RESEARCH ARTICLE

The effects of climate change in the development of agriculture

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Abstract

In recent years the development of agriculture in each country faces a number of challenges. The new problem is related to the impact of climate change. The presence of climate events has increased proportionally in each country, but the effects are disproportionately distributed between countries and agricultural activities. Due to intensity of changes in climate factors wind has damaged greenhouses, there were production losses from temperature fluctuations and agricultural infrastructures were damaged due to rainfalls and farmers' producers in greenhouses in Albania have suffered increased costs and decreased income. Due to the climate changes farmers are frequently exposed to the extreme weather events, which cause significant income losses [5]. The global climate changes are rising the cost of production and adversely affecting farmers' income [2]. The study objective is to evaluate the factors affecting for incomes increase of the farmers' producers in greenhouses in the main area of the agricultural production in Albania, at Lushnja region. A regression model has been applied to achieve the objective, testing linkages of key factors — winds, temperatures and rainfall on the farmers' income. Results show that variables winds and the temperature significantly influenced the agricultural production cycle and consequently general costs and the farmers' income. Findings are of theoretical importance for the farmers' and operators, suggesting appropriate inputs and technologies that consider the importance of these specifics appealing for possible recommendations to the public agencies.

Keywords: climate change, income, temperature, farmers, greenhouses, Albania.

1. Introduction

Over the years the development of agriculture in each country faces a number of challenges. Small farmers' encounter particular difficulties for the quality and price of inputs, and the market–access, and technical–contemporary information and policies provided by public institutions. However, a new and growing problem is related to climate change and their impact. The presence of climate events has increased proportionally in each country, but effects are disproportionately distributed between countries and agricultural crops. In Albania in recent years also there is a growing presence of the climate factors and with impact on agro–sectors. The frequent winds, temperature fluctuations and rainfalls have raised costs of the production cycle and complicated marketing and realization of production in the markets and have damaged the land productive capabilities. The dynamics of these developments is particularly worrying to the arable–crops farmers, olive–growers and farmers producers in greenhouses, in the main agricultural production area in Albania, in region of Lushnja. In recent years, farmers' in greenhouses in this region, due to the intensity of change in climate factors have observed damage of greenhouses from winds, production losses from temperature fluctuations and damages on the agricultural–rural infrastructure due to rainfalls, which increased costs and decreased farmers' income. Considering the importance of the problem this study will provide an evaluation of impact of the climate factors on income of the farmers' producers in greenhouses, in southwestern Albania at Lushnja region.

The problem of increasing impact of climate change on the agriculture and especially on farmers' income represents a growing concern during last decades everywhere and it has been treated in literature. Bryan and Behrma [3] predicts that the climate changes poses major challenges for the farmers' in developing countries,

who have limited capacity to adapt. Harvey et al. [5] finds that because of climate changes farmers are frequently exposed to the extreme weather events, which cause significant income losses. By Aggarwal [2] the global climate changes are rising cost of production and adversely affecting farmers' income. Menike and Arachchi [6] finds that as a results of rising trends in temperatures and winds farmers' have had losses. Aggarwal [1] by linking directly climate changes with growth crops processes, believes that small changes in temperatures and rainfalls could have significant effect on the quality of fruits and vegetables, with implications on farmers' prices. Füssel and Klein [4] have estimated and found a growing perception over the decades about the impact of climate changes for farmers.

2. Material and Methods

Main hypothesis:
Increasing the intensity of changes in climate factor affects the increase in income of the farmers, producers in greenhouses, in the Lushnja region in Albania.
Other hypothèses:
H 1 — Increasing the intensity of winds, affects the increase of farms income;
H 2 — Increasing the intensity of temperature fluctuations, affect increase of farms income;
H 3 — Increasing the intensity of rainfalls, affects the increase of farmers' income.
The paper is based on the studies and practical assessments of the impact of climate factors on the agriculture in other countries and regions. A quantitative research was applied to test the linkages of the key determinants and their impact on the income level of farmers, producers in greenhouses, in Lushnja region. In order to achieve the objective the questionnaire was designed and relevant sections are aiming at providing a widely database. The questionnaire was previously tested on a focus–group and then it was implemented. The size of the sample applied in the study area was at the optimum level of 220 farmers' interviewed. In the category of the study area there are no striations (each greenhouse ~ 0.1 ha). From a procedural view were considered; the main area of producers in the greenhouses in Lushnja and the random choice within the area. The dependent variable is measured in dummy form (0=decrease; 1=increase), and the independent variables are ordinarily measured and respectively by the scale 0–3 (0=strongly disagree; 1=disagree; 2=agree; 3=strongly agree). For measuring the impact of the factors under review, after the preliminary estimates is determined econometric model — which is the least squares method.

