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THE EXISTENCE AND UNIQUENESS OF STATIONARY SOLUTION FOR NONLINEAR RANDOM REACTION-DIFFUSION EQUATION IN BANACH SPACES

EXISTENCA DHE UNICITETI I ZGJIDHJES STACIONARE PËR PROBLEMIN JOLINEAR TË RASTIT TË REAKSION-DIFUZIONIT NË HAPËSIRA BANAHIANE.

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PËRMBLEDHJE
Ne studiojmë një problem jolinear të rastit të reaksion-difuzionit në hapësira banahiane abstrakte, të drejtuar nga një zhurmë reale, me koeficient të difuzionit madhësi të rastit dhe me kusht fillestar funksion të rastit. Ekuacioni i rastit i reaksion-difuzionit bën pjesë në klasën e ekuacioneve stokastike parabolike me derivate të pjesshme. Procesi i zhurmës reale është përkufizuar si zgjidhje e një ekuacioni diferencial stokastik Itô në hapësirën euklidiane me numër të fundëm dimensionesh ose në hapësirë hilbertiane. Jepet një treshe e Gelfandit $V \subset H = H' \subset V'$ me zhytje të ngjeshura (kompakte). Le të jetë $A(t), t \in R+$, një familje operatorësh jolinearë të rastit që veprojnë nga hapësira V në hapësirën V', e cila kënaq kushtet: vazhdueshmërinë, monotoninë dhe koercivitetin. Kufiza e lirë e ekuacionit të reaksion-difuzionit është një pasqyrim i kufizuar në kuptimin e hapësirës duale. Ne ndërtojmë një bazë stokastike të përshtatshme dhe e përkufizojmë zgjidhjen e dobët të problemit jolinear të reaksion-difuzionit.
Fjalë kyçe: problem jolinear i rastit i reaksion-difuzionit, zhurmë reale, zgjidhje stacionare, hapesire Banah

SUMMARY
We study a nonlinear random reaction-diffusion problem in abstract Banach spaces, driven by a real noise, with random diffusion coefficient and random initial condition. We consider a polynomial nonlinear term (more generally, a power serie nonlinearity can be considered). The reaction – diffusion equation belongs to the class of parabolic stochastic partial differential equations. The real noise process is defined as a stationary solution of an Itô stochastic differential equation in finite dimensional Euclidian space or Hilbert space. Given a Gelfand triplet $V \subset H = H' \subset V'$ with dense embeddings. Let $A(t)$ be a family of nonlinear random operations, acting from V to $V', t \in R+$, which satisfies the following assumptions: strong measurability, continuity, monotony, and coercivity. The free term of the reaction-diffusion equation is a bounded mapping in the sense of dual space. We assume that the initial condition is an element of Hilbert space.
Key words: random reaction- diffusion problem, real noise, stationary solution, Banach spaces.

INTRODUCTION

Random reaction-diffusion equations form an important part of the theory of random partial differential equations that is both very rich and changeling mathematically and is related in physics, chemistry, biology, medicine, astronomy, and economic sciences. To be specific, in this paper we consider a random reaction – diffusion equation with a polynomial nonlinearity. Of course, we can consider more general mathematical models. Let (Ω,F,(⟦F_t⟧_(t≥0),P) be a stochastic basis, and let w(t)=(w_1 (t),…,w_m (t)) be a standard m-dimensional Wiener process defined

on(Ω,F,(〖F_t)〗_(t≥0),P).Let ξ(t) be a stationary solution of the Itô equation in R^k.

dξ(t)=a(ξ(t))dt+b(ξ(t)dw(t),t≥0,
Where a(·) and b(·) satisfy the assumptions of section 2.1 below. We look at the process (Ω,F,F(t)_(t≥0) ,P,(ξ̂(t))_(t≥0)) as a model of real (Markov, colored) noise, stationary in time. Having assumed that the noise process is given, we consider the random nonlinear evolution equation in Hilbert (or Banach) spaces driven by the real noise ξ̂(t):

(2)
(du(t,ω))/dt+A(ξ̂(t,ω),u(t,ω))=f(ξ̂(t,ω)),t≥0,ω∈Ωw
here {A(ξ,·),ξ∈R^k } is a family of monotone operators in a Gelfand triplet V⊂H⊂V^' and f is a function from R^k to V^' (see section 2.2.1 for detailed assumptions on A and f). The aim of this paper is to prove the existence of a stationary solution of equation (2). Note that this equation does not contain Itô differential. The first one is that we want to consider the real noise ξ̂(t) as a given Markov process, stationary in time. Corresponding to this process, ξ̂(t) we would find a stationary solution of equation (2). This fact motivates some technical details of the following analysis, like the choice of a special stochastic basis (see section 3.1) and Theorem 3.1 which are novel with respect to the literature concerning with Itô equations.

MATERIALS AND METHODS

Preliminaries
2.1 The noise equation
Denote by L(R^m,R^k) the space of linear operators from R^m to R^k and by |.|_(L_2(R^m,R^k)) the Hilbert -Schmidt norm of a linear operator from R^m to R^k. Assume that:
(a.1) the mappings a(·):〖 R〗^k→R^k and b(·) :R^k→L(R^m,R^k) are locally Lipschitz continuous and satisfy the dissipativity condition
2⟨a(x),x⟩_(R^k)+|b(x)|_(L^2 (R^m,R^k))^2≤-η|x|_(R^k)^2+ρ ,∀x∈R^kfor some real constants η and ρ ;
(a.2) η>0
Consider the stochastic differential equation
(3) dξ(t)=a(ξ(t))dt+b(ξ(t))dw(t),t≥0
with the initial condition

(4) ξ(0)=ξ_0.
The following two facts are well-known: under the assumption (a.1) for every p≥2 and for every ξ_0∈L^p (Ω,F_0,P;R^k), the equation (3) – (4) has a unique progressively measurable solution ξ(t), defined for t≥0 with ξ(t)∈L^p (Ω;C([0,T];R^k)) for each T > 0. This solution if a Markov process with the Feller property; if in addition (a.2) holds true, there exists an invariant measure m_0 for equation (3) with finite moments of all orders.

RESULTS AND DISCUSSIONS

2.2 The random evolution equation with monotone operators
2.2.1 Assumptions
Let H be a real separable Hilbert space and V⊂H be a real reflexive separable Banach space (norms |·|, · respectively, inner product ⟨·,·⟩ in H), Hdense in H, and V⊂_⟶ H. Let H^'and V' be their dual spaces. Identifying H with its dual H^',, and H^', with a subspace of V', we can write V⊂H⊂V' with dense embeddings. We shall denote also the dual pairing between V' and V by ⟨·,·⟩, since its restriction to V×H coincides with the inner product of H. Let {A(ξ,·),ξ∈R^k } be a family of nonlinear operators from V to V' which satisfy the following assumptions

(A.1) for every u∈V , ξ→A(ξ,u), is a strong measurable mapping from R^k to V', bounded in bounded sets,

(A.2) for every ξ∈R^k,u,v,z∈V the function
s→⟨A(ξ,v+sz),u⟩ is continuous on R ,

(A.3) there is a constant λ_0∈R such that for every ξ∈R^k,u,v∈V
2⟨A(ξ,u)-A(ξ,v),u-v⟩+λ_0 |u-v|^2≥0

(A.4) there are a function ρ: R^k⟶[0,∝) and constants, p≥2,λ∈R,α>0,r≥0,C_p>0 such that for every ξ∈R^k,u,∈V,

2⟨A(ξ,u),u⟩+λ|u|^2+ρ(ξ)≥α u ^p and ρ(ξ)≤C_p (1+|ξ|_(R_k)^r),
(A.5) with p as above, there is a constant C_A>0 such that for every ξ∈R^k,u∈V, A(ξ,u) _V'≤C_A (1+ u ^(p-1)). Finally, let f=f(ξ): R^k⟶V^' be a given strong measurable function which satisfies the assumption (f.1) there is a constant C_f>0, such that for all ξ∈R^k, f(ξ) _v'^p'≤C_f (1+|ξ|_(R_k)^r), , where p' is the conjugate exponent of p (i.e. 1/p+1/p'=1). We consider the random evolution equatin
(5)
(du(t,ω))/dt+A(ξ(t,ω),u(t,ω))=f(ξ(t,ω)),t≥0,ω∈Ω,with the initial condition

(6) u(0,ω)=u_0 (w),ω∈Ω. We assume that

(7) u_0∈L^2 (Ω,F_0,P;H). We interpret the previous equation in the weak form:
(8)
├
(⟨u(t,ω),φ⟩+∫_0^t⟦⟨A(ξ(s,ω),u(s,ω)),φ⟩·ds⟧=@⟨u_0 (ω),φ⟩+∫_0^t⟦⟨f(ξ(s,ω)),φ⟩·ds,∀t≥0,∀φ∈V⟧)}
By solution of the equation (5) – (6) we mean a progressively measurable process u=u(t,ω), defined for t≥0 with the property
(9)

u∈L^2 (Ω;C([0,T];H))∩L^p (Ω×[0,T];V) for all T>0, such that, for a P- a. e. ω∈Ω, equation (8) is verified for all t≥0 and φ∈V.
Existence of a Stationary Solution
Definition of stationary solution
u is a stationary process in H This means that for all n∈N, 0≤t_1<t_2<⋯<t_n and h>0 the joint law of random element (u(t_1+h),u(t_2+h),…,u(t_n+h))∈H^n is independent of h. Theorem 3.1 Assume conditions (a.1) and (a.2) of section 2.1. Under the hypotheses (A.1)-(A.5) and (f.1), suppose that λ<α/βThen equation (5) with the initial condition (6), satisfying (7), has a stationary solution.

3.3 Sum of Monotone Operators
Theorem 3.2
Assume that ∑_(i=1)^u⟦(λ_i-α_i/β_i ⟧)<0 . Then the equation (10) has a stationary solution. The proof is the same as the one of Theorem 3.1
(10)
(du(t,ω))/dt+∑_(i=1)^m⟦A_i (ξ(t,ω),u(t,ω)) ⟧=∑_(i=1)^u⟦f_i (ξ(t,ω)) ⟧

4. Applications in non-linear random reaction-diffusion equation with real noise
In this section we study the random reaction-diffusion equation with polynomial nonlinearity

(11)∂u/∂t=cΔu- ∑_(h=0)^(2p-1)a_h (x,ξ)u^h∈,∈D⊂ R^3,t ≥ 0,p N, where D denotes an open bounded set of R3. The associated initial and boundary conditions are

(12) u(0,x,ω) = ⟦u ⟧_0 (x,ω) and

(13) u(t,x,ω)=u_0 (x,ω)
assume that the diffusion coefficient c = c(ξ) is non negative, bounded, measurable in ξ ,,and independent on x. Assume that the random functions a_h (x,ξ) are measurable in (x,ξ)and there are the real constants c_h< C_h and positive constants c_(2p-1)< C_(2p-1) such that c_h ≤ a_h (x,ξ) ≤C_h for each 1 ≤ h ≤ 2p-1 and for each(x,ξ)∈D×R^k. On the random function a_0 (x,ξ) we may impose the conditions: x → a_0 (x,ξ) is measurable in ξ, belongs to H^(-1) (D), and satisfies the condition:
|a_0 (x,ξ)| H^(-1) (D)≤C(1+|ξ|^r R^k) for some positive constants C and r. Thanks to the previous assumptions and Young inequality, there is a constant $\bar{c} > 0$ such that
∑_(h=0)^(2p-1)a_h (x,ξ)u^h) u ≥ 1/2 c_(2p-1).u^2p - $\bar{c}$.

For the abstract formulation of the problem (33), (34), (35), let H = L^2 (D) , V = H_0^1 (D), V' = H^(-1) (D),
A(ξ ,u) = ∑_(h=0)^(2p-1)a_h (x,ξ)u^h,f(ξ) = - a_0 (x,ξ). The proof of the conditions (A.1) – (A.5) and (f.1) is classical. As to the disipativity condition, we have $\gamma = 0, \delta = 0, \alpha = \frac{1}{2} c_{2p-1}$. Thus, we can apply Theorem 3.1 and obtain:

Theorem 4.1
Under the previous assumptions, the nonlinear random reaction diffusion problem **(11), (12), (13)** admits an unique stationary solution.

Corollary 4.1

Under the suitable assumptions, we can prove a similar result for the random Hodgkin – Huxley equations, Fitz – Hugh – Nagumo equations, Lotka – Volterra equations, Boussinesq- Glover equation, heat equation, Belousov – Zhabotinsky equations in chemical dynamics. For more details regarding to the random versions of above mentioned equations, see Chung (1987), Cordova and Bras (1981), Flandoli and Kolaneci (1994), Freeze (1975), Kolaneci (1988), Kutler (2011), Murray (2003), Sagar (1980), Stengel (1979).

CONCLUSIONS

In this paper we investigate the existence and uniqueness of stationary solution for nonlinear random reaction-diffusion equation in Banach spaces, driven by a real noise. We assume that diffusion coefficient is a random variable and the initial condition is a random function. The real noise process is defined as a stationary solution of an Itô stochastic differential equation in finite dimensional Euclidian space or Hilbert space. We consider a multiplicative noise term, which is more general than additive noise term introduced by P. L. Chow or other researchers, see Kuttler 16 M. Metivier 13 To be specific, we consider a random reaction – diffusion equation with a polynomial nonlinearity. Of course, we can investigate more general mathematical models, and suggest several applications, especially Boussinesq - Glover equation.

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DISA TEOREMA PER PIKAT FIKSE TE FUNKSIONEVE RACIONALE NE HAPESIRAT b-METRIKE

FIXED POINT THEOREMS FOR MAPPINGS SATISFYING CONTRACTIVE CONDITIONS OF RATIONAL TYPE ON A b-METRIC SPACES

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PËRMBLEDHJE
B-distanca përbën një përgjithësim të distancës klasike, në të cilën kemi një kusht më të përgjithshëm se ai i mosbarazimit të trekëndëshit: $d(x,y) \le s(d(x,z)+d(z,y))$ ku $s \ge 1$. Funksionet kontraktive ne forme racionale perbejne nje klase shume te rendesishme funksionesh kontraktive te cilet kane tehequr vemendjen e shume studjuesve te pikave fikse. Qëllimi i këtij punimi është të studiojë klasën e funksioneve kontraktive në forme racionale ne hapësirat e plota b-metrike me distance te vazhdueshme ne secilin variabel. Studimi yne eshte i ilustruar me shembuj dhe përgjithëson disa nga rezultatet kryesore të arritura deri tani ne kete fushe.
Fjalët çelës: hapesira b-metrike, kushte racionale kontraktiviteti.

SUMMARY
The b-metric is a generalizations of classical metric, which satisfies a relaxed triangle inequality $d(x,y) \le s(d(x,z)+d(z,y))$ for some constant $s \ge 1$, rather than the usual triangle inequality. The aim of this work is to study the necessary conditions for existence of fixed points for mappings which satisfying contractive conditions of rational type in the framework of complete b-metric spaces with continuous distance in each variable. Our results, which are illustrate with examples, generalizes and extends many existing results in literature and enable for the further studies in the study of the stability theory of iterative procedures, equilibrium theory etc..
Key-words: b-metric space, rational contractive condition.

INTRODUCTION

The Banach contraction principle is a very popular tool for solving problems in nonlinear analysis. Generalizations of this principle have been obtained in several directions. The following is an example of such generalizations. Jaggi in [7] proved the following fixed point theorem satisfying a contractive condition of rational type.

Theorem 1.1 Let T be a continuous self-map defined on a complete metric space (X,d). Suppose that T satisfies the following contractive condition:

$$d(T(x),T(y)) \le \alpha \frac{d(y,T(y))d(x,T(x))}{d(x,y)} + \beta d(x,y), \quad (1.1)$$

$\forall x,y \in X, x \ne y$

where $\alpha,\beta \in [0,1)$, such that $\alpha+\beta<1$. Then T has a unique fixed point.

Also, in 1975, Dass & Gupta [17] proved that every continuous self-map on the metric spaces (X,d) which satisfies the following contraction conditions:

$$d(T(x),T(y)) \le \alpha \frac{d(y,T(y))[1+d(x,T(x))]}{1+d(x,y)} + \beta d(x,y), \quad (1.2)$$

$\forall x, y \in X$

where $\alpha, \beta \in [0,1)$ and $\alpha + \beta < 1$, have an unique fixed point.

Remark 1.2 By a simple calculation we have that every contraction which satisfies the condition (1.2) satisfies also the condition (1.1).

Another generalization of the contraction principle was suggested by Alber and Guerre-Delabriere [10] in Hilbert spaces. Rhoades [11] has shown that their result is still valid in complete metric spaces.

Definition 1.3 Let (X,d) be a metric space. A mapping $T: X \to X$ is said to be a φ-weak contraction if

$$d(Tx,Ty) \le d(x,y) - \varphi(d(x,y))$$

for all $x, y \in X$, where $\varphi: [0,\infty) \to [0,\infty)$ is a continuous and non-decreasing function with $\varphi(t) = 0$ if and only if $t = 0$.

