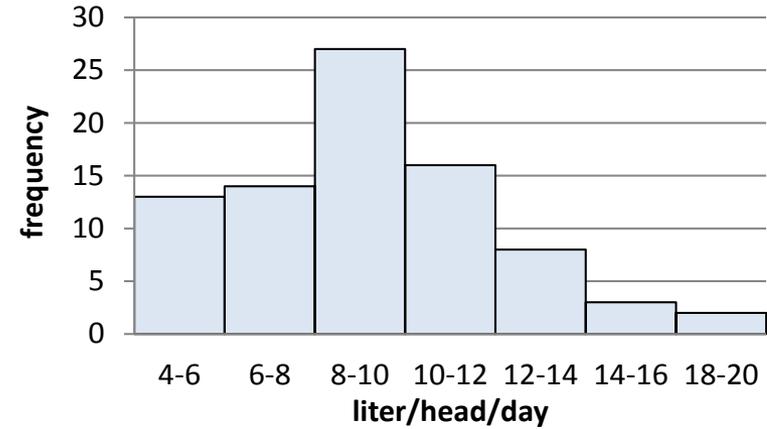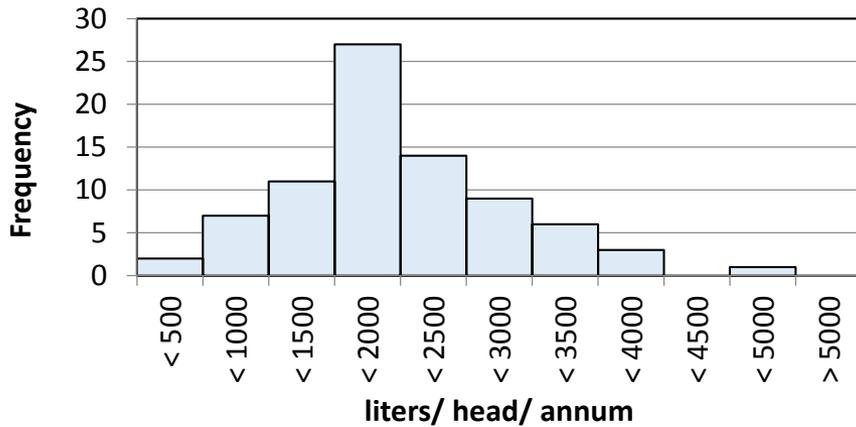
- hypothesis:
    - inefficiency effects are absent
        - *rejected at p<1%*
    - inefficiency effects are not stochastic
        - *rejected at p<1%*
- variables tested
    - regressors: milking rate, milk to cheese conversion rate, area of grass land, periods of grazing, and feeding with hey and bran, bran and hey feeding rate, lactation period, herd size, TVC, labor, and consumption of hey and bran
    - technical inefficiency measures: HH size, # of pensioners in the HH, proportion of adult females in the HH, # of adults, # of adult females in the HH, higher education of HH heads and spouses, off-farm activity and income, pensioner(s) in the HH, cattle, feeding with combined feed, implementation of animal health protection measures, HH income from sales of agriculture products, quality of hey fields

- one stage estimation of SF production and inefficiency models

- stochastic frontier production model
  $ln(CHEESEOUTPUT_{it}) = \beta_0 + \beta_1 ln(LACTATIONPERIOD) + \beta_2 ln(HAY) + \beta_3 ln(HERD) + V_{it} - U_{it}$

- inefficiency model
  $U_{it} = \delta_0 + \delta_1(BRAN_{it}) + W_{it}$

Estimation Results

| variable	significance	explanation
stochastic frontier production model		
intercept	p<1%	
lactation period	p<1%	longer lactation period is positively related with cheese output (elastic)
Hay feeding rate	p<1%	Hey feeding rates is positively related with cheese output (inelastic)
Herd size	p<1%	Herd size is positively related with cheese output (elastic)
inefficiency model		
intercept	p<1%	
bran	p<10%	Improved feeding practice is inversely related with technical inefficiency