3. Results and Discussion

The data provided suggest an integrated representation of the *social structure* in which *agricultural production* in greenhouses is realized. Thus, about 97% are men and 3% women. Among them: about 48% have secondary education, 45% primary and about 6% have no education (Table 1). On average, family farm consists of 4–5 members (Figure 1), indicating for the future of activity.

Table 1. Sample by education and gender

Education	Gender		Total
	Female	Male	
Without primary school	1	12	13
With primary school	3	97	100
High School		105	105
University	1		1
Master		1	1
Total	5	215	220

Source: Data processing by authors.

Figure 1. Structure of sample by the number of family members.
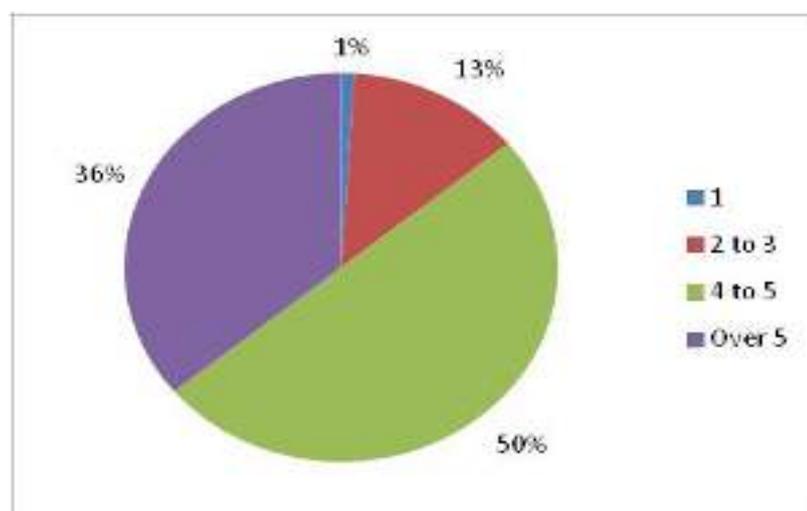
Source: Data processing by authors.

The model results represent the impact of factors on the farmer's income (table 2.). Variable hypothesized *rainfall* do not affect farmers' income. Variables *winds* and *temperatures* have a *significant impact* on farmer's *income* and this is explained by its specific importance during vegetative–cycle with impact to costs and the realization of production in the market.

Table 2. Measurement of factors by least squares method.

Method: Least Squares				
Date: 11/21/17 Time: 12:33				
Sample: 1 220				
Included observations: 63				
Excluded observations: 157				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.525149	0.151540	3.465418	0.0010
Winds	-0.092420	0.040999	-2.254205	0.0279
Temp.	0.150219	0.050717	2.961915	0.0044
Rainf.	0.018584	0.031342	0.592941	0.5555
R-squared	0.193079	Mean dependent var		0.793651
Adjusted R-squared	0.152049	S.D. dependent var		0.407935
S.E. of regression	0.375644	Akaike info criterion		0.941035
Sum squared resid	8.325375	Schwarz criterion		1.077107
Log likelihood	-25.64259	F-statistic		4.705814
Durbin-Watson stat	1.638878	Prob(F-statistic)		0.005181

Source: Data processing by authors.
INCOME = 0.52 - 0.09*WINDS + 0.15*TEMP. + 0.0185*RAINF.

4. Conclusions

The paper provides an analytical representation of the measured factors impact on the level of farmers' income. Factor rainfall have no affect to the farmers' income and this is explained by the appropriate hilly–relief area for drainage from rainfalls. Variables winds and temperatures affecting significantly, by proving their impact to the agricultural production cycle, its realization in the market resulting with effects on farmers' income.

Findings are of theoretical importance and practical for the farmers and the operators. Theoretically findings support the influence of the variables winds and temperature to the income and it can serve to the future searches. Practically there are benefits for farmers' suggesting inputs and appropriate production technologies that consider the importance of this specifics and in this context they appeal for possible recommendations to the public agencies.

5. References

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