Theorem 1.4 [11] Let (X,d) be a complete metric space and T be a φ-weak contraction on X. Then, T has a unique fixed point.

There exists a large number of extensions of Theorem 1.4 in literature, [19,20].

The concept of *b*-metric space as a generalization of metric spaces was introduced by Czerwik in [2]. After that, several interesting result about the existence of a fixed point for single-valued and multi-valued operators in b-metric space have been obtained (see [2,3,4,5,6,8,9,12,13,14]).

In this paper we prove a fixed point theorems for contractions and generalized weak contractions satisfying rational expressions in complete b-metric spaces.

PRELIMINARIES.

Definition 2.1 [1,14] Let X be a set and let $s \ge 1$ be given real number. A function $d: X \times X \to \mathbb{R}^+$ is said to be a b-metric if and only if for all $x, y, z \in X$ the following conditions are satisfied:

1. $d(x,y) = 0$ if and only if $x = y$;
2. $d(x,y) = d(y,x)$;
3. $d(x,z) \le s[d(x,y) + d(y,z)]$

The pair (X,d) is called a b-metric space with parameter s.

There exists more examples in the literature [1, 2, 3, 17] showing that the class of b-metrics is effectively larger than that of metric spaces, since a b-metric is a metric when $s = 1$ in the above condition 3.

Example 1.[18] Let (X,d) be a metric space and $\rho(x,y) = (d(x,y))^p$, where $p > 1$ is a real number. Then ρ is a b-metric with $s = 2^{p-1}$. However, (X,ρ) is not necessarily a metric space.

For example, let X be the set of real numbers and let $d(x,y) = |x-y|$ be the usual Euclidian metric. Then $\rho(x,y) = (x-y)^2$ is a b-metric on $\mathbb{R}$ with $s = 2$, but is not a metric on $\mathbb{R}$.

Example 2. [4] The space $l_p (0 < p < 1)$,

$$l_p = \{(x_n) \subset \mathbb{R} : \sum_{n=1}^{\infty} |x_n|^p < \infty\}$$

together with the function $d: l_p \times l_p \to \mathbb{R}$,

$$d(x,y) = \left(\sum_{n=1}^{\infty} |x_n - y_n|^p\right)^{\frac{1}{p}}$$

where $x = (x_n), y = (y_n) \in l_p$ is a b-metric space with parameter $s = 2^{1/p} > 1$.

Example 3. [4] The space $L_p (0 < p < 1)$ of all real functions $x(t), t \in [0,1]$ such that:

$$\int_o^1 |x(t)|^p dt < \infty$$

is a b-metric space if we take

$$d(x,y) = \left(\int_0^1 |x(t) - y(t)|^p dt\right)^{\frac{1}{p}} \text{ for each } x, y \in L_p.$$

The parameter $s = 2^{\frac{1}{p}} > 1$

We need the following definitions.

Definition 2.2. Let (X,d) be a b-metric space. Then a sequence $(x_n)_{n \in \mathbb{N}}$ is called:

(a) b-convergent if there exists $x \in X$ such that $d(x_n, x) \to 0$ as $n \to \infty$. In this case, we write $\lim_{n\to\infty} x_n = x$.

(b) b-Cauchy if $d(x_n, x_m) \to 0$, as $n, m \to \infty$.

Proposition 2.3. In a b-metric space (X,d), the following assertions hold:

(p_1) A b-convergent sequence has a unique limit.

(p_2) Each b-convergent sequence is b-Cauchy.

(p_3) In general, a b-metric is not continuous as the following example shows.

Example 4. [see Example 3 in 16] Let $X=\mathbb{N}\cup\{0\}$ and let $d: X\times X\to\mathbb{R}$ be defined by:

$$d(m,n)=\begin{cases}0 & \text{if } m=n\\ \left|\frac{1}{m}-\frac{1}{n}\right| & \text{if } m \text{ and } n \text{ are even or } mn=\infty\\ 5 & \text{if } m \text{ and } n \text{ are odd and } m\neq n\\ 2 & \text{otherwise}\end{cases}$$

It is easy to see that for all $m,n,p\in X$, we have:

$$d(m,n)\le 3(d(m,p)+d(p,n))$$

Thus, (X,d) is a b-metric space with $s=3$.

Let $x_n=2n$ for each $n\in\mathbb{N}$.

Then $d(2n,\infty)=\frac{1}{2n}\to 0$ as $n\to\infty$. That is, $x_n\to\infty$, but $d(x_n,1)=2\not\to d(\infty,1)$ as $n\to\infty$.

Aghajani *et al*. [1] proved the following simple lemma about the b-convergent sequences.

Lemma 2.4 [1] Let (X,d) be a b-metric space with $s\ge 1$, and suppose that $(x_n)_{n\in\mathbb{N}}$ and $(y_n)_{n\in\mathbb{N}}$ b-converge to x,y respectively. Then, we have

$$\frac{1}{s^2}d(x,y)\le\liminf_{n\to\infty}d(x_n,y_n)\le\limsup_{n\to\infty}d(x_n,y_n)\le s^2d(x,y)$$

In particular, if $x=y$, then, $\lim_{n\to\infty}d(x_n,y_n)=0$.

Moreover, for each $z\in X$ we have

$$\frac{1}{s}d(x,y)\le\liminf_{n\to\infty}d(x_n,z)\le\limsup_{n\to\infty}d(x_n,z)\le sd(x,z)$$

Lemma 2.5 [5] Let (X,d) be a b-metric space with parameter s and $(x_n)_{n\in\mathbb{N}}$ a sequence in X such that, $d(x_{n+1},x_{n+2})\le qd(x_n,x_{n+1})$, for all $n\in\mathbb{N}$,where $0\le q<1$. Then the sequence $(x_n)_{n\in\mathbb{N}}$ is Cauchy sequence in X provided that $sq<1$.

MAIN RESULTS

Theorem 3.1 Let (X,d) be a complete b-metric space with parameter s and with continuous b-metric in each variable, $T: X\to X$ be a continuous mapping such that:

$$d(T(x),T(y))\le\alpha\frac{d(y,T(y))d(x,T(x))}{d(x,y)}+\beta d(x,y),\quad (3.1)$$

$\forall x,y\in X, x\neq y$

where α,β are positive real constants such that $s\beta+\alpha<1$. Then, T has a unique fixed point.

Proof. For a arbitrary point $x_0\in X$ we construct the sequence $(x_n)_{n\in\mathbb{N}}$ such that $x_{n+1}=f(x_n)$ for all $n\in\mathbb{N}$.

So

$$d(x_1,x_2)=d(Tx_0,Tx_1)\le\alpha\frac{d(x_0,Tx_0)d(x_1,Tx_1)}{d(x_0,x_1)}+\beta d(x_0,x_1)$$
$$=\alpha\frac{d(x_0,x_1)d(x_1,x_2)}{d(x_0,x_1)}+\beta d(x_0,x_1)$$

Equivalently $d(x_1,x_2)\le\frac{\beta}{1-\alpha}d(x_0,x_1)$ where $\frac{\beta}{1-\alpha}=k<1$.

Similarly, $d(x_2,x_3)\le k(d(x_1,x_2))$. Inductively:

$$d(x_n,x_{n+1})=d(Tx_{n-1},Tx_n)\le$$
$$\le\alpha\frac{d(x_{n-1},Tx_{n-1})d(x_n,Tx_n)}{d(x_{n-1},x_n)}+\beta(d(x_{n-1},x_n)\quad (3.2)$$
$$\le\frac{\beta}{1-\alpha}d(x_{n-1},x_n)=kd(x_{n-1},x_n)$$

By Lemma 2.5 the above sequence is Cauchy in complete b-metric space (X,d).

So there exists a $z\in X$ such that $\lim_{n\to\infty}x_n=z$.

By the continuity of T and d we have:

$$Tz=T(\lim_{n\to\infty}x_n)=\lim_{n\to\infty}Tx_n=\lim_{n\to\infty}x_{n+1}=z$$

and this prove that z is a fixed point.

If there exists another point $w\neq z$ in X such that $Tw=w$, then

$$d(w,z)=d(Tw,Tz)\le\frac{\alpha d(w,Tw)d(z,Tz)}{d(w,z)}+\beta d(w,z)$$
$$=\beta d(w,z)<d(w,z)$$

which is a contradiction. Hence, the fixed point is unique.

Theorem 3.2 Let (X,d) be a complete b-metric space with parameter s and with continuous b-metric in each variable, $T: X\to X$ be a continuous mapping such that:

$$d(F(x),F(y))\le\alpha\frac{d(y,F(y))[1+d(x,F(x))]}{1+d(x,y)}+\beta d(x,y),\quad (3.3)$$

$\forall x,y\in X$

where α, β are positive real constants such that $s\beta + \alpha < 1$. Then T has a unique fixed point.

Proof. The proof of this Theorem follows immediately by Remark 1.2 .

Theorem 3.3 Let (X,d) be a complete b-metric space with parameter s and with continuous b-metric in each variable, $T: X \to X$ be a continuous mapping such that for all $x, y \in X$:

$$sd(Tx,Ty) \le M(x,y) - \varphi(M(x,y)) \tag{3.4}$$

where $\varphi: [0,\infty) \to [0,\infty)$ is continuous and non-decreasing function with $\varphi(t) = 0$ if and only if $t = 0$ and

$$M(x,y) = \max\{\frac{d(Tx,Tx)d(y,Ty)}{d(x,y)}, d(x,y)\} \tag{3.5}$$

Then T has a fixed point.

Proof. Let $x_0 \in X$ be such that $x_0 \neq Tx_0$. We construct the sequence $(x_n)_{n\in\mathbb{N}}$ in X as follows

$$x_{n+1} = T(x_n), \qquad n = 0,1,2,\ldots$$

$$\begin{aligned} d(x_n, x_{n+1}) &\le sd(x_n, x_{n+1}) = sd(Tx_{n-1}, Tx_n) \\ &\le \max\{\frac{d(x_{n-1},Tx_{n-1})d(x_n,Tx_n)}{d(x_{n-1},x_n)}, d(x_{n-1},x_n)\} \\ &\quad -\varphi(\max\{\frac{d(x_{n-1},Tx_{n-1})d(x_n,Tx_n)}{d(x_{n-1},x_n)}, d(x_{n-1},x_n)\}) \\ &= \max\{d(x_n,x_{n+1}), d(x_{n-1},x_n)\} - \\ &\quad -\varphi(\max\{d(x_n,x_{n+1}), d(x_{n-1},x_n)\}) \end{aligned} \tag{3.6}$$

Suppose that there exists n_0 such that $d(x_{n_0}, x_{n_0+1}) > d(x_{n_0-1}, x_{n_0})$.

Then from (3.6)

$$\begin{aligned} d(x_{n_0}, x_{n_0+1}) &\le \max\{d(x_{n_0}, x_{n_0+1}), d(x_{n_0-1}, x_{n_0})\} \\ &\quad -\varphi(\max\{d(x_{n_0}, x_{n_0+1}), d(x_{n_0-1}, x_{n_0})\}) \\ &= d(x_{n_0}, x_{n_0+1}) - \varphi(d(x_{n_0-1}, x_{n_0})) < d(x_{n_0}, x_{n_0+1}) \end{aligned}$$

which is a contradiction. Hence, $d(x_n, x_{n+1}) \le d(x_{n-1}, x_n)$ for all $n \ge 1$ and so the $(d(x_n, x_{n+1}))_{n\in\mathbb{N}}$ is a non-increasing sequence of positive real numbers.

Then there exists $r \ge 0$ such that $\lim_{n\to\infty} d(x_n, x_{n+1}) = r$.

Taking the limit as $n \to \infty$ in (3.6) and using the properties of the function φ and the continuity of the distance d we get $r \le r - \varphi(r)$, which satisfy if and only if $r = 0$, that is

$$\lim_{n\to\infty} d(x_n, x_{n+1}) = 0 \tag{3.7}$$

Next, we show that $(x_n)_{n\in\mathbb{N}}$ is a b-Cauchy sequence in X. Suppose the contrary, that is, $(x_n)_{n\in\mathbb{N}}$ is a not a b-Cauchy sequence. Then there exists $\varepsilon > 0$ for which we can find two subsequences $(x_{m_k})_{k\in\mathbb{N}}$ and $(x_{n_k})_{k\in\mathbb{N}}$ of $(x_n)_{n\in\mathbb{N}}$ such that n_k is the smallest index for which

$$n_k > m_k > k, \; d(x_{m_k}, x_{n_k}) \ge \varepsilon. \tag{3.8}$$

This means that

$$d(x_{m_k}, x_{n_k-1}) < \varepsilon \tag{3.9}$$

From (3.8) and (3.9) we have:

$$\begin{aligned} \varepsilon \le d(x_{m_k}, x_{n_k}) &\le sd(x_{m_k}, x_{m_k-1}) + sd(x_{m_k-1}, x_{n_k}) \\ &\le sd(x_{m_k}, x_{m_k-1}) + s^2 d(x_{m_k-1}, x_{n_k-1}) + s^2 d(x_{n_k-1}, x_{n_k}) \end{aligned} \tag{3.10}$$

Using (3.7) and taking the upper limit as $k \to \infty$, we get

$$\frac{\varepsilon}{s^2} \le \limsup_{k\to\infty} d(x_{m_k-1}, x_{n_k-1}) \tag{3.11}$$

By triangular inequality, we have

$$d(x_{m_k-1}, x_{n_k-1}) \le sd(x_{m_k-1}, x_{m_k}) + sd(x_{m_k}, x_{n_k-1})$$

Taking the upper limit as $k \to \infty$, we get

$$\limsup_{k\to\infty} d(x_{m_k-1}, x_{n_k-1}) \le \varepsilon s \tag{3.12}$$

So, by (3.11) and (3.12) we have

$$\frac{\varepsilon}{s^2} \le \limsup_{k\to\infty} d(x_{m_k-1}, x_{n_k-1}) \le \varepsilon s \tag{3.13}$$

From (3.4) and (3.5), we have

$$\begin{aligned} sd(x_{m_k}, x_{n_k}) &= sd(Tx_{m_k-1}, Tx_{n_k-1}) \\ &\le \max\{\frac{d(x_{m_k-1},Tx_{m_k-1})d(x_{n_k-1},Tx_{n_k-1})}{d(x_{m_k-1},x_{n_k-1})}, d(x_{m_k-1},x_{n_k-1})\} \\ &\quad -\varphi(\max\{\frac{d(x_{m_k-1},Tx_{m_k-1})d(x_{n_k-1},Tx_{n_k-1})}{d(x_{m_k-1},x_{n_k-1})}, d(x_{m_k-1},x_{n_k-1})\}) \\ &= \max\{\frac{d(x_{m_k-1},x_{m_k})d(x_{n_k-1},x_{n_k})}{d(x_{m_k-1},x_{n_k-1})}, d(x_{m_k-1},x_{n_k-1})\} \\ &\quad -\varphi(\max\{\frac{d(x_{m_k-1},x_{m_k})d(x_{n_k-1},x_{n_k})}{d(x_{m_k-1},x_{n_k-1})}, d(x_{m_k-1},x_{n_k-1})\} \end{aligned} \tag{3.14}$$

Taking the upper limit as $k \to \infty$ in (3.14) and using (3.8) and (3.13) we get, $\varepsilon s \le \varepsilon s - \varphi(\varepsilon s) < \varepsilon s$ which is contradiction. Therefore, $(x_n)_{n\in\mathbb{N}}$ is a b-Cauchy sequence in X. Since X is a b-complete metric space, there exists $z \in X$ such that $x_n \to z$ as $n \to \infty$ and $z = \lim_{n\to\infty} x_{n+1} = \lim_{n\to\infty} T(x_n)$.

Using the triangular inequality, we get

$$d(z,Tz) \le sd(z,Tx_n) + sd(Tx_n,Tz)$$

Letting $n \to \infty$, we get

$d(z,Tz) \le s\lim_{n\to\infty} d(z,Tx_n) + s\lim_{n\to\infty} d(Tx_n,Tz) = 0$

So, we have $Tz = z$. Thus, z is a fixed point of T.

Corollary 3.4 Let (X,d) be a complete *b*-metric space with parameter s and with continuous *b*-metric in each variable, $T: X \to X$ be a continuous mapping such that:

$sd(Tx,Ty) \le k\max\{\frac{d(Tx,Tx)d(y,Ty)}{d(x,y)}, d(x,y)\}$, for all $x,y \in X$ (3.15)

where $k \in (0,1)$. Then T has a fixed point.

Proof. In Theorem 3.3, taking $\varphi(t) = (1-k)t$ for all $t \in [0,\infty)$, we get Corollary 3.4.

Remark 3.5 Since a b-metric is a metric when $s = 1$, so our results can be viewed as a generalization and extension of several other comparable results.