Efficiency Distribution

- farmers, on average, reached 81% of efficiency level

- there is a scope to increase output by 19% by employing the same level of inputs and improving husbandry practices

- 98% variability in farmer performance can be explained by technical inefficiency

- increasing returns to scale estimate - an increase of the production can be attained with the given technology and improvement in the availability of supplementary feeding
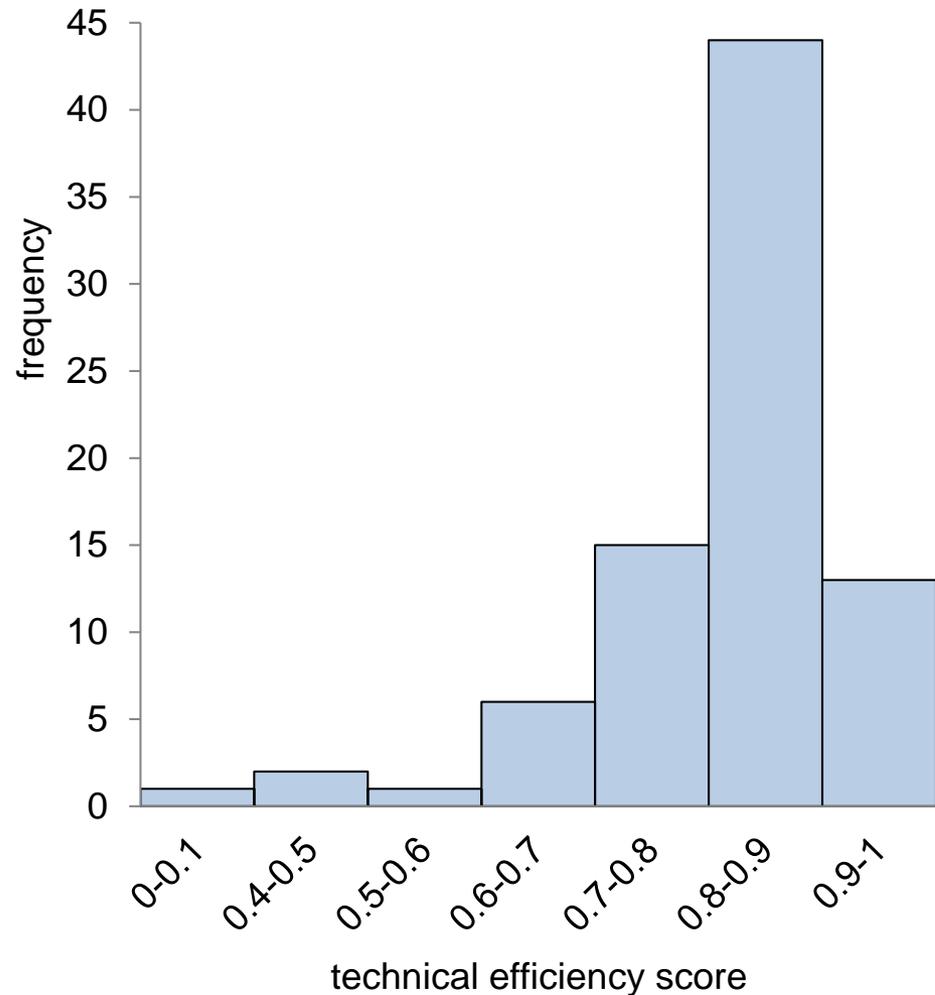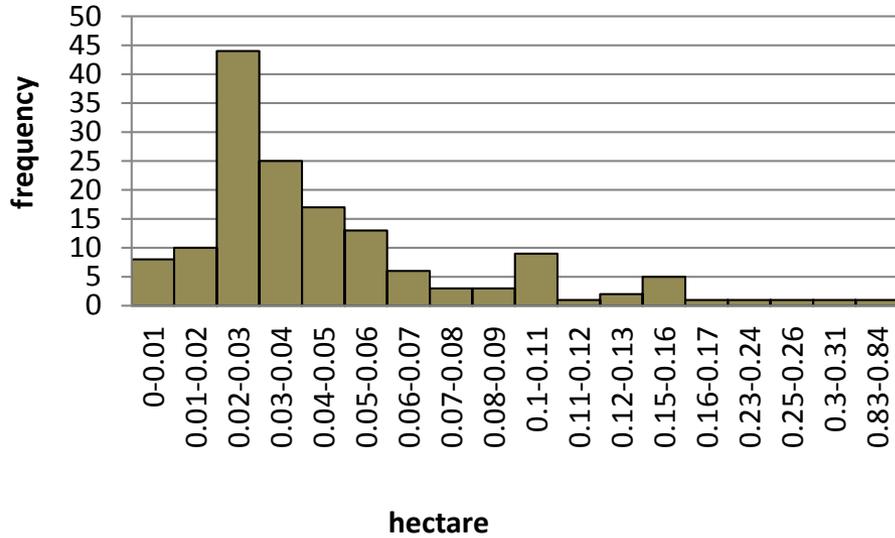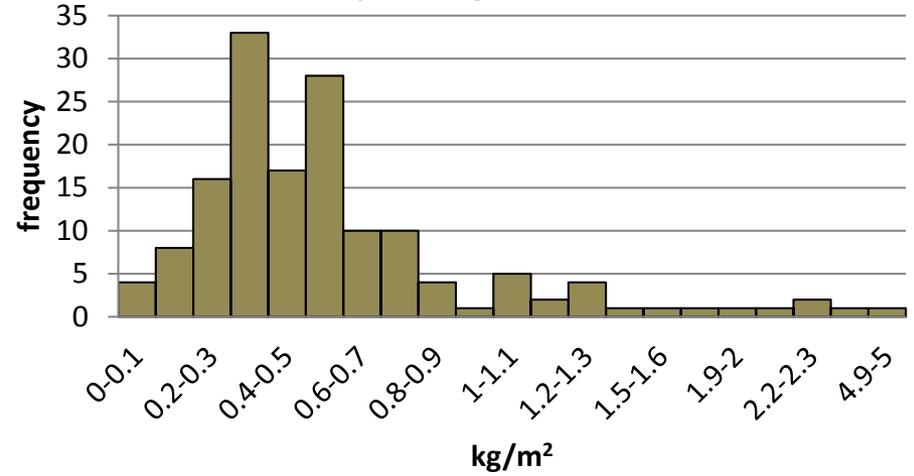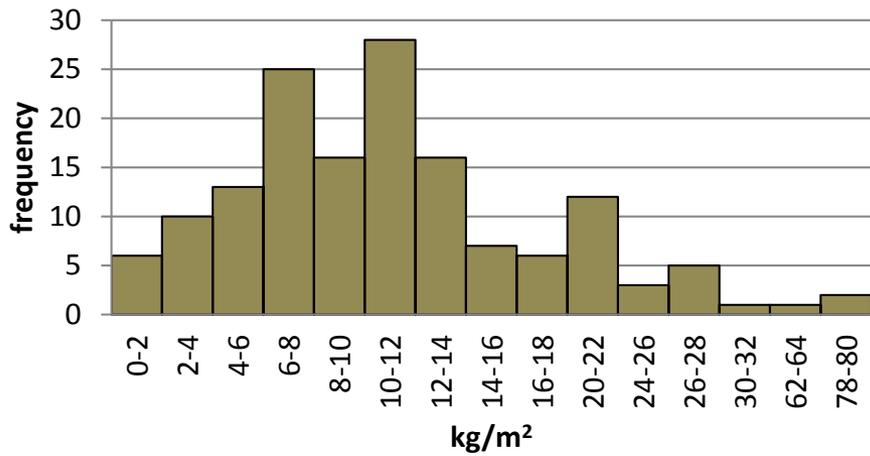
Potato Farming