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APPROACHING CLOUD COMPUTING IN ALBANIA

QASJA E "CLOUD COMPUTING" NË SHQIPËRI

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PËRMBLEDHJE
Punimi ka për qëllim studimin e situatës aktuale në Shqipëri në lidhje me njohjen, aplikimin, gadishmërinë dhe problematikat që kanë profesionistët për "Cloud Computing", që synon ta çojë teknologjinë drejt një ere të re konceptimi dhe zhvillimi. Për këtë qëllim është kryer një sondazh i publikuar online që i drejtohet profesionistëve të IT, në lidhje me aplikimin e Cloud.
Rezultatet tregojnë se ka kërkesë për t'u zhvilluar drejt "Cloud Computing" dhe gadishmëri për të kaluar të dhënat në Cloud (mbi 65%), për të arritur rezultate të larta në ruajtjen dhe shpërndarjen e informacionit me performancë të lartë në shërbimet sociale, llogaritjet komplekse, përpunim i sasive të mëdha të informacioneve etj. Punimi analizon se vështirësia kryesore në aplikimin e Cloud Computing qëndron në mungesën e eksperiencës dhe pengesat kryesore jane privatësia e të dhënave dhe integrimi me infrastrukturën ekzistuese (72%), ndaj rekomandon masat që duhet të ndërmerren për kapërcimin e vështirësive.
Fjalët celës: cloud computing, llogaritje komplekse, sondazh, statistikë.

SUMMARY
The paper aims to study the current situation in Albania regarding to recognition, application, availability and problems that professionals have regarding "Cloud Computing", which aims to bring technology into a new era of conception and development. For this purpose, it is conducted a survey, published online, that addresses IT professionals, concerning Cloud application.
Results show that there is a demand to develop towards "Cloud Computing" and willingness to move data to the Cloud (over 65%), in order to achieve higher results in the preservation and dissemination of information with high performance in social services, complex calculations, processing large amounts of data etc. The paper analyzes that the main difficulties in application of cloud computing lies in the lack of experience and the major barriers are data privacy and integration with existing infrastructure (72%), therefore recommends steps to be taken to overcome the difficulties.
Keywords: cloud computing, complex calculations, survey, statistics.

INTRODUCTION

Cloud computing is a recent stage in the information and communications technology evolution of the last decades and potentially one of the major advances in history of computing. It has transformed the way IT management is conceived, developed, maintained and paid for.
The National Institute of Standards and Technology (NIST) define Cloud Computing as follows: "Cloud computing is a model for enabling convenient, on-demand network access to a

shared pool of configurable computing resources (e.g. networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction". [5]

The core technological concepts that lead to evolution of cloud computing are virtualization, multitenancy and Web services. Virtualization is the technology that hides the physical characteristics of a computing platform from the users, instead presenting an abstract, emulated computing platform [6]. A related concept is that of multitenancy, whereby a single instance of application software serves multiple clients and "Web services", which is defined by the W3C as "a software system designed to support interoperable machine-to-machine interaction over a network" [8].

There is a debate in the technology world that Cloud computing has evolved from Grid computing and that Grid computing is the foundation for Cloud computing. The relationship between Grid and Cloud computing is as follows: "Cloud Computing not only overlaps with Grid Computing, it is indeed evolved out of Grid Computing and relies on Grid Computing as its backbone and infrastructure support." [3].

Since there is no published study in Albania regarding to Cloud Computing, this study aims to present the current situation (recognition, application, availability and problems) reported by Albanian IT professionals.

Application of Cloud Computing in Albania is important for public institutions and private companies. It offers solutions to everyday problems of the IT infrastructure, which show super power calculator, depository and distribution, reducing costs and increasing capacity with high efficiency. It provides a better opportunity to integrate all IT constituent components by hiding complexity, increasing graduation and reusing of Cloud services achieved with a lower cost [1].

The development of cloud computing has a great impact in economy. Many benefits of cloud computing in the corporate arena are purely financial, while other network externalities relating to cloud computing will have much broader positive effects [9].

Cloud Computing can be applied as a platform, service or program to assist institutions, businesses and individuals.

MATERIALS AND METHODS

In April-May 2013, we conducted a survey of IT professionals in Albania to have a better understanding of cloud computing usage in Albania and future plans for cloud computing adoption. Respondents represented a wide range of IT professionals graduated at Tirana, Politechnic University etc. Our survey was mainly performed online, only 10% of it was filled manually. Actually, we received 267 responses from groups of interest, which were interviewed about their professional qualifications, their knowledge and experience on Cloud and how confident they are on applying cloud computing in their everyday work. The interviewees were asked about advantages, difficulties and obstacles they have faced during their efforts in cloud implementation and their preferences on cloud services and providers.

DATA ANALYSIS

The aim of the survey consists of collecting, analysing, presenting data and comparing it with global information. Our survey found that the majority of respondents about 82% claim to have good knowledge of Cloud Computing, but the survey concluded that only 56% of them have accurate knowledge about cloud.

After analyzing data, we concluded that a considerable amount of respondents should consider having more information about cloud computing (fig 1).

An optimistic result of the survey is that a vast majority of respondents are very optimistic about using cloud computing in their everyday work. 82% of respondents are willing to move data in the cloud. 65% of them consider moving a part of the data in the cloud and 17% are willing to move all the data. (fig 2)

The current result is very promising compared to global situation. According to global cloud survey

report of 2012, 36% of respondents have no plans to move their data to the cloud vs 64% who plan to move to the cloud within few years. [3]

Figure 1.Have accurate knowledge about Cloud Computing

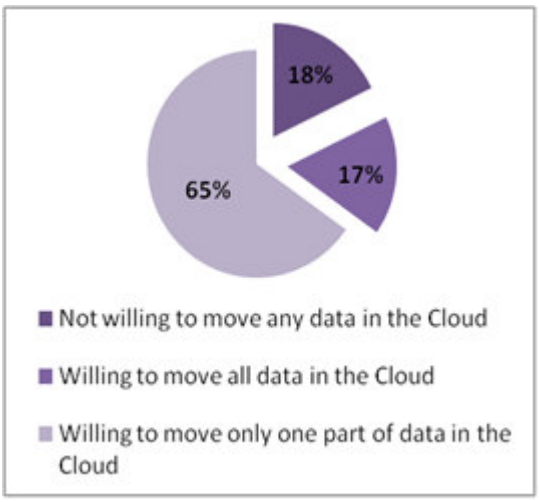

Figure 2.Willing to move data in the Cloud

According to the survey, current situation in Albania is optimistic. 17% of respondents do not consider implementing cloud, 52% are considering this issue and 31% have tested, implemented or used Cloud. (fig. 3)
43% of respondents have implemented more than one application in cloud, 68% of it is developed the last year.

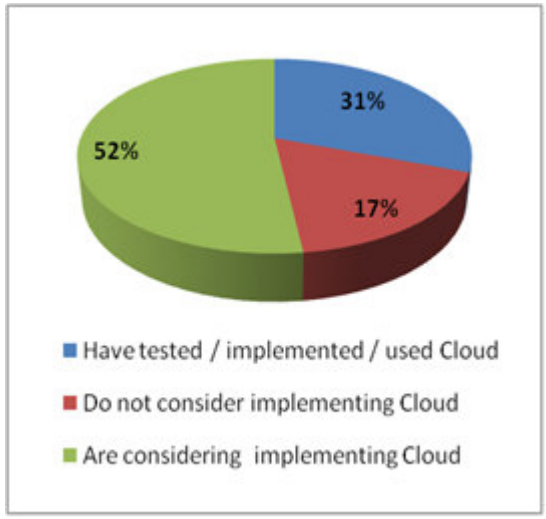

Figure 3.Current situation in Albania

There is numerous business benefit expected to see from cloud adoption, but four of them tops the list. Most of the respondents evaluate as the major advantage of cloud the enhancement of IT performance at a low cost. There are also technical benefits such as flexibility in capacity building and being very suitable for development teams. (fig. 4)
According to Unisphere Research, there are a number of benefits for organizations using
Public PaaS, IaaS, or cloud services. The feature that garners the greatest interest from respondents (45%) is the fact that public
cloud solutions offer rapid-start opportunities. Another 43% like the fact that public cloud solutions reduce or eliminate the need for data center systems, hardware and accompanying
administration. A similar number respond to the ability to scale applications on demand. [4]
An impressive fact of the survey is that the majority of the respondents have chosen Google as the most convinent provider followed by Microsoft and Amazon. (fig. 5) This is explained by the low costs that Google offers and a vast variety of free services. Microsoft technologies are widespread in Albania leading Azure platform in the second place.

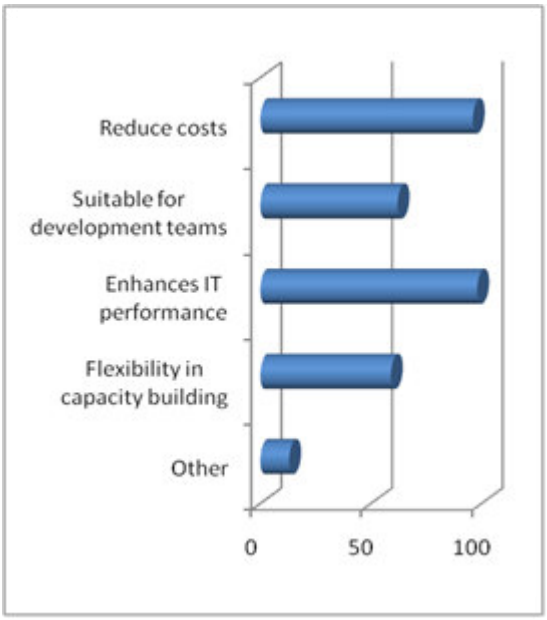

Figure 4.The most important benefits of Cloud

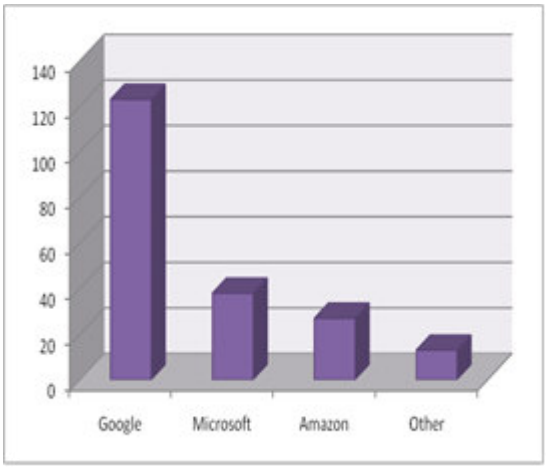

Figure 5. The most convenient providers

The global trend highlights greater adoption of private clouds compared to public clouds and the same trend is found in our survey. The most preferred cloud type is private cloud (54%) due to privatecy and security issues. This is followed by hybrid cloud (38%) and public cloud (8%).

Our survey results that lack of experience and adaption of existing systems is the most important reported difficulty in cloud adaption. 61% report these issues as very frequently found in adapting cloud computing in their organizations.

There are a number of challenges respondents have to face while using cloud (SaaS, IaaS, or cloud services). This survey shows that 72% report data privacy and integration with existing infrastructure as the major barriers to cloud computing usage.

DISCUSSION

One of the biggest challenges reported by the survey is data privatecy and security. This is reflected by 54% of respondents that have preferred private cloud and 38% hybrid cloud.

Maintaining data privacy requires a greater legislative attention in setting standards and having a continuous control on this very important issue. The Cloud provider should be transparent in reporting of all investments in new technologies and increased safety; backup data policy; recover data policy; incident reporting; compensation to customers in case of outages; preservation of privacy even after termination of the contract with the client. Every Cloud provider shoud have a full log report about the client's data location (country) within the cloud and every action on client's data and applications. IT professionals should be careful in having all necessary information about their data in every time, and making and agreement about cloud support efficiency and cost.

An impressive barrier reported is the adaption of existing systems in Cloud Computing. Conversion of an existing application that is suitable for the Cloud can be a great investment, which may require much time and changes in the whole application. Migration to cloud implies a strategy in identifing applications for migration to a cloud, considering for the type of cloud environment the application is best suited and finally application migration planning and testing. It requires detailed application migration process design experience and deep understanding of cloud computing models as well as detailed knowledge of how the applications interact with both each other, the external (cloud)

environment, and the underlying infrastructure and experience integrating IT systems and cloud management. [2] However, there are several companies that have expertise and experience in helping customers to migrate to the Cloud or transform their data centers between different providers.

Compared to Global Research, our survey repondents did not rank quality of service and long term costs in their major barriers to cloud computing. [7] This inconsistency highlights the lack of experience and increases the need for more information (workshops, social networks, e-learning etc.) and training about cloud computing in Albania.

CONCLUSIONS

- The current situation in Albania is optimistic in availability of Albanian IT professionals to adapt to new technologies, but overcoming the difficulties increases the need for more information (workshops, social networks, e-learning etc.) and training about cloud computing in Albania.
- 52% of IT professionals are considering to move data in the Cloud and 31% have tested, implemented or used Cloud.
- Most of the respondents evaluate as the major advantage of cloud the enhancement of IT performance at a low cost, and have chosen Google Application Engine as the most convenient provider.
- The biggest challenges reported by the survey are data privatecy and security 72%, which requires a greater legislative attention and migration to the Cloud, which requires a full migrating strategy.

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ON WEAKLY COMPATIBLE MAPS IN DISLOCATED AND DISLOCATED QUASI-METRIC SPACES

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PËRMBLEDHJE
Hapesirat e dislokuara metrike e kuasi-metrike jane disa nga pergjithesimet e hapesires metrike, te cilat u prezantuan nga Hitzler. P dhe Zeyada. F, te motivuar nga roli I rendesishem qe ato luajne ne fushat si topologjia, programimi logjik dhe shkencat kompjuterike. Ne vitin 1996 Jungck perkufizoi nocionin e funksjoneve dobesisht kompatibel. Me pas shume matematiciene studjuan e zhvilluan rezultate mbi pikat fikse per klasen e funksjoneve dobesisht kompatibel. Kohet e fundit shume kerkues zhvilluan keto koncepte ne kornizen e hapesirave te plota te dislokuara metrike. Ate kane dhene teorema mbi pikat fikse ,pikat fikse te perbashketa, pikat e koincidences per nje funksjon, dy funksjone apo dy cifte funksjonesh qe plotesojne tipe te ndryshme kontraktimi. Ne kete materjal te paraqitur, ne zhvillojme teorema mbi pikat fikse te perbashketa (duke treguar egzistencen dhe unicitetin) per dy cifte funksjonesh dobesisht kompatibel ne hapesirat e dislokuara metrike, duke perfshire tipe maksimumi dhe lineare kontraktimi. Rezultatet e lidhura me kete materjal pergjithesojne dhe permiresojne nje numer teoremash ne literaturen egzistuese.
Fjalët çelës: largesë e dislokuar, largesë kuazi e dislokuar, pikë fikse, vargu d-konvergjent,varg dq-konvergjent.
Key-words: weakly compatible maps, dislocated metric, dislocated quasi-metric, fixed point.

INTRODUCTION

Dislocated metric and dislocated quasi-metric are some of the generalizations of metric, that were introduced by Hitzler. P and Zeyada. F, motivated from the important role which they play in fields as topology, programming logic and theory of computation. In 1996 Jungck weakened the notion of compatibility in weak compatibility. Since then, many mathematicians studied fixed point results for the class of weakly compatible mappings. More recently, many researchers exploited these concepts in framework of complete dislocated metric space and dislocated quasi-metric space. Based on these metrics, they have obtained fixed, common fixed, coincidence and coupled fixed point theorems for a single self map and two pairs of self mappings satisfying different types of contractive conditions.

In this present paper, we develop some common fixed point theorems (existence and uniqueness) for two pairs of weakly compatible mappings in dislocated metric space, using maximum and linear type of contractive conditions. The related results generalize and improve various theorems in recent literature.

PRELIMINARIES

We start with base and auxiliary definitions and notations, which will be used throughout in this paper.

Definition 2.1[11] Let X be a non-empty and let $d: X \times X \to \square^{+}$ be a function, called a distance function if for all $x, y, z \in X$, satisfies:

$d_1 : d(x,x) = 0$

$d_2 : d(x,y) = d(y,x) = 0 \Rightarrow x = y$

$d_3 : d(x,y) = d(y,x)$

$d_4 : d(x,y) \le d(x,z) + d(z,y)$.

If d satisfies the condition $d_1 - d_4$, then d is called a metric on X. If it satisfies the conditions d_1, d_2 and d_4 it is called a quasi-metric space. If d satisfies conditions d_2, d_3 and d_4 it is called a dislocated metric (or simply d-metric). If d satisfies only d_2 and d_4 then d is called a dislocated quasi-metric (or simply dq-metric) on X. A nonempty set X with dq-metric d, i. e., (X,d) is called a dislocated quasi-metric space.

Definition 2.2 [11] A sequence $(x_n)_{n \in \square}$ in d-metric space (X,d) is called Cauchy if for all $\varepsilon > 0$, $\exists n_0 \in N$ such that $\forall m, n \ge n_0$, $d(x_m, x_n) < \varepsilon$.

Definition 2.3 [11] A sequence $(x_n)_{n \in \square}$ is dislocated convergent to x if $\lim_{n \to \infty} d(x_n, x) = 0$. In this case x is called a d-limit of $(x_n)_{n \in \square}$ and we write $x_n \to x$.