Potato

area planted with potato

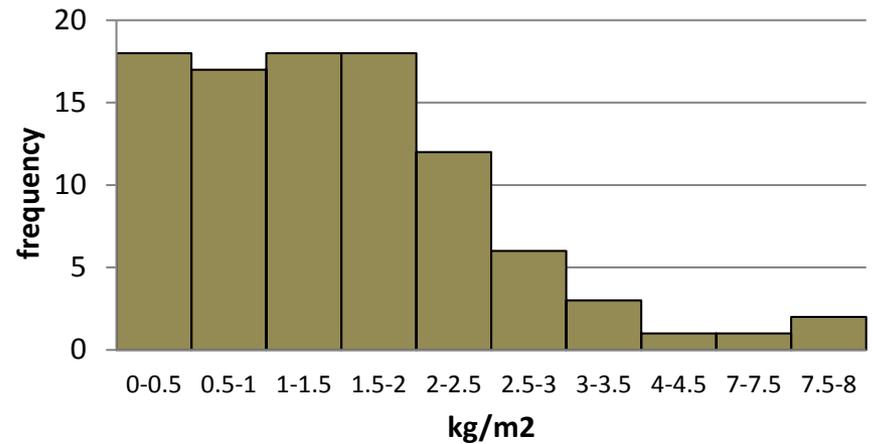

planting rate
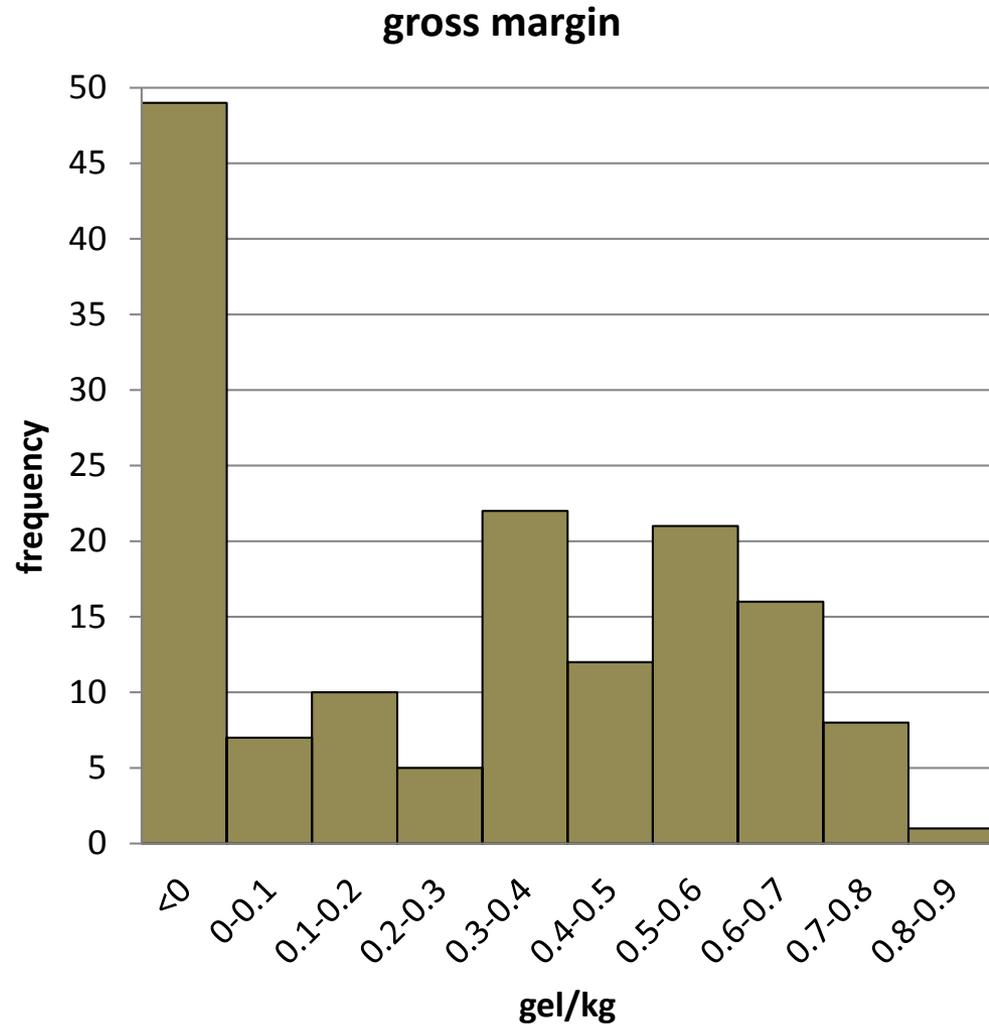

manure application rate

potato yield

- estimated average gross margin 0.27 GEL/kg

- estimated gross margin ratio - 28%

- imputed family labor input and costs (cultivation, harvest, etc.)

- imputed input costs (manure, seeds, etc.)

- Self-consumed output valued at market prices

gross margin

- hypothesis:
  - inefficiency effects are absent
    - *rejected at p<1%*
  - inefficiency effects are not stochastic
    - *rejected at p<1%*
- variables tested
  - regressors: planting rate, planted area, manure application rate, TVC, labor
  - technical inefficiency measures: HH size, # of pensioners in the HH, proportion of adult females in the HH, # of adults, # of adult females in the HH, higher education of HH heads and spouses, off-farm activity and income, pensioner(s) in the HH, HH income from sales of agriculture products, measures against pests/ diseases, quality of arable land, years of the use of harvest as seed, seed quality

Estimation Procedure

- one stage estimation of SF production and inefficiency models


- stochastic frontier production model
  $$ln(POTATOOUTPUT_{it}) = \beta_0 + \beta_1 ln(AREAPLANTED) + V_{it} - U_{it}$$


- inefficiency model
  $$U_{it} = \delta_0 + \delta_1(PPMEASURES_{it}) + \delta_2(QUALITYSEED_{it}) + W_{it}$$

Estimation Results

| variable	significance	explanation
stochastic frontier production model		
intercept	p<1%	
area	p<1%	larger area planted with potatoes is positively related with potato output (inelastic)
inefficiency model		
intercept	p<10%	
PPmeasures (dummy var.)	p<10%	Implementation of plant protection measures is inversely related with technical inefficiency
QualitySeed (dummy var.)	P<10%	Use of quality seeds is inversely related with technical inefficiency

- farmers, on average, reached 57% of efficiency level

- there is a scope to increase output by 43% by employing the same level of inputs and improving agronomic practices

- 95% variability in farmer performance can be explained by technical inefficiency

- decreasing returns to scale estimate - applied technology reaches its limitations and when increasing the area cultivated has to be replaced (machinery, seeds, chemicals)