Definition 2.4 [11] A d-metric space (X,d) is complete if every Cauchy sequence in it is d-convergent.

Example 2.5 Let $X = [0,1]$ and $d(x,y) = \max\{x,y\}$. Then the pair (X,d) is a dislocated metric space, but it is not a metric space.

Lemma 2.6 [11] Every subsequence of d-convergent sequence to a point x_0 is d-convergent to x_0

Definition 2.7 [11] Let (X,d) be a d-metric space. A mapping $T: X \to X$ is called contraction if there exists $0 \le \lambda < 1$ such that: $d(Tx, Ty) \le \lambda d(x,y)$ for all $x, y \in X$.

Lemma 2.8 [11] Let (X,d) be a dq-metric space. If $f: X \to X$ is a contraction function, then $f^n(x_0)$ is a Cauchy sequence for each $x_0 \in X$.

Lemma 2.10 [11] d-limits in a d-metric space are unique.

Definition 2.11 [4] Let F and S be mappings from a dislocated metric space (X,d) into itself. Then, F and S are said to be weakly compatible if they commute at their coincidence point; that is $Fx = Sx$ for some $x \in X$ implies $SFx = FSx$.

Example2.12 Let $X = [0,1]$ and $d(x,y) = |x - y| + y$ for all $x, y \in X$ be a dislocated metric on X. Then (X,d) be a dislocated quasi-metric space. We define the mappings $fx = \frac{1}{2}x$ and $gx = \frac{1}{4}x$ and consider the sequence (x_n), where $x_n = \frac{1}{n}$ for $n \in N$. It is clear that f, g are compatible since $\lim_{n \to \infty} d(fgx_n, gfx_n) = 0$, here the sequence (x_n) is such that $\lim_{n \to \infty} fx_n = \lim_{n \to \infty} gx_n = 0$ for $0 \in X$.

MAIN RESULTS

Theorem 3.1 Let (X,d) be a complete dislocated metric space and $S, T, F, G: X \to X$ are continuous mappings, satisfying the conditions:

(3.1.1) $S(X) \subset G(X), T(X) \subset F(X)$

(*3.1.2*) The pairs (S,F) and (T,G) are weakly compatible

(3.1.3)

$$d(Sx,Ty) \le k \max \left\{ \begin{array}{l} d(Fx,Gy), d(Fx,Sx), d(Gy,Ty) \\ d(Fx,Ty), d(Gy,Sx), \\ \dfrac{d(Fx,Sx)d(Gy,Ty)}{d(Fx,Gy)} \end{array} \right\}$$ for

all $x, y \in X$ and $0 \le k < \frac{1}{2}$, whenever $d(Fx,Gy) \ne 0$ .Then $F, G, S,$ and T have a unique common fixed point in X.

Proof: Let x_0 be an arbitrary point in X .Define the sequence (x_n) and (y_n) in X as follows:

$y_{2n} = Sx_{2n} = Gx_{2n+1}; y_{2n+1} = Tx_{2n+1} = Fx_{2n+2}$

Let consider these steps:

Step1. If $y_{2n} = y_{2n+1}$ for some n, then $Gx_{2n+1} = Tx_{2n+1}$. Hence x_{2n+1} is a coincidence point of G and T.

If $y_{2n+1}=y_{2n+2}$ for some n, then $Fx_{2n+2}=Sx_{2n+2}$. Hence x_{2n+2} is a coincidence point of F and S.

Step2. If $y_{2n}\neq y_{2n+1}$ for all n by condition (3.1.3) we have:

$$d(y_{2n},y_{2n+1})=d(Sx_{2n},Tx_{2n+1})$$

$$\leq k\max\left\{\begin{array}{l} d(Fx_{2n},Gx_{2n+1}),d(Sx_{2n},Fx_{2n}),\\ d(Tx_{2n+1},Gx_{2n+1}),d(Fx_{2n},Tx_{2n+1}),\\ d(Gx_{2n+1},Sx_{2n}),\\ \dfrac{d(Sx_{2n},Fx_{2n})d(Tx_{2n+1},Gx_{2n+1})}{d(Fx_{2n},Gx_{2n+1})} \end{array}\right\}$$

$$=k\max\left\{\begin{array}{l} d(y_{2n-1},y_{2n}),d(y_{2n},y_{2n-1}),\\ d(y_{2n+1},y_{2n}),d(y_{2n-1},y_{2n+1}),\\ d(y_{2n},y_{2n}),d(y_{2n+1},y_{2n}) \end{array}\right\}$$

$$\leq 2kd(y_{2n-1},y_{2n})$$

Denote $p=2k$ where $0\leq p<1$, hence $d(y_{2n},y_{2n+1})\leq pd(y_{2n-1},y_{2n})$.

Similarly we have: $d(y_{2n-1},y_{2n})\leq pd(y_{2n-2},y_{2n-1})$

Continuing in this way in generally get:

$$d(y_n,y_{n+1})\leq p^n d(y_0,y_1)\ for\ n=0,1,2,\ldots$$

Since $0\leq p<1$, as $n\to\infty, p^n\to 0$, so $d(y_n,y_{n+1})\to 0$. Thus (y_n) is a Cauchy sequence in a complete dislocated metric space (X,d). So there exists a point $z\in X$ such that $(y_n)\to z$.

Therefore the subsequences

$(Sx_{2n})\to z,(Gx_{2n+1})\to z,(Tx_{2n+1})\to z\ and (Fx_{2n+2})\to z$

Since $T(x)\subset F(x)$, there exists a point $u\in X$ such that $Fu=z$. Again using (3.1.3), have:

$$d(Su,z)=d(Su,Tx_{2n+1})$$

$$\leq k\max\left\{\begin{array}{l} d(Fu,Gx_{2n+1}),d(Fu,Su),\\ d(Gx_{2n+1},Tx_{2n+1}),d(Fu,Tx_{2n+1}),\\ d(Gx_{2n+1},Su),\dfrac{d(Fu,Su)d(Gx_{2n+1},Tx_{2n+1})}{d(Fu,Gx_{2n+1})} \end{array}\right\}$$

$$=k\max\left\{\begin{array}{l} d(z,Gx_{2n+1}),d(z,Su),\\ d(Gx_{2n+1},Tx_{2n+1}),d(z,Tx_{2n+1}),\\ d(Gx_{2n+1},Su),\dfrac{d(z,Su)d(Gx_{2n+1},Tx_{2n+1})}{d(z,Gx_{2n+1})} \end{array}\right\}$$

Taking limit as $n\to\infty$, we get,

$$d(Su,z)\leq k\max\left\{\begin{array}{l} d(z,z),d(z,Su),d(z,z)\\ d(z,z),d(z,Su),d(z,Su) \end{array}\right\}$$

$$\leq 2kd(z,Su)$$

Since $0\leq k<\frac{1}{4}$, we have $d(Su,z)=0$. Again since (X,d) is a dislocated metric space, have $Su=z$. Hence, $Su=Fu=z$.

In the same way, since $S(X)\subset G(X)$, there exists a point $v\in X$ such that $Gv=z$.

Using the similar argument as the above and condition (3.1.3) we show that $Tv=z$.

This means that $Su=Fu=Tv=Gv=z$.

Now, by the weak compatibility of (S,F), it follows that $Sz=Fz$.

Let prove that z is the fixed point of S. If we consider:

$$d(Sz,z)=d(Sz,Tv)$$

$$\leq k\max\left\{\begin{array}{l} d(Fz,Gv),d(Fz,Sz),\\ d(Gv,Tv),d(Fz,Tv),\\ d(Gv,Sz),\dfrac{d(Fz,Sz)d(Gv,Tv)}{d(Fz,Gv)} \end{array}\right\}$$

$$=k\max\left\{\begin{array}{l} d(Sz,z),d(z,Sz),d(z,z),\\ d(Sz,z),d(z,Sz),4d(z,Sz) \end{array}\right\}$$

$$\leq 4kd(Sz,z)$$

Since $0\leq 4k<1$, we have $d(Sz,z)=0$. Since X is a dislocated metric space get $Sz=z$, from this follows $Sz=Fz=z$.

Similarly, since the pair (T,G) are weakly compatible and, $TGv=GTv\Rightarrow Tz=Gz$.

We show that z is the fixed point of T. Using the same argument:

$$
\begin{aligned}
(z,Tz) &= d(Sz,Tz) \\
&\le k\max\left\{\begin{array}{l} d(Fz,Gz), d(Fz,Sz), \\ d(Gz,Tz), d(Fz,Tz), \\ d(Gz,Sz), \dfrac{d(Fz,Sz)d(Gz,Tz)}{d(Fz,Gz)} \end{array}\right\} \\
&= k\max\left\{\begin{array}{l} d(z,Tz), d(z,z), d(Tz,Tz) \\ d(z,Tz), d(Tz,z), \\ \dfrac{d(z,z)d(Tz,Tz)}{d(z,Tz)} \end{array}\right\} \\
&\le 4kd(z,Tz)
\end{aligned}
$$

So $d(z,Tz)=0$ since $0\le 4k<1$ .Thus $Tz=z$ since (X,d) is a dislocated metric space.

Hence, we proved $Sz=Fz=Tz=Gz=z$. This shows that z is the common fixed point of the mappings $S,T,F \text{ and } G$.

Uniqueness: Let suppose that u and v are two fixed points of the mappings $S,T,F \text{ and } G$

From condition (3.1.3) we have:

$$
\begin{aligned}
d(u,v) &= d(Su,Tv) \\
&\le k\max\left\{\begin{array}{l} d(Fu,Gv), d(Fu,Su), \\ d(Gv,Tv), d(Fu,Tv), d(Gv,Su), \\ \dfrac{d(Fu,Su)d(Gv,Tv)}{d(Fu,Gv)} \end{array}\right\} \qquad (4) \\
&= k\max\left\{\begin{array}{l} d(u,v), d(u,u), d(v,v) \\ d(u,v), d(v,u), \dfrac{d(u,u)d(v,v)}{d(u,v)} \end{array}\right\} \\
&\le 4kd(u,v)
\end{aligned}
$$

From (4) since $0\le 4k<1$ get $d(u,v)=0$, which implies $u=v$ because (X,d) is a dislocated metric space. Thus fixed point is unique.

Example3.2 Let $X=[0,1]$ and $d(x,y)=x+y$. Then the pair (X,d) is a dislocated metric space. We define the functions $F,G,S,$ and T as follows:

$Fx=\frac{x}{5}, Gx=\frac{x}{4}, Sx=\frac{x}{15}, Tx=\frac{x}{12}$. The pairs (S,F) and (T,G) are weakly compatible, functions $F,G,S,$ and T are continuous and $S(X)\subset G(X), T(X)\subset F(X)$

We have,

$$
\begin{aligned}
d(Sx,Ty) &= d\left(\frac{x}{15},\frac{y}{12}\right) \\
&= \frac{1}{3}\left(\frac{x}{5}+\frac{y}{4}\right) \\
&= \frac{1}{3}d(Fx,Gy) \\
&\le k\max\left\{\begin{array}{l} d(Fx,Gy), d(Fx,Sx), \\ d(Gy,Ty), d(Fx,Ty), \\ d(Gy,Sx), \dfrac{d(Fx,Sx)d(Gy,Ty)}{d(Fx,Gy)} \end{array}\right\}
\end{aligned}
$$

Where the constant $\frac{1}{3}\le k<\frac{1}{2}$, for all $x,y\in X$.

Thus all conditions of theorem are satisfying and 0 is the unique common fixed point of S,T,F and G .

If in above theorem 3.1 we take $S=T$ we establish this corollary.

Corollary 3.3 Let X be a complete dislocated metric space and $T,F,G: X\to X$ are continuous mappings, satisfying the conditions:

(3.3.1) $T(X)\subset G(X), T(X)\subset F(X)$

(3.3.2) The pairs (T,F) and (T,G) are weakly compatible

(3.3.3)

$$
d(Tx,Ty)\le k\max\left\{\begin{array}{l} d(Fx,Gy), d(Fx,Tx), d(Gy,Ty) \\ d(Fx,Ty), d(Gy,Tx), \\ \dfrac{d(Fx,Tx)d(Gy,Ty)}{d(Fx,Gy)} \end{array}\right\} \text{ for}
$$

all $x,y\in X$ and $0\le k<\frac{1}{2}$,whenever $d(Fx,Gy)\neq 0$ .Then F,G and T have a unique common fixed point in X .

Corollary 3.4 Let X be a complete dislocated metric space and $T,S: X\to X$ are continuous mappings, satisfying the conditions:

$$d(Sx,Ty)\le k\max\left\{\begin{array}{l} d(x,y),d(x,Sx),d(y,Ty)\\ d(x,Ty),d(y,Sx),\\ \dfrac{d(x,Sx)d(y,Ty)}{d(x,y)}\end{array}\right\} \quad \text{for}$$

all $x,y\in X$ and $0\le k<\frac{1}{2}$, whenever $d(x,y)\neq 0$.

Then S and T have a unique common fixed point in X.

Proof. This corollary is obtained from theorem 3.1 if we take in it $F=G=I$.

This corollary is theorem 3.3 of K. Zoto in [9]. If in this corollary put $S=T$, we obtain another corollary for one self mapping on X.

Example 3.5 Let $X=R$ with the dislocated metric $d(x,y)=\max\{x,y\}$ for all $x,y\in X$. Define $S,T:X\to X$ by $Sx=\frac{x}{4},Tx=\frac{x}{8}$.

Then

$$\begin{aligned} d(Sx,Ty)&=d\left(\frac{x}{4},\frac{y}{8}\right)\\ &=\max\left\{\frac{x}{4},\frac{y}{8}\right\}\\ &\le\max\left\{\frac{x}{4},\frac{y}{4}\right\}\\ &=\frac{1}{4}\max\{x,y\}\\ &<\frac{1}{2}d(x,y)\\ &<\frac{1}{2}\max\left\{\begin{array}{l} d(x,y),d(x,Sx),d(y,Ty)\\ d(x,Ty),d(y,Sx),\\ \dfrac{d(x,Sx)d(y,Ty)}{d(x,y)}\end{array}\right\}\end{aligned}$$

Hence, the conditions of corollary 3.4 hold and S and T have a unique common fixed point in X. Here $x=0$ is a common fixed point of S and T.

Changing the contractive condition in the first theorem of paper and following the same line of proof, we can develop two next theorems.

Theorem 3.6 Let (X,d) be a complete dislocated metric space and $S,T,F,G:X\to X$ are continuous mappings, satisfying the conditions:

(3.6.1) $S(X)\subset G(X),T(X)\subset F(X)$

(3.6.2) the pairs (S,F) and (T,G) are weakly compatible

$$(3.6.3)\quad d(Sx,Ty)\le c\max\left\{\begin{array}{l} d(Fx,Gy)+d(Fx,Sx)\\ d(Fx,Gy)+d(Gy,Ty)\\ d(Fx,Sx)+d(Gy,Ty)\end{array}\right\} \quad \text{for}$$

all $x,y\in X$, and $0\le c<\frac{1}{2}$.

Then $F,G,S,$ and T have a unique common fixed point in X.

Theorem3.7 Let (X,d) be a complete dislocated metric space and $S,T,F,G:X\to X$ are continuous mappings, satisfying the conditions:

(3.7.1) $S(X)\subset G(X),T(X)\subset F(X)$

(3.7.2) the pairs (S,F) and (T,G) are weakly compatible

$$\begin{aligned} d(Sx,Ty)\le{}& k_1\left[d(Fx,Gy)+d(Fx,Sx)\right]\\ &+k_2\left[d(Fx,Gy)+d(Gy,Ty)\right]\\ &+k_3\left[d(Fx,Sx)+d(Gy,Ty)\right]\end{aligned}\qquad (3.7.3)$$

for all $x,y\in X$, and $0\le k_1+k_2+k_3<\frac{1}{2}$.

Then $F,G,S,$ and T have a unique common fixed point in X.

Remark 3.8 Our result extends and improves theorem 3.3 of K. Zoto in [9] . The results of C. T. Aage and J. N. Salunke [1 ,2], K. P. R. Rao and P. Rangaswamy [5,6,7] and some corollaries in [8,10]are special case of theorem 3.1 and it generalizes and improves them. If we take $F=G=I$ (identity mapping) in theorem 3.6, we obtain theorem 3.7 of R. Shrivastava, Z. K. Ansari and M. Sharma in [13]. Our results improve these existing results of authors mentioned above. Others corollaries can be obtained from theorems 3.6 and 3.7. Corollary 3.3 and if we replace $S=T$ in corollary3.4, theorems 3.6 and 3.7 then easily these theorems hold true in dislocated quasi-metric space.