technical efficiency score

International Comparison
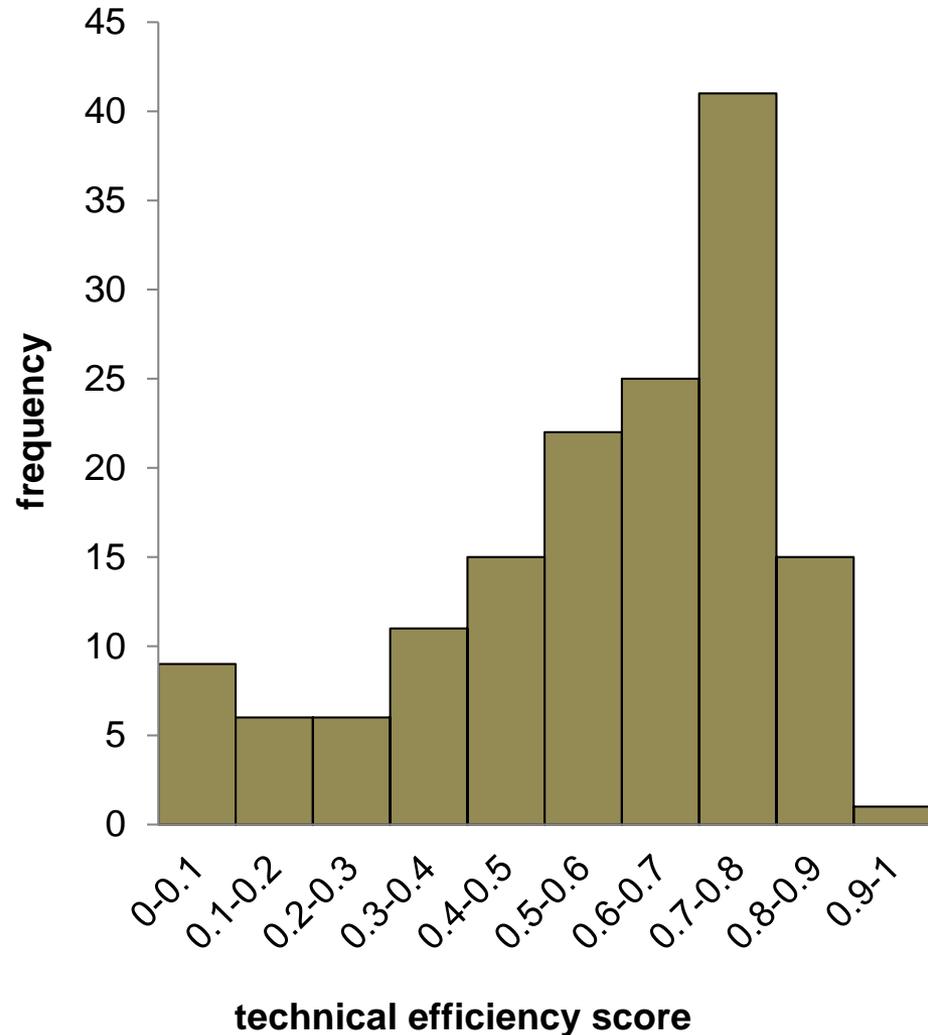
Potato yield compared to different countries (Kazbegi = 100%)
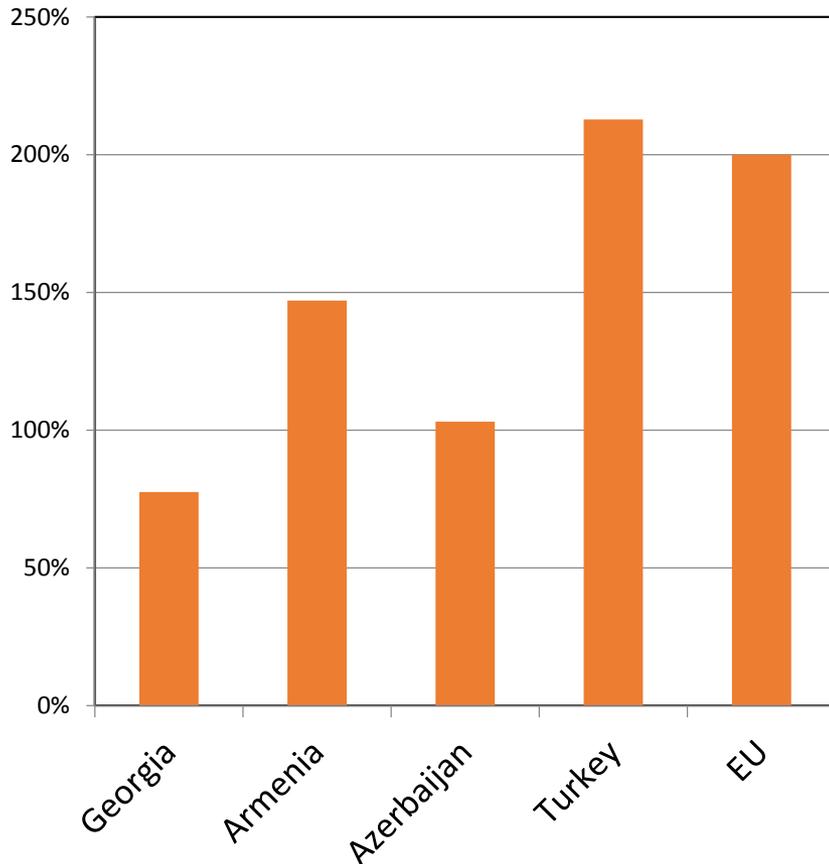
Milk yield compared to different countries (Kazbegi = 100%)
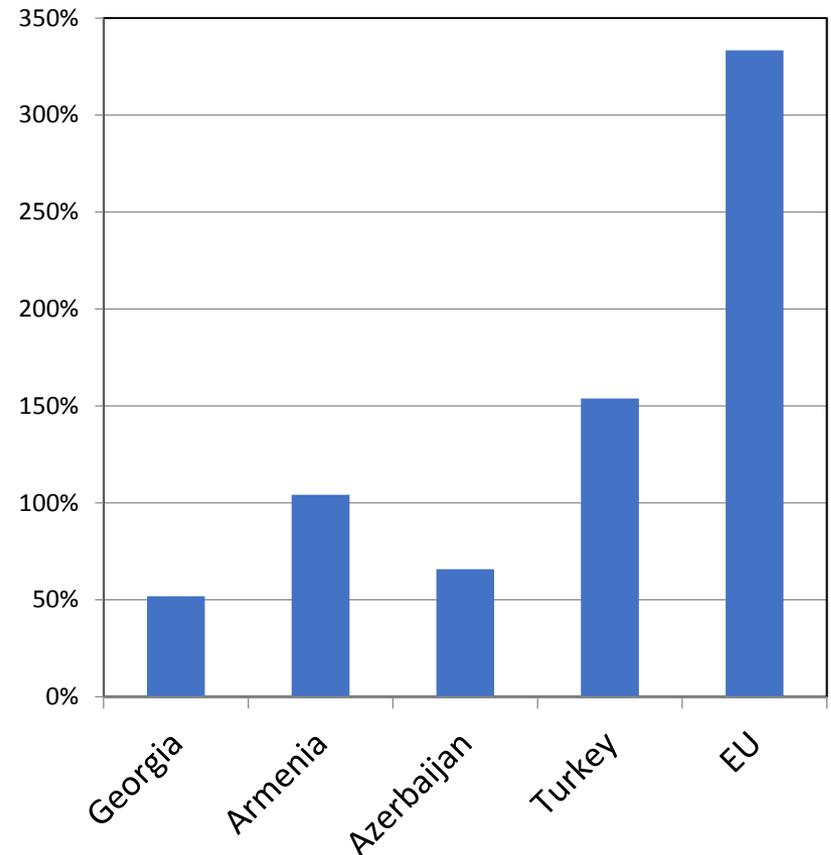
Source: FAO, own estimates

- Farmers and production processes are very heterogenous now

- Compared to international standards, production efficiency is low

- Efficiency analysis shows, that there is potential for output increase without large input increase (efficiency increase)

- Profitability of production is positive (at least in the short run)

- Investment in new technology is challenging

(target: increased household income)

- empowerment of local extension service to provide need based advisory services to farmers
- Implementation of support programs that would
  - explicitly address efficient use of existing technology among farmers inclusive of education, information acquisition, learning by doing process
  - favor reasonable specialization and commercialization of local farmers
  - improve availability and accessibility to farm inputs (including seeds, feed, etc.)
  - facilitate to the development of non-agriculture livelihood opportunities

Thank you!