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KLASIFIKIMI I BANKAVE SHQIPTARE SIPAS TREGUESVE TË EFIÇENCËS

ALBANIAN BANKS CLASSIFICATION ACCORDING TO THE EFFICIENCY INDICATORS

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PERMBLEDHJE
Ky studim përpiqet të gjejë ngjashmëritë midis bankave shqiptare lidhur me efiçencën që ato gjenerojnë. Për të bërë të mundur këtë analizë ne aplikojmë metodën cluster. Nëpërmjet kësaj analize ne krahasojmë njëkohësisht klasifikimin e bankave në tre grupe sipas madhësisë me grupimin e tyre sipas treguesve të efiçencës. Rezultatet tregojnë se bankat e mëdha të klasifikuara në grupin G3 janë ato që pothuajse gjithmonë shfaqen shumë afër njëra-tjetrës. Kjo tregon se ato jo vetëm janë më efiçentet, por njëkohësisht formojnë edhe grupin më homogjen. Banka Alpha dhe Banka Ndërkombëtare Tregtare janë dy bankat e grupeve të tjera që shfaqen shumë afër grupit G3. Bankat e tjera të grupit G2 dhe G3 janë më shumë të shkrira me njëra-tjetrën. Studimi arrin në përfundimin se bankat e mëdha në Shqipëri janë më të mundshmet për të qenë më efiçente. Megjithatë jo patjetër një bankë e vogël mund të mos jetë e tillë.
Fjalët çelës: efiçenca, sistemi bankar, analiza cluster

SUMMARY
This study tries to find similarities between Albanian banks regarding the efficiency. To enable this analysis we apply the cluster method. Through this analysis, we also compare the classification of banks into three groups according to their size with the classification by the efficiency indicators. Results show that banks with the highest weight in assets (meaning banks of the third group) are generally those that appear very close to each other. This indicates that they are the most efficient and form the most homogeneous group. Alpha Bank and International Commercial Bank are the two banks of other groups that appear closer with the G3 group. Other banks from G2 and G3 group are more distributed between them without clearly classification. The study concludes that large banks in Albania are likely to be more efficient. However, not necessarily a small bank may not be so.
Key words: efficiency, banking system, cluster analysis

1.INTRODUCTION

The globalisation trend in one side increases the financial linkages, increasing in this way the contagion effects. In the other side, the financial systems face competitive pressure. These issues become even more sensitive for post-communist European countries as their economies have created relatively new financial systems being currently of little experience, moreover when they become part of EU. Their survival requires them among others, to be as efficient as possible. In such conditions, financial institutions, managers, regulators, investors as well as governments are concerned about how efficiently these institutions perform their functions. Therefore, in this paper, we want to answer these basic questions: 1) how close to each other banks in Albania in terms of bank

efficiency are; 2) how these similarities have changed during the years of the period under consideration; 3) Is it the same classification with the bank's size classification?

We apply cluster analysis techniques to examine the degree of similarities between banks. Cluster analysis aims to find similarities between the banks and cluster them into groups. This analysis can not impose restrictions on relationships between banks and can not find the factors that have contributed to these relationships. Such an analysis is very important as a first step of other deeper analysis that tries to explain the relationship between banks and factors affecting on these relationships.

In our analysis, we will focus specially on the efficiency of Albanian banks, although it not fully captures all features of banking system. The paper uses this characteristic as a basis for describing, comparing, and analyzing banks in Albania, and their evolution over time in the period 2008-2011. Results show that banks with the highest weight in assets (meaning banks of the third group) are generally those that appear very close to each other. This indicates that they are the most efficient and form the most homogeneous group. Alpha Bank and International Commercial Bank are the two banks of other groups that appear closer with the G3 group. Other banks from G2 and G3 group are more dissolved between them without clearly classification. The study concludes that large banks in Albania are likely to be more efficient. However, not necessarily a small bank may not be so.

The paper continues with section 2, which provides a review of the literature on the financial linkages, particularly about efficiency dimension. Section 3 describes the general methodologies for cluster analysis. Section 4 explains the data and theoretical foundation for the choice of variables. Section 5 presents the results, while section 6 concludes and outlines areas for further research.

2.LITERATURE REVIEW

Many studies supported the relationship between low efficiency and the failure of the financial institution. Banks and S&Ls with low efficiency failed at greater rates than institutions with higher efficiency levels (Berger and Humphrey, 1992a; Cebenoyan, et al., 1993). Management quality, as measured by regulatory agency assessments, is positively related to cost efficiency (DeYoung, 1997c) which, in turn, Granger-causes reductions in problem loans (past due and nonaccrual, Berger and DeYoung, 1996). As a result, efficiency measures have been shown to improve the predictive accuracy of failure prediction models and thus may represent a useful addition to current modelling efforts by regulatory agencies Berger (1997).

There are various studies within the literature that used different clustering methods for a given classification problem and compared their results (Nanda et al., 2010). Through our literature survey, we found that Sorensen et al., (2006) explain that, in the period 1998-2004, the banking sectors in the euro area countries seem to have become somewhat more homogeneous, although the results are unequivocal and considerable differences remain. Karreman (2009) examines the contemporary financial geographies of Central and Eastern Europe and argues how these may affect the established European financial centre network in the future. The results show a distinct spatial order of financial centres organised around three main city clusters: a 'south-east' cluster controlled by Athens, a 'central-east' cluster controlled by Vienna and a 'Baltics' cluster controlled by both Copenhagen and Stockholm. Beck et al., (2008) uses information from different databases to benchmark countries' financial systems over time. Beck et al., (2010) introduces the updated and expanded version of the Financial Development and Structure Database and presents recent trends in structure and development of financial institutions and markets across countries. They found a general deepening of financial markets and institutions over time, which is more pronounced in the high-income

countries and more pronounced for markets than for banks. Čihák et al., (2012) use the Global Financial Development Database, an extensive dataset of financial system characteristics for 205 economies from 1960 to 2010. The authors document cross-country differences and time series trends. Our contribution is to try clustering banks in Albania related to their efficiency. This analysis had to confront significant gaps in information on Albanian bank's interlinkages that is necessary to inform policy decisions regarding Albanian banking system.

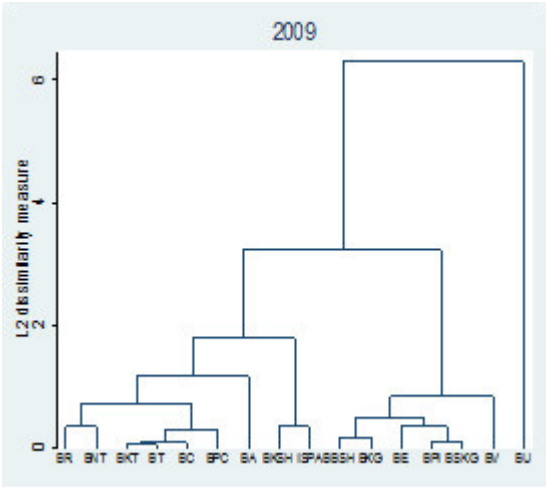
3.METHODOLOGY AND VARIABLES DESCRIPTION

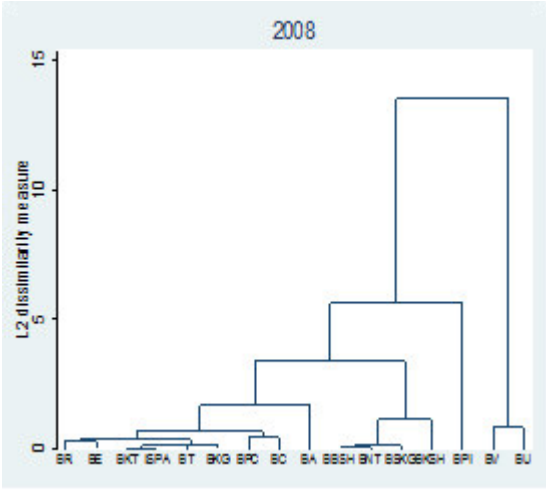
The objective of cluster analysis is to determine the natural groupings (or clusters) of observations. In our study, we search in the data for groups of banks, in which banks in the same group are more similar to each other than to those in other groups. This technique would give a better and more accurate explanation of the observations with a minimal loss of information, because it requires no assumptions about the independence of the observations. However, this method like other methods imposes some limitations. There are several cluster-analysis methods, where most of them allow a variety of distance measures for determining the similarity or dissimilarity between observations. In this study, we chose to apply hierarchical techniques, since the number of final clusters was unknown. We decided to use the squared Euclidean measurement in this study, since it place greater emphasis on outliers to generate distance patterns (see Dillon and Goldstein, 1984; Everitt et al., 2001). Finally, we choose the complete and average linkage method, because they led to the most consistent and stable results. We have therefore based our discussion on these methods, and the dendrograms for each time period show the cluster-relation between the different banks. Stata 11 package was applied to carry out the calculations.

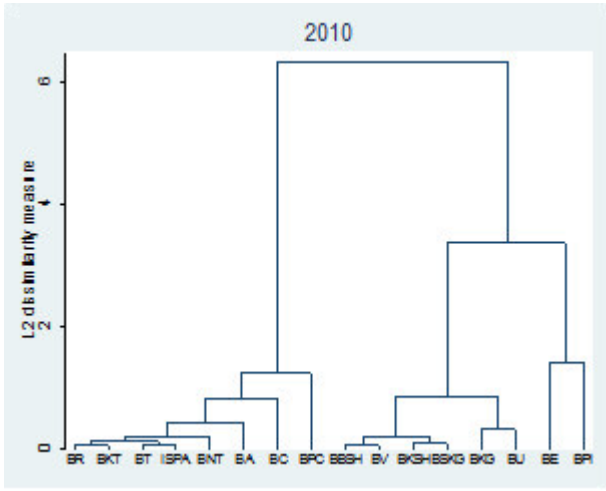
The paper uses the data to characterize and compare banks over time. So, are the data themselves that structure the results, therefore the selection of variables is very important. For intermediaries, efficiency is primarily constructed to measure the cost of intermediating credit. Determinations of efficiency require different methodologies to measure it. Traditional methods of measuring the efficiency are related with analysis of various financial ratios, such as ROA, ROE, net interest margin etc. Several other studies have attempted to identify the characteristics that explain bank efficiency differences by means of bank size, form of organization, market characteristics (such as concentration), age of financial institution, loans to total assets ratio, etc. In our study, the efficiency measures will include indicators such as overhead costs to total assets, net interest margin, lending-deposits spread, non-interest income to total income, cost to income ratio, and closest related variables include return on assets and return on equity, based on the categorization of variables proposed by Beck et al., (2010). *The net interest margin* equals the accounting value of a bank's net interest revenue as a share of its total earning assets, while *overhead cost* equals the accounting value of a bank's overhead costs as share of its total assets. Higher levels of net interest margins and overhead costs indicate lower levels of bank efficiency, as they incur higher costs and there is a higher wedge between lending and deposit interest rates. *Lending-deposits spread* is lending rate minus deposit rate. *Cost-income ratio* that measures the overhead costs relative to gross revenues, with higher ratios thus indicating lower levels of cost efficiency. *Return on Assets and Return on Equity* are computed as unweighted averages across all banks in a given year. They regarded as the basic indicators of bank profitability. The variables described above are relatively crude measures of efficiency. It is possible to calculate efficiency indices based on data envelopment analysis, stochastic frontier analyses or other more sophisticated measures (see Bauer et al., (1998) for a detailed comparison of frontier efficiency methods in financial institution). Therefore, we include cost efficiency in our analyses to make it even more complete. We take the value of this

variable from the study of Kristo (2013). We picked out from Bank of Albania database the time period 2008 to 2010, to not have missing variables and structural changes of the banking system.

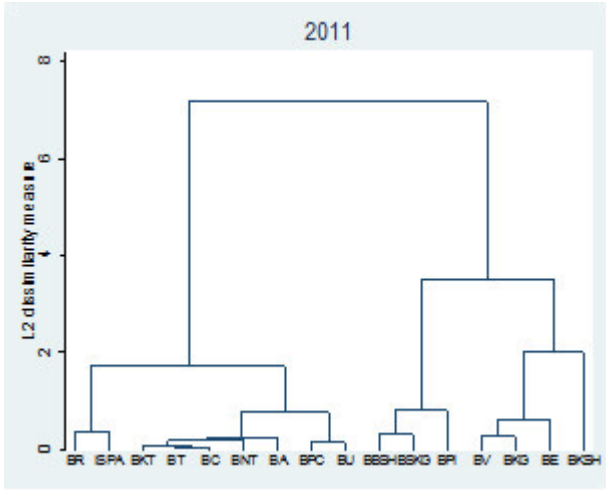
Figure: Dendrograms of Albanian bank's classification







Source: Authors calculations



4.RESULTS

We have applied the two methods: average and complete linkage. Both of them give almost identical results, with very small differences. Results obtained from complete method give a more clear idea of the similarities and differences between the banks, so we decided to illustrate the dendrograms of this method for each year below.

Generally, these banks are classified into three groups. The third and the bigger group include 8-9 banks. At this group are always included BR, BKT, ISPA, BT (all these banks are in

G3 group according to Central Bank of Albania classification), BC, BA and BPC. BNT (G1 group) is included to the third group for three year, whereas BKG, BE, BU, and BKSH are included to this group for only one year. The second group includes fewer banks compared to the first one (5-6 banks). The banks that are always included in this group are BSKG (G2 Group) and BBSH (G1 Group). BKG, BPI and BV are included to the second group for three years. The last group, in general, includes 1-2 banks. In this group has been included BE, BKSH, BU, BPI and BV. During the study period, BE, BKSH and BU pass from one group to another.

The dendrogram of the year 2008 shows almost the same classification as the Central Bank of Albania. Exception from this classification is BE (G2 group), which appears closer to the banks of the third group. Another exception is BA (G3 group), which is much closer (regarding efficiency indicators) to the second group, while BSKG (G2 group) appears closer to the some banks of the first group even though it belongs to the second group.

In 2009 there seems to be not so strong the link between banks in the same group. We can distinguish BSKG closer to the small banks as the year 2008. On the other hand there is BNT (G1 group), that is near the banks of the biggest group (G3 group). This similarity confirms even more the results of the cost efficiency analysis to Kristo (2013). BSKG and BNT tendency to stay closer to the banks of G1 group and G3 group respectively maintained even during other years.

In 2010, we have the third group as more homogeneous, while the second and the first group look more merged with each other. However, over the years under the study seem that three banks of the G2 group BC, BA and BPC are closer to the G3 group.

Also the year 2011 represents the third group as more homogeneous. These banks have many similarities with each other than two other groups. Passing of BU to the second group (due to its increased size) is also reflected on the efficiency resemblance of this group. In addition, the greater similarity in efficiency, of the BC with big banks seem to justify further more its passage into the third group. Well, the exchange of BC with BA seems also justified in terms of efficiency similarity that they have with respective groups.

Banks	**Groups**	**Year coverage**
United Bank of Albania **(BBSH)**	**G1** banks sharing below 2% of total banking system's assets each	2008-2011
Veneto Bank **(BV)**		2008-2011
International Commercial Bank **(BNT)**		2008-2011
First Investment Bank **(BPI)**		2008-2011
Credit Bank of Albania **(BKSH)**		2008-2011
Union Bank **(BU)**		**2011 in G2**
Procredit Bank **(BPC)**	**G2**	2008-2011

Emporiki Bank-Albania **(BE)**	banks sharing 2 to 7 percent of total banking system's assets each	2008-2011
National Bank of Greece Albania Branch **(BKG)**		2008-2011
Alpha Bank **(BA)**		**2008-2009 in G3 group**
Société Générale Albania Bank **(BSKG)**		2008-2011
Raiffeisen Bank, **(BR)**	**G3** banks sharing more than 7% of total banking system's assets each	2008-2011
National Commercial Bank **(BKT)**		2008-2011
Intesa Sanpaolo Bank Albania **(ISPA)**		2008-2011
Tirana Bank **(BT)**		2008-2011
Credins Bank **(BC)**		**2008-2010 in G2 group**

Table: Classification of banks into groups based on their activity size

Source: Bank of Albania (2012)

5.CONCLUSION

We used cluster analysis to understand better the Albanian banks in terms of their efficiency. This analyses classified banks into groups according to similarities that they exhibit. The results of this method showed that not necessarily a big bank is more efficient. The third group and the largest, is more homogeneous. Whereas two other groups are more merged with each other. Moreover, the passage of banks into different groups, according to the weight of assets, supported by the efficiency classification.

The recommendations for banking regulators authorities may be obtained after further investigations. Some proposals for further research include: 1) the evaluation of the bank efficiency with different parametric and non-parametric methods; 2) adding other variables of bank's development to understand even more their connections; 3) this paper is a first step for analyzing the banking system development. Therefore, further analysis should be undertaken to study the factors affecting the efficiency of Albanian banks.

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WHY DO ALBANIANS MIGRATE INTERNALLY?

PËRSE MIGROJNË SHQIPTARËT BRENDA VENDIT?

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PËRMBLEDHJE
Një nga fenomenet kryesorë, që shoqëruan tranzicionin shqiptar ka qënë migracioni: i brendshëm dhe i jashtëm. Ndërkohë që migracioni i jashtëm ka qënë në fokus të debatit akademik, migrimi i brendshëm mbetet ende i nënstudiuar. Ky artikull ka të bëjë me migrimin e brendshëm dhe me mënyrën se si ky fenomen është ndikuar nga faktorë të ndryshëm social – ekonomikë në terma agregatë. Analiza jonë fokusohet në përcaktuesit e migrimit drejt Tiranës, që është destinacioni kryesor. Qëllimi është të hidhet dritë mbi kopmleksitetin e këtij fenomeni, me qëllim të kuptuarin e motiveve dhe përcaktuesve, të cilët formëzojnë proçesin e migrimit. Variablat e interesit, që krijojnë dallime në sjelljen migratore të flukseve migratorë midis rajoneve të ndryshëm dhe Tiranës, janë diferencat në normat e papunësisë, si edhe ndryshimet në të ardhurat për frymë midis rajonit të destinacionit dhe origjinës. Ne kemi krijuar një model migrimi, që merr në konsideratë një model të zgjeruar graviteti. Burimi i të dhënave janë të dhënat e Regjistrimit të Popullsisë dhe Banesave (2011) dhe tregues të tjerë zyrtarë, të tillë si GDP/frymë, normat e papunësisë dhe tregues të tjerë social - ekonomikë. Rezultatet mbështesin modelin Harris – Todaro dhe teori të tjera të migracionit, të cilat konsiderojnë ndryshimet në të ardhura si përcaktuesin kryesor të flukseve migratorë në nivel agregat. Bazuar në rezultatet tona teorikë dhe ekonometrikë, punimi përmbyllet me disa rekomandime për politikat.
Fjalët kyçe: migrimi i brendshëm, përcaktuesit shtytës dhe tërheqës, Shqipëri, modeli i gravitetit, norma e papunësisë, PBB/frymë, nivel agregat

SUMMARY
One of the major phenomenon which has accompanied the Albanian transition has been the migration: internal and international. Whilst the international migration has been on the focus of the academic debate, internal migration is still understudied. This paper is about the internal migration and the way in which such a phenomenon has been influenced by different economic and social factors in aggregate terms. We focus our analysis on the determinants of migration to Tirana, as the main destination. The purpose is to throw light onto the complexity of this phenomenon, in order to understand the motives and determinants that form the migration process. The variables of interest that create differences on such behaviour of migration flows between different regions and Tirana, are the differences in GDP per capita between the destination and source districts, and the differences in unemployment rates as well. We build a migration model, which takes into consideration an extended gravity model. We use data from last Census (2011) and other official data regarding GDP per capita, unemployment rates and other social - economic indexes. Results support the Harris – Todaro model and other migration theories regarding the income differences as a main determinant of migratory flows, in aggregate level. Based on our theoretical and econometric results, we try to conclude by providing some policy recommendations.
Keywords: internal migration, push and pull determinants, Albania, gravity model, aggregate level, unemployment rate, GDP/capita

1. Introduction

The literature suggests that substantial economic changes usually bring about labour flows that take place within a country's labour market from one sector to another and from rural to urban areas, as well as between national labour markets. Entering the transition period, Albania was immediately characterised by large migration flows, associated with the economic and political transformations. In 2000, approximately one fifth of the 1989 Albanian population were living in a foreign country (Galanxhi et al., 2004). According to Instat (2010), one in five familes has at least a family member that has migrated within the country, whilst about two in five familes have at least a member that has moved abroad. Population movements have continued at high rates not only immediately after the 1990, but during 2001-2011 as well, and especially within the country from the rural to the urban areas. Results of population Census 2011 indicate that about more than 10% of population currently living in Albania has changed its residence within the country (INSTAT, 2012).

This paper investigates determinant factors of internal migration in Albania during the transition period. The purpose of this paper is to draw light on complex behaviour of migrant flows, in order to understand the motives that encourage migration processes, focusing on the differences regarding per capita GDP between origin and destination regions. Moreover, a model of gravity will be used in order to observe such differences. The aim is to be able to provide some political suggestions in order to smooth down the effects of uncontrolled population movements across the country.

This paper is organised as follows. Section 2 introduces some of the main characteristics of Albanian population movements after 1990. Section 3 reviews the main theories of migration in relation to Albanian migration. Methodology and the empirical analysis to be applied in this paper is introduced in Section 4. Section 5 draws some relevant conclusions brought to light in this paper.

2. Internal migration in Albania

Migration has been one of the most dynamic characterstics generating socio-economic effects of Albanian transition (King, 2005; King & Vullnetari, 2003; Barjaba, 2000; Doka, 2005). Although Albania is much alike other countries of the South and East European region and other developing economies, the mass migration during a relatively short time and relative to its population make it an exeption (Mullan, 2005). Understanding motivation of migrants, causes and consequences of their movements, would help building political strategies to minimise negative effects of such flows and maximising any benefits from this processes.

Albania has been mostly known for its international migration flows, though internal migration is as well widespread. As internal migration has been considered as one of the most important processes of the post-communist Albania, it remains an underdiscussed issue in the domestic migration literature (Vullnetari and King, 2008; King *et al*., 2008; Bërxholi 2000; Bërxholi *et al.*, 2005). Internal migration has been a much faster reaction against the negative shocks of economic transformation with the beginning of transition as compared to the international migration, maybe because it may considered as a less costly alternative. Almost one in three adult persons have experienced migration within the country since they were born (World Bank, 2007). Migration has been of different forms, but the rural-urban one dominates (Hagen – Zanker and Azzarri, 2008).

According to Carletto et *al*. (2004), internal migration has had two main peaks during periods of 1990-1993 and 1996-1998. The latter was due to the fall of pyramid schemes. During the rest of the period from 1990, internal migration has been almost constant. Figure 1 supports this finding. However, migration movements have been higher before 2000.

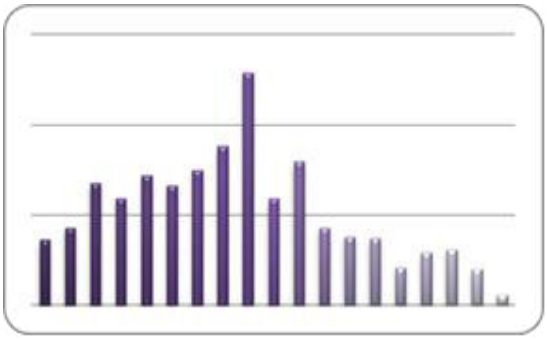

Figure 1. Internal migrants according to the year of their movement (1990-2008)
Source: Authors' calculations based on LSMS 2008.

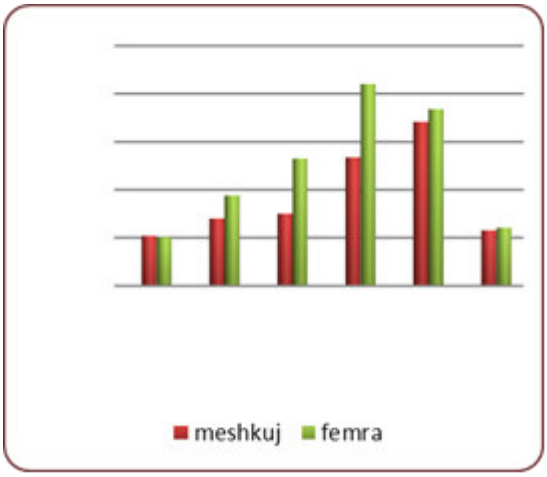

Figure 2. Internal migrants according to age and gender
Source: Instat (2012) Results of Census 2011, authors'calculations

The host region of the largest interest to migrants has been the capital city, Tirana (Instat, 2002; 2004: 117). According to Vullnetari and King (2008), almost three fourth of internal migration is attributed to economic causes such as seeking or beginning a new job and land insufficiency. Individual migrants have generally been of the working age and educated (World Bank, 2007). It has been found that they are characterised of various socio-economic past (De Soto *et al.,* 2002; Cila, 2006). Moreover, it has been argued that Albanian internal migration has been the consequence of the excess labour force in rural areas, which are supposed to continue moving towards urban areas until an equilibrium is stabilised (Çabiri, 2002; Instat, 2004). However, according to Gilbert and Gugler (1992), although the gap between rural and urban areas in the developing countries would have mitigated a massive migration from the underdeveloped rural areas, "cities hardly welcomes new migrants; only those that are highly qualified, wellinformed and risktakers will succeed to move in" (pp. 374). Consequently, migration becomes a selection process in terms of the socio-economic past as well as gender and age of the subjects.

3. Theoretical analysis of migration

Migration is known as the movement of people from one permanent residence to another permanent or temporary residence for a substantial period of time breaking thus the social and cultural ties. The history of human migration is as old as man itself. Since the dawn of human evolution, people have migrated in search of food, shelter, safety and better climate. People still move for these reasons, but new reasons for migration are arising, such as job relocation, overpopulation etc. The dynamics of populations have always produced a surplus population which had to relocate, either vertically within the social structure or physically, which is the focus of migration studies. The redistribution of population through migration appears disrupting.

Migration is a shared topic within social sciences; to a greater or a lesser extent in the study of migration each discipline bear on the process by bringing its distinctive approach. Economists have approached the study of migration in terms of jobs and economic opportunities (Thomas, 1954; Shaw, 1975; Todaro, 1970), whilst demographers have been more focused on the role of migration in population growth, particularly population forecasting and projections (Bogue, 1969).

One of the dominant research frameworks in this field is *neoclassical theory*, which explains that migration is caused by the difference between

economic benefits expected at origin and destination. Neoclassical migration theory considers rural-urban migration as an constituent part of the whole development process, by which surplus labour in the rural sector supplies the workforce for the urban industrial economy (Lewis, 1954). At the macro-level, neo-classical economic theory explains migration by geographical differences in the supply and demand for labour. The resulting differentials in wages cause workers to move from low-wage, labour-surplus regions to high-wage, labour-scarce regions. Migration will cause labour to become less scarce at the destination and scarcer at the sending end. Capital is expected to move in the opposite direction. In a perfectly neo-classical world, this process of "factor price equalization" (the Heckscher-Ohlin model) will eventually result in growing convergence between wages at the sending and receiving end (Harris and Todaro 1970; Lewis 1954; Ranis and Fei 1961; Schiff 1994; Todaro and Maruszko 1987). In the long run, this process would remove the incentives for migrating.

Keynesian economic theory is critical of the neo-classical view on migration. In Keynesian theory, labour supply also depends on the nominal wage, not only on the real wage. This distinction stems from the different views on the role of money in the economy. In the neo-classical point of view money is solely a medium of exchange. The Keynesian point of view is different, because here money is not only a medium of exchange but also a medium of saving. Because of this latter function of money, potential migrants are also attracted to high nominal wage regions. In addition, intentions to re-migrate or to send remittances further increase the importance of the nominal wage level compared to the real wage level. As a result, there may not be a new equilibrium, as hypothesised by neo-classical economic theory. Although the Keynesian migration theory is a criticism against the neoclassical models of labour mobility, it is also an equilibrium recovering mechanism, where migration removes unemployment differences rather than wage differentials (Jennissen, 2003). Structural changes and the consequent instability of the economic environment in the source country may raise unemployment, and thus encourages labour force searching for jobs in other labour markets from those in the origin.

Human capital theory assumes that personal assets such as skills, education, and physical abilities are fundamental "capitals" that boost economic production. Human capital theory also enables to theoretically explain the selectivity of migration beyond explanations focusing only on costs. Migrants are typically not representative of the communities they come from. Considering that individuals are different in terms of personal skills, knowledge, physical abilities, age, sex, and so on, there will also be differences in the extent to which people are expected to gain from migrating, that is, they can expect diverging returns on their migration investment. Differences in such expected "returns on investments" can partly explain diverging inter-individual propensities to migrate. Depending on the specific type of labour demand in migrant receiving areas, migrants will be selected depending on their specific skills and educational background. This makes it possible to explain theoretically why the likelihood of migration decreases with age and why individuals with higher education often exhibit a higher migration propensity.

New economics of migration considers migration as a household decision taken to minimize risks to family income or to overcome capital constraints on family production activities.

Dual labor market theory argues that migration is caused by demand for low-wage labor. From the migrants' perspective, therefore, immigration is a human capital investment.

According to *network theory*, the existence of interpersonal ties that connect migrants, former migrants, and nonmigrants in origin and destination areas thru ties of kinship, friendship, and shared community origin is hypothesize to increase the likelihood of migration by lowering the costs, raising the benefits, and mitigating the risks of movement. Network connections are social capital (Boyd 1989; Gurak and Caces 1992).

4. Empirical analysis and results

The empirical literature on migration defines different factors that affect the propensity to emigrate, which fall into the categories of personal, family and regional factors. The data used in this paper are drawn from results of Census 2001 and 2011 and other official data.

Among the set of intervening obstacles, the distance of the move is generally included as one that is always present (Lee, 1966). To this extent, considerable research has modelled aggregate migration flows across space using the gravity model based on the law of universal gravitation derived by Isaac Newton. The basic equation to social interactions that applies is (Boyle et al, 1998): $\hat{M}_{ij} = k\frac{P_i P_j}{d_{ij}^b}$, where $\hat{M}_{ij}$ is the estimated number of migrants moving between *i* and *j*, *k* is a constant, P_i and P_j are the populations of the origin and destination and d_{ij} is the distance between them. The model applies in natural logarithm variables and can be generally operated as ordinary least squares with the assumption of the normal distribution.

	Unstandartized Coefficient	Beta	t	Sig.
Constant	-,753		-1,232	,220
Logmigrantstock	,955	,971	11,941	,000
Logdifferences inGDP	,884	,515	1,114	,268
Logdifferencesinunemloyment	-,408	-,131	-1,620	,108
Logrelativepopulation	2,380	1,169	2,541	,012
LogrelativePercentofagriculture	-,569	-,249	-1,855	,066
LogrelativeSizeof enterprises	-6,999	-,613	-3,505	,001
logdistance	-,095	-,027	-,424	,672
Logdifferenceinactiveenterprises	1,700	1,269	3,143	,002

Table 1: Empirical results

In Albania, the transition process from planned to free market economy has been accompanied by a dramatic growth in unemployment, low wages and higher prices for consumer goods. Living conditions and standards of living have deteriorated. In the absence of other ways to response to this situation and to protect against these risks, the migration serves to reduce the total risk to family income. The main goal is to escape the misery of life in the areas of origin. Also we must consider the migration as a solution to an immediate problem.

In order to analyse the migration rate and location choice of emigrants, measures of per capita GDP, as well as total population indexes and differences in unemployment rate are used to describe factors in the origin and destination countries (Mayda 2005, Jennissen 2003, Bauer et *al.,* 2000).

The results indicate that there are strong push factors driving migration flows, which are mainly related to the labour market conditions in Albania. Inequality at home location is positively associated with the rates of temporary emigration from each district, whilst the main determinants is the existing migrants'stock, which stimulate further migration flows.

5. Conclusions

Political implications emerging from this paper analysis are that if it is necessary to slowdown migration flows from rural areas there is the need to intervene in credit markets, reforming the formal credit system in rural areas and encouraging the development of formal credit institutions. These and other complentarity policy measures may increase production efficiency and reduce family migration pressures, as well as destination regions pressures regarding socio-economic infrastructure. In general, investments with the purpose of promoting rural development initiative are expected to reduce incentives to migrate.

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DEVELOPMENT DYNAMIC OF WHEAT CULTIVARS IN ALBANIA

DINAMIKA E ZHVILLIMIT TË KULTIVARËVE TË GRURIT NË SHQIPËRI

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PËRMBLEDHJE

Ndryshimet në strukturën e prodhimit bujqësor në dy dekadat e fundit në Shqipëri, ndikuan në përshtatjen sistemit të prodhimit e të përdorimit të farës së grurit. Ndryshimet në strukturën e prodhimit bujqësor në dy dekadat e fundit në Shqipëri, ndikuan në përshtatjen sistemit të prodhimit e të përdorimit të farës së grurit. U vërejt rënie e përdorimit të farës së certifikuar të prodhuar në vend dhe shtim të farës së importuar. Ky studim përfshin nivelin e përdorimit të farës së certifikuar,shfrytëzimin e kultivarëve të krijuar në vend dhe problemet që lidhen me prodhimin e farës. Kultivarët me origjinë të huaj kanë shfaqur mungesë stabilitetit. Sigurimi i prodhimit të stabilizuar kërkon krijimin e kultivarëve të rinj, testimin e tyre dhe përhapjen tek fermerët. Intensifikimi i prodhimit të grurit e bën domosdoshmëri mbështetjen e një programi kombëtar të përmirësimit gjenetik të grurit.
Fjalë çelës: Certifikim, kultivarë, seleksionim, stabilitet, testim.

SUMMARY

Changes in the structure of agriculture production in the last two decades in Albania have influenced towards the adaption of wheat seed production system and its use. Studies of this sector's development have pointed out a considerable drop of the use of wheat certified seed produced within the country and a gradual increase of imported seed. This study concerns the use level of producers' certified seed, the exploitation grade of domestic cultivars and the problems related to domestic seed production. From the wheat production analysis it appears that cultivars of foreign origin have shown lack of stability in different areas or time periods, during their cultivation. Reaching stability of production requires the creation of new domestic cultivars and their dissemination among the farmers. The intensification of wheat production requires the support of a national program for wheat genetic improvement.
Key words: Certification, cultivar, breeding, stability, testing

Introduction

Common wheat (*Triticum aestivum* L.) is one of the main crops in the structure of the agricultural production in Albania. This study includes with the problems of wheat cultivation in the country for the period 2000-2012. It is cultivated in an area of about 80,000 ha with an average yield of over 4 t ha - 1 (13). During the last decades there was a progress in increasing of wheat production in the country. Studying the tendency of wheat cultivation in our country, we observe that the surface to be cultivated in the future cannot be extended. Also, a number of negative factors predicted might have a negative impact in the

future. The use of modern and suitable varieties ensures the efficiency of other factors in the increase of wheat production. The extremes in continuity such as drought followed by intensive rainfall, are by themselves catastrophic and associated with ecological effects, like the dissemination of a number of diseases and pests that affect the human populations and the agricultural production, too (11). A great number of new cultivars are selected for resistance indicates that the biotic stress is the main cause for the decrease of the production on average more than 50% (12). In modern agriculture, seed is one of the most important factors in the technology applied by the farmers. The scientists constantly have recommended changing and improvement of the variety as a fundamental reserve for the increase of the production by means of the same level of cultivation technology. The cultivars are temporary in production, what might be good today, can also be good tomorrow, but the day after tomorrow they will not be any more good (8). The study of the new wheat cultivars in different areas of cultivation in our country has indicated significant differences in their adaptation to the eco-climatic conditions of each area (4). The creation and dissemination of the new varieties that are tolerant to high temperatures, to drought during their maturity stage as well as to specific diseases are important to ensure the production stability. The objective of genetic improvement is the development of the cultivars combining stable high production with high quality (6). Meanwhile, the benefits of the new varieties can be secured only through the use of certified seeds which in the market are at a price much higher than the seeds that the farmer can secure from his own production. For this reason, many countries support the financing of the certified seeds for the farmers. Improvement of small farmers' access to use of qualitative seeds by them including improvement of the regulatory seeds structure in conformity with the international standards, also improvement of small farmers' access to appropriate technologies and the increase of production of lots of varieties including measures to facilitate the transfer of technology and improved practices of business in the rural communities (10). Since this directive has not been implemented so far, the goal of this study is to raise the sensibility of the farmers and the policy-makers to support the use of certified wheat seeds, particularly in the priority areas of wheat production. In the future, wheat seed production should be a priority in the seeds programs.

Materials and methods

To carry out this study, it is exploited the statistical yearbooks of the Ministry of Agriculture, Food and Consumer Protection, the informative newsletters of NSSI on seeds certification, the newsletters of NFA on seeds import, the National Plan for the implementation of the Stabilization and Association Agreement 2010-2014, the local Legislation in the field of planting vegetative material, the EU Directive on the trading of cereals seed as well as the scientific and professional literature. The methods applied to carry out this study are based on the analysis of the official data, it is processed the results achieved in wheat production for the period 2000-2012, nationwide as well as in each district and prefecture and the identification of the problems and opportunities. Seed production starts from a known source which is called the breeder seed. This category serves as the source for the production of the pre -basic seed which as a rule is produced under the supervision of the agency authorized by the breeder (9). The basic seed is produced from the pre-basic seed and under the care of the breeder or his authorized agency and under the control of the certification agency (1). From the basic seed, it is produced the certified seed under the supervision of the certification agency. On this base, some conclusions are achieved and the relevant recommendations can be provided.

Results and discussion

Wheat production even in the future will be cultivated in a considerable area in our country. Actually, it ranks second after alfalfa for the

cultivated area. It is a very good crop in agricultural rotations, it is planted in dry areas, mountainous and above water, it has lower cost and provides a stable income. In fig. 1, it is given a detailed surface cultivated in every prefecture. Out of the total area planted in the whole country (tab. 1), it is noticed that eight prefectures sow 2-4 % of land area, while Fier district sows 26 %, Korça 20 %, Elbasan 14 % and Berat 10 %. So, only four prefectures cultivate 74 % of the whole country area, while the other eight prefectures together 26 % of the surface (fig. 2). Regarding the average production realized, the four prefectures have provided 75 % of the total production at national level (tab. 1), while the average yield in the four areas for three year-period of the study varies from 102 - 105 % toward the average nationwide yield (tab. 1).

Analyzing the structure of the varieties applied, it is noticed that new varieties and certified seeds are used in around 80 % of these areas. The development of the new cultivars obviously has influenced on the production, increasing the productivity, improving the product quality, raising/increasing the rural areas income, minimizing the use of land and other inputs. The testing and registration procedure of the new varieties in our country is realized in compliance with the legislation in force (7) and according to the international standards because Albania is UPOV Member since 2005. As it is indicated in the in the graph (fig.3), testing of the new wheat varieties for the period 2007-2013 was carried out on average for about 8-10 cultivars per year with the exception of 2010. Upon the completion of testing in compliance with the relevant rules, it is realized the registration of the new varieties. During this period it is registered a considerable number of varieties in total 20 out of which only three are new local varieties, Universi 1 and Universi 2, created in AUT and L4/10 created in ATTC Lushnja (1). Despite this positive situation of testing and registration of the new wheat varieties, their dissemination to the farmer has been negligible because it can be achieved only through use of the certified seed.

Use of certified seed. Seed certification system in our country is based on the local legislation on the multiplication of the planting vegetative material (9). Also, our country is member of the OECD cereals certification scheme since 2005. Implementation of the rules for trading of cereals seed determines the criteria, the technical parameters and the standards (3) which can be achieved through seed certification. The creation of new varieties in our country is carried out by public institutions (AUT and ATTC Lushnja), while their multiplication (seed production is carried out by private companies). The nomenclature of seed reproduction in our country is the same as in the European Union, nominated: Pre base, Base and the first reproduction (R_1) and the second reproduction (R_2) (9). As it is seen, the regulatory framework and the infrastructure are similar to that of the European Union. While, actually, the wheat seed provided to the farmers is mostly of foreign origin or of seeds to obtain from their own production. Analyzing the 2012 Index (1) we see that out of 17,250 tons necessary for wheat seed, only 20 % of the area is cultivated with certified seed and out of this only 5.8 % is of certified seed produced in the country and 14.2 % of certified seed imported (2). The finding is much disturbing because about 80 % of the wheat area is cultivated with non-certified seed and the farmers not only do not achieve the benefits of the new varieties that are created by the public institutions to be used by them but also they have to face other negative impacts from the use of non-checked seed for a long time (5). The wheat genetic improvement is the duty of the public institutions and to cope with the solution of the problems raised above, it is necessary for investments in order to increase the genetic improvement capacities. In the seed industry, it is the seed producer's responsibility to ensure the genetic purity of the cultivar and to guarantee the seed quality. A special responsibility of the institutions that create cultivars is the maintenance of the cultivar according to the scientific and technical criteria, for this reason it is very important to support the improvement of work in this sector.

Conclusions

The cultivation of wheat in the future will continue to be an important crop in the agricultural production of our country. The variety structure applied up to now is not appropriate because. In the lower area, the foreign cultivars are mainly cultivated and the structure is changed almost every year through cultivating cultivars unknown by the farmers. To intervene and to change immediately this situation need to support for the priority areas in the wheat production to use the certified seed. The application of a program for creation of the new wheat cultivars and for the production of wheat certified seed in the country.

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Acronyms

AUT – Agricultural University of Tirana
ATTC – Agriculture Technology Transfer Center
MAFCP - Ministry of Agriculture, Food and Consumer`s Protection
NFA - National Food Authority
NSI - National Seed and Seedlings Institute
OECD - Organization for Economic Co-operation and Development

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MACRONUTRIENTS CONTENTS AND GENETIC DIVERSITY IN SOME COMMON BEAN LANDRACES (*PHASEOLUS VULGARIS* L.)

PËRMBAJTJA E MAKRONUTRIENTËVE DHE DIVERSITETI GJENETIKË TE DISA POPULACIONE VENDORE TË FASULES (PHASEOLUS VULGARIS L.)

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PËRMBLEDHJE
Fasulja (Phaseolus vulgaris L.) është lloji më i rëndësishme i perimeve për konsum dhe ushqim në vend, dhe kultivohet e shoqëruar me misër apo si kulturë e vetme, në sipërfaqe më të vogla me sistem intensiv bujqësore. Koleksioni prej 10 populacioneve është grumbulluara nga lokalitet të ndryshme në gjithë vendin. Qëllimi i hulumtimit ishte vlerësimi i diversitetit gjenetik për përmbajtje të makronutrientëve (K, Ca, Mg dhe Na) në kokërr në mes të populacioneve të ndryshme të fasules, që i përkasin Bankës Gjenetike të Kosovës (GBK). Eksperimenti shumë faktorësh u ngrit sipas dizajnit bllok plotësisht i rastit (DBPR) me tre përsëritje. Analizat statistikore ANOVA, janë realizuar me softuerin Minitab-16. Diversiteti gjenetik midis populacioneve, ato i bën një burim i vlefshëm si donatore potenciale të gjeneve për seleksionim dhe zhvillimin e kultivarëve të rinj në fasule.
Fjalët çelës: Fasule, populacione vendore, diversiteti, makronutrientë, burime gjenetike.

SUMMARY
Common bean (*Phaseolus vulgaris* L.) is the most important vegetable species in food consumption in the country, and is grown in intercropping system with maize or as single crop in a small scale in more intensive farming system. A set of 10 landraces were collected from different sites across the country, in different localities. The aim of this research was to evaluate the genetic diversity for grain macronutrients content (K, Ca, Mg and Na) among different common bean landraces, belonging to Gene Bank of Kosovo (GBK). The factorial experiment was set up as randomized complete block design (RCBD) with three replications. Statistical analyses were performed using ANOVA and Minitab-16 software. The genetic diversity among landraces makes them a valuable resource as potential donor of genes for breeding and development of new cultivars of common bean.
Key words: Common bean, landraces, diversity, macronutrients, genetic resources.

INTRODUCTION

The common bean, is one of 10 most important crops in the world, with a cultivation area 29,211.491 ha, that produced 23,250.253 tons of dry beans year^{-1}, ranking directly after soybean in the world production of grain legumes (FAOSTAT, 2013). Common bean is cultivated in all regions of Kosovo, in monoculture, in associations or in

crop rotations on 7.505 ha with an average yield 0.9 ton ha^{-1}, while the annual consumption is 11.53 kg $capita^{-1}$; the great value for human nutrition, compared to other vegetables, rank common bean in the first place among other legumes (Fetahu et al., 2012a). The common bean landraces are high variable plants, with a long history of cultivation and great nutritional value, and some of them associated with the production of particular traditional products (Fetahu et al., 2012b). Since these local forms were grown on the same soil for centuries they are somehow the result of the farmer's selection, who, year after year, chose forms of high production (Pinheiro et al., 2010). However, the lack of information about these genetic resources is a major cause of its low exploitation by breeders (Lima et al., 2012).

This observation of common bean forms originating from the cultivation on very different soil types (reflecting the geological substrates) may have quite distinct genetic characteristics in relation to mineral uptake and use efficiency (Pinheiro et al., 2010). The consumption of beans has been associated to several health benefits like reduction of cholesterol level and coronary heart diseases (Anderson et al., 1999; Bazzano et al., 2001), high antioxidant capacity (Heimler et al., 2005) etc.. The identification of genetic diversity among common bean landraces with high levels of macronutrients, adds their value, without increasing the cost to consumers. Thus, breeding programs should be to associate great agronomic performance and nutritional value.

The aims of the research were to evaluate the genetic diversity among common bean landraces, for nutrient content in dry bean grains and for macronutrient (K, Ca, Mg and Na), which are important in human nutrition, plant breeding and future genetic improvement.

Materials and methods

Plant material

A set of 10 landraces of common bean that were collected in different sites across the country, selected localities represent various rural areas and geographical regions of Kosovo (Table 1). In the spring of 2011, the seeds were sowed at Experimental Didactic Farm (EDF) of the Faculty of Agriculture and Veterinary in Prishtina, according to a random complete block design with three replications (RCDB). Seeds of each landraces are sowed with distance: (10 m x 70 cm x 25 cm) x 2 rows, or plant density is 5.71 plant m^2 or 80 plants $replication^{-1}$. From 10 plants for each genotype and replication were harvested all mature seeds, which have formed the average sample for chemical analysis, in order to assessment grain contents for 4 macronutrients (K, Ca, Mg and Na), important nutrients in human nutrition.

Statistical analysis

All data were subjected to an ANOVA appropriate to a randomized complete block design with three replications (RCDB). A combined ANOVA was calculated in two ways, were analyzed as main value for all macronutrients and landraces. The least significant difference (LSD) was used to compare the mean of the genotypes and macronutrients. The Pearson correlation coefficients, was calculated for macronutrients, also using the program (MINITAB-16). Data analyses were done by statistical tests, grouping of genotype landraces was done by Fisher's method. Genetic distances and similarities regarding the bean landraces of genetic diversity were analyzed by Cluster Analysis of Standardized Variables for forth evaluated macronutrients.

Chemical analysis

After harvesting, seeds from each pod of individual plant were mixed thoroughly and randomly selected plant. For chemical analysis, randomly selected, bean seeds samples were ground to a fine powder to ensure homogeneity before analysis of macronutrients. Macronutrients: K, Ca, Mg, Na, were expressed as mg kg^{-1}, for common bean landraces is determined through burning and mineralize sample at 550˚C for 4 - 6 hours and then were diluted in HCl (1:4). Nutrients were determined by flame atomic absorption spectrometry (AAS).

Table 1. Common bean landraces (*Ph.vulgaris* L.) analysed with their geographical origin

Code	Geographical origin	Latitude	Longitude	Elevation
FAGB-01	Samadrexhë	42^{0}49'39.4"	21^{0}03'31.1"	654
FAGB-02	Suharekë	42^{0}21'27.2"	20^{0}50'58.2"	403
FAGB-05	Sveqel	42^{0}55'51.0"	21^{0}08'14.4"	686
FAGB-09	Crallukë	42^{0}30'35.6"	20^{0}45'32.8"	545
FAGB-10	Komoran	42^{0}34'29.2"	20^{0}54'35.6"	592
FAGB-19	Marvec	42^{0}40'13.0"	21^{0}41'12.7"	897
FAGB-20	Busovatë	42^{0}34'07.4"	21^{0}31'16.4"	841
FAGB-23	Biçec	42^{0}14'35.5"	21^{0}12'21.5"	641
FAGB-50	Trebosh	42^{0}00'53.2"	21^{0}01'26.7"	430
FAGB-51	Zahaç	42^{0}39'17.7"	20^{0}22'47.2"	457

Table 2. Average macronutrients content of dry grain for bean landraces and their comparison mg kg^{-1}

Landraces	K	Ca	Mg	Na
FAGB-01	1430.9^{ab}	180^{ab}	117.5^{ab}	18.9^{ab}
FAGB-02	1409.2^{ab}	160^{ab}	118.5^{ab}	18.2^{ab}
FAGB-05	1413.6^{ab}	200^{ab}	122.2^{a}	26.0^{ab}
FAGB-09	1344.2^{b}	100^{b}	103.4^{b}	12.9^{ab}
FAGB-10	1409.2^{ab}	192^{ab}	120.0^{ab}	9.4^{ab}
FAGB-19	1342.0^{b}	180^{ab}	121.0^{ab}	21.1^{ab}
FAGB-20	1430.9^{ab}	134^{ab}	115.1^{ab}	5.6^{b}
FAGB-23	1489.4^{a}	216^{a}	121.0^{ab}	29.8^{ab}
FAGB-50	1461.2^{ab}	220^{a}	121.2^{ab}	25.7^{ab}
FAGB-51	1410.1^{ab}	180^{ab}	109.9^{ab}	33^{a}
μ	**1414.07**^{ab}	**176.2**^{ab}	**116.98**^{ab}	**20.06**
LSDp0.05	1.4007	0.197	0.1465	0.1403
LSDp0.01	1.9187	0.2699	0.2007	0.1922

Means that do not share a letter are significantly different.

RESULTS AND DISCUSSION

Considering the great value of traditional cultivation and grain use of common bean landraces (CBL), it is important to characterise them with respect to their nutritional value for macronutrients. The geographical origin of (CBL) from different localities, latitude, longitude and elevation from 403 to 897m, are showed in (Table 1). The average data obtained and their comparison for macronutrients content for: (K, Ca, Mg, Na), in dry grain for (CBL) are given in Table 2.

The study results showed a wide diversity among CBL for 4 nutrients. A study carried out on CBL, showed that the Sodium content (Na) ranged from 5.6 to 33mg kg^{-1}, and coefficient of variation for Na content in dry grain for different CBL had high value of CV=41.98%.

The genetic variability of CBL was detected among genotypes: FAGB-51 and FAGB-20, differences among them were 27.4 mg kg^{-1}, or relative variability was 136.59%, compared with mean value (Na-μ=20.06 mg kg^{-1}). These values agreed with those reported previously for grain

mineral concentrations for landraces and modern cultivars; Beebe et al., 2000; House et al., 2002; Gelin et al., 2007) and some of this variability has been exploited for the genetic improvement of the crop (Beebe et al., 2000; Parades et al., 2009).

Main genotype content of K, in dry grain beans was μ=1414.07 mg kg^{-1} and range of variation was from (1342.0 to 1489, 4 mg kg^{-1}). Main genotype content value of Mg, were μ=117.0 mg kg^{-1} and rang of variation among CBL were from (103.4 to 122.2 mg kg^{-1}).

Ca concentration is more variable than both Mg and K; those macronutrients had narrow range of diversity. Higher content of Ca, were found to the genotype FAGB-50 with 220 mg kg^{-1}, in other side lower contents, were detected to the genotype FAGB-09 with 100 mg kg^{-1}, and difference among them were 120 mg kg^{-1}, and minimum content for both macronutrient (Ca and Mg), were found in the same genotype FAGB-09.

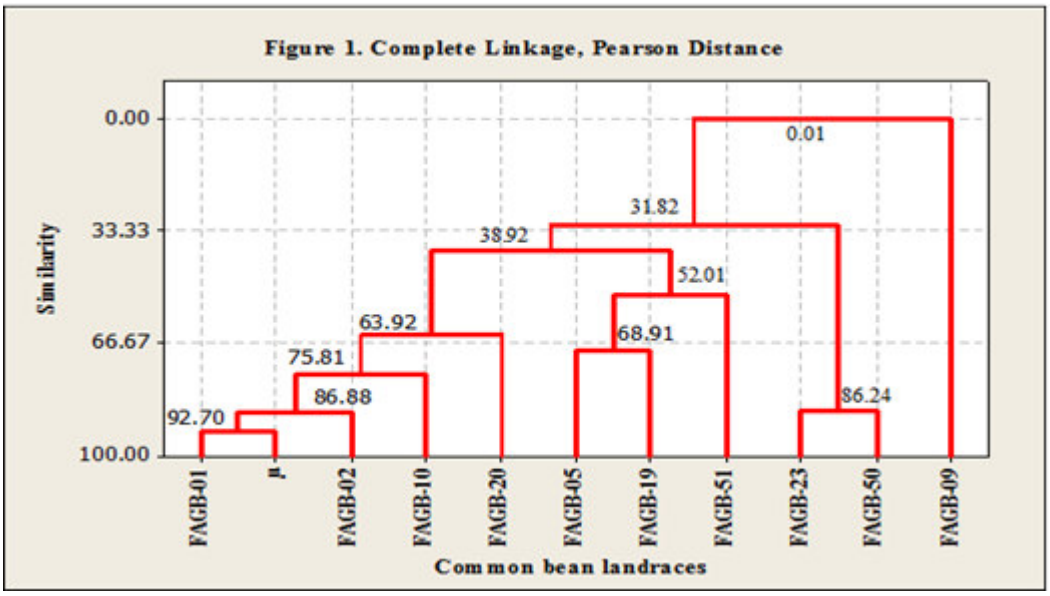
Both environmental and genetic factors have influence in accumulation of macronutrients in dry bean grain. However, K and Mg are distributed more uniformly throughout grain compared with Ca, particularly with Na. Our findings are in agreement with results (Parades et al., 2009).

The values of coefficient of variation, minimal and maximal value among macronutrients, it was detected for: K (3.05%) and Na (41, 98%).

The data analysis indicated that the CBL presented significant differences between them for all macronutrients evaluated. According to the reported data (Parades et al, 2009), for macronutrients rang of variation were: K (14.2 to18.4 g kg^{-1}), Ca (1.0 to 2.6 g kg^{-1}), Mg (1.3 to 2.3) and Na (0.03 to 0.12 g kg^{-1}), our investigated data are in agreement, but those are in disagreement with reported data (Golam et al, 2011) for Ca (58.67 to 122,98 mg kg^{-1}) and Mg (6.47 to 11.05 mg kg^{-1}). Other data indicated that the mean of Ca content was 1.5 g kg-1 and varied from 0.5 to 3.1 g kg-1 (Islam et al., 2002).

These results indicate the existence in the CBL a significant genetic diversity and variability that seems particularly relevant for macronutrients, very important for human nutrition.

Similarity among (CBL), for macronutrients was defined according to the complete linkage, Pearson distances (Figure 2), the similarities for 10 CBL, these were arranged in three different groups and subgroups, one of them (FAGB-09) was completely separate.



The Pearson correlation analysis (Table 3), on the mean of CBL genotypes indicated that the content was positively correlated with the Ca-K, Mg-K, Mg-Ca and Na-Ca.

Despite the detection of these differences, regarding the correlation coefficient, little information exists on the metabolic processes during accumulation of macronutrients, besides some nutrients have strong positive correlation and the other side correlation between: K / Na and Mg / Na, it was positive with medium and lower level and no significant.

Regarding the correlation coefficient for macronutrients we might speculate that it could reflect some interaction between the origin of genotypes x environment conditions, which genotypes were previously cultivated, and now had express on content of macronutrients.

The high mineral variability observed in the grain of this CBL could be useful for the selection of landraces with higher nutrition value and for the improvement of grain nutrition quality traits

CONCLUSION

Researches of Common bean landraces (CBL), for macronutrient (K, Ca, Mg and Na), identified the existence of diversity and genetic variability between landraces for macronutrient content, which were significantly different.

Genetic diversity between (CBL) for macronutrient content was observed for Na in maximum and for K in minimum.

The correlation coefficient, determined that there are strong and significant correlative linkages for the macronutrients content: K/Ca, Mg and Ca/Na, Na, while the K/Na, Mg report was with average and poor positive correlation, but non-significant.

Such genetic diversity between (CBL), provide a potentially valuable source, which can be used as a donor of genes for development of new beans cultivars.

Genetic diversity between (CBL), in practical terms, is potentially valuable source for selection and use of specific populations for cultivation, in order to enhance the nutritional value without adding cost of production and the consumer

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CALCULATION OF COSTS DURING KILN DRYING OF WOOD IN KOSOVO

KALKULIMI I KOSTOVE GJATË THARJES ARTIFICIALE TË DRURIT NË KOSOVË

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PËRMBLEDHJE
Procesi i tharjes së lëndës drusore të sharruar në Kosove bëhet kryesisht me tharje në dhomat artificiale (rreth 95%). Pjesa më e madhe e subjekteve që merren me tharjen e drurit përdorin tharëse klasike (konvencionale). Kjo është arsyeja e kësaj pune kërkimore. Kostoja e tharjes artificiale ngarkon drejtpërdrejtë koston e shitjes së lëndës së sharruar të tharë nëpër markete. Për studim kemi marrë lëndën drusore të ahut 28×4000mm, (trashësi×gjatësi), me lagështi fillestare 60% dhe përfundimtare _ 8%. Tharjet janë bërë në dhomën tharëse me kovekcion "te Adili" Rroganë. Nga matjet e bëra rezultojnë këto kosto të shpenzimeve/m3: Kostoja e investimeve 4,73C/m3 Kostoja e mirëmbajtjes 0,654C/m3 Kostoja e energjisë elektrike 4,26C/m3 Kostoja e punëtorëve 3,93C/m3; Kostoja e energjisë së nxehtësisë 3,61C/m3 Kostoja e defekteve të tharjes 8,75C/m3; Në bazë të kalkulimeve të bëra për tharjen e 1m3 lëndë drusore të sharruar me lagështi fillestare 60%. dhe përfundimtare ≈ 10%, të tharë në dhomën tharëse "te Adili" Rroganë shpenzohen 25,94C/m3.
Fjalë çelës: Druri, tharja artificiale, kostoja , lagështia , nxehtësia specifike.

SUMMARY
The drying process of wood products in Kosovo mainly is done by convencional kiln drying. Most of the subjects involved in wood drying are using classical (conventional) kiln. This is why we research in this field. The cost of kiln drying directly load the selling price of wood sawn material. For the study are chosen timber of beech (Fagus Sylvatica L with dimensions 28 × 4000mm), with initial moisture content 60% and final moisture content ≈ 10%. A case study is taken conventional kiln "te Adili" Rroganë. Results from measurements give this costs/m3: The investment cost 4.73€/m3; The maintenance cost 0.654€/m3; The electricity cost 4.26€/m3 ; The labor cost 3.93€/m3; Heat energy cost 3.61€/m3; The cost of drying defects 8.75€/m3 ; Based on the calculations, to dry 1m3 of the wood products with initial moisture content 60% and final moisture content ≈ 10%, dried in kiln drying (Case study "te Adili" Rroganë) are spent 25.94 €/m3;
Key words: wood, killn drying, the costs, humidity, specific heat, beech.

INTRODUCTON

Kiln drying of wood is very costly (approximately 10% of the value of the wood), because to realize the wood drying are needed some costs that charge drying costs.

The total cost of wood drying depends mainly from energy consumption, investments, drying defects, staff employees (workers), type of wood, wood thickness, initial and final moisture content of the wood etc. Drying price increase if the drying is poor, so poor drying may exceed all other costs, especially with conventional drying of thicken wood boards from beech timber (Fagus sylvatica L.) which represent difficulties

during drying. From the literature it is found that, the costs for construction dryer equipment their operating time (about 10 years) are equal to 1-2% of the drying wood.

The aim of the research is to determinate:

Drying cost in: €/m^3, hour, days and month (with specification timber of beech Fagus Sylvatica L, with dimensions 28×4000mm) which is growing up in the territory of Kosovo,

To show costs in percentile m^3 in each center of cost.

MATERIALS AND METHODS

The material used in the study is beech timber (Fagus sylvatica L.) which grows in the territory of Kosovo. The thickness of the boards was 28mm and 4000mm in length. Studies have been done in conventional kiln chamber with total volume of 123m^3, which are dried in 35m^3/in a cycle, or in percentage 28.5% of the total volume of the chamber (other spaces in the room are occupied with stick and other spaces for free movement of air). Dimension of stick were 25*32mm, made from beech wood. Initial moisture content 60% and drying moisture content 9.94% ≈ 10%, The lower temperature were 40^0C, and the upper temperature were 66^0C.

For the study are made five proofs from which then get average results.

First all costs were seperate into two groups:

- Fixed costs
- Variable costs.

On the fixed costs count: investment and interest costs, while in variable costs are counting: maintenance, heat energy, workers (labour), electricity, and costs of drying defects.

Capital costs - Investments for the construction of the drying chamber were 25.000€. The investment cost for the production of dried timber is based on the time of the return on investment for 10 years with overall growth of 10.07% interest, amounting to 14.761€. Total capital investment cost is 39.761€.

Table 1. Capital investment and interest costs.

Costs/hours	€0,92
Costs/day	€11,0
Costs/months	€331,3
Costs/m^3	€4,73

The cost of Maintenance– Maintenance cost includes all works that deal with the maintenance of the chamber, such: avoiding failures that occur during labor and the cost price of the employees working in avoiding breakdowns. According to the data of the factory for the last 5 years, average maintenance cost ranges 550€/year. Based on calculations and the price of the electricity (0,0695€/Kw/h) resulting these costs: 0.064€/h; 1.53€/day; 45.8€/month; € 0.65/m^3.

The cost of electricity - Electricity consumed for a month is calculated from energy consumption of: fans, water pumps and other equipments within the dryer. This costs are calcultated to be: $E_{monthly}$=4291kW/h. Based on calculations have these costs: 0,414€/hour; 9,939€/day; 298,22€/month; and 4,26€/m^3.

The cost of heating energy - Specific heat consumption of 2,400-3700 kJ assimilate 3700kJ ≈ 1kWh, is calculated to evaporate a kilogram of water for conventional dryer chamber, including requirements for all other energy used for heating of the chamber and drying of sawn timber in it.

The price for a kilogram of wood used to heat energy is calculated from the weight of beech wood in dry condition 15€/480kg=1m3 ≈0.031€/kg.

Low thermal capacity for dried timber is calculated to be 14700-16700kJ/kg assimilate 14700kJ/kg or 3.97kW/kg. If 1kg of wood =0.031€/kg then 1kW of heat energy will be 0.031/3.97= 0.0076€/kW.

The chamber dry 70m^3 wood/month with initial moisture content = 60%, the amount of water removed will be:

Moisture content G_w=60% (0,6),

The mass of beech (Fagus Sylvatica) with moisture content 60% is m=0,88gr/cm^3 or 880kg/m^3,

The wood is drying to G_d=10% (0,1) of moisture content.
Then mass of the moisture in wood (Mw) is:

$$M_w = m \times G_w = 880 \times 0{,}6 = 528 kg moisture/m^3$$

Where: m- mass of wet wood
G_w - the percentage of moisture in wood.
The amount of moisture to be removed from the timber is:

$$U = M_w - M_w \times G_d = 528 - 528 \times 0{,}1 = 528 - 52{,}8 = \frac{475{,}2 kg moisture}{m^3}$$

Capacity of the drying chamber is 70m^3, then 70*475,2=33264kgwater/70m^3.
According to the reference [5] is taking the average amount of energy required to evaporate 1kg/moisture so 3700kJ≈1kW/h. The calculation follows that 33264*1=33264KW heat energy.

Table 2. Costs of the heat.

Costs/hour	5,96 kW	0,0076KW/€	0,35€/hour
Costs/day	1109 kW	0,0076KW/€	8,42€/day
Costs/month	33264 kW	0,0076KW/€	253€/month
Costs/m^3	61,3 KW	0,0076KW/€	3,61€/m^3

The cost of workers - The cost of workers in wood drying depends on the number of workers employed in the wood drying factory.
Based on the number of employees that working in permanent jobs and those with temporary jobs take the following values: 0,38€/hour; 9,16€/day; 275€/month; 3,93€/m^3.
The cost of wood drying defects- The cost of kiln drying defects is determined from the literature with a loss of 2-3%. In the study it is used 3,24% based on (Bajraktari A, Sejdiu Rr, Thaçi B, Nunies L. Evaluation of beech wood defects due to different drying sheme, IUFRO Wood Drying Conference- July 30 to August 03, 2012-Belem, Para, Brazil pg. 13).

Price for 1m^3/wood for dried beech is calculated based on the Kosovo markets price 270€/m^3. Total drying amount for a month is 270€/m^3.
The total drying amount for a month is 70*270€=18900€/month.

Table 3. The cost of wood drying defects.

Costs/huor	0,85€/hour
Costs/day	20,4€/day
Costs/month	612€/month
Costs/m^3	8,74€/m^3

Table 4. Shows the costs for spending units (not counting the cost of drying defects).

Costs type	€/month	€/day	€/hour	€/m^3	%
Capital	331,3	11,0	0,46	4,7	27,6
Electric	298,2	9,9	0,4	4,2	24,7
	275,0	9,1	0,38	3,9	22,9
Heat	253,0	8,4	0,3	3,6	21,2
Mainte	45,8	1,5	0,06	0,6	3,5
Total				17€	100

RESULTS AND DISCUSSION

Figure 1. Shows the data from table (not counting the cost of drying defects).

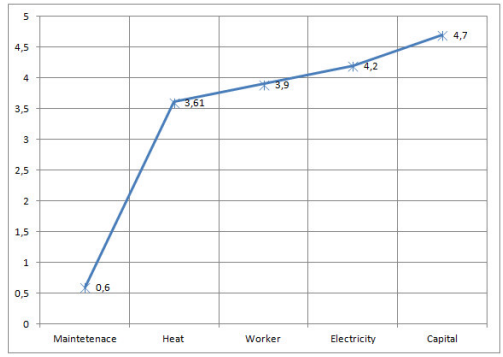

Figure 1.

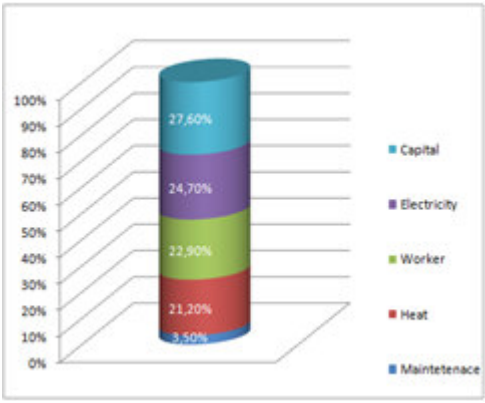

Figure 2.

Figure 2. Shows the percentage of estimated costs without drying defects.

Often subjects who dry timber don't calculate the losses from drying defects. If we take into account the losses arising from defects the total cost for drying 1m^3 would be like in table. 5.

Table 5. Total cost for drying 1m^3

Costs type	€/month	€/day	€/hour	€/m3	%
Drying defects	609€	20,3€	0,85€	8,7€/m3	36%
Capital cost	331,3€	11,0€	0,46€	4,7€/m3	17%
Electricity cost	298,2€	9,9€	0,4€	4,2€/m3	16%
Workers cost	275,0€	9,1€	0,38€	3,9€/m3	15%
Heat energy cost	253,0€	8,4€	0,3€	3,6€/m3	14%
Maintenance	45,8€	1,5€	0,06€	0,6€/m3	3%
Total				25,7€/m3	100%

Figure 3. Shows the data from table 3 (including and cost of drying defects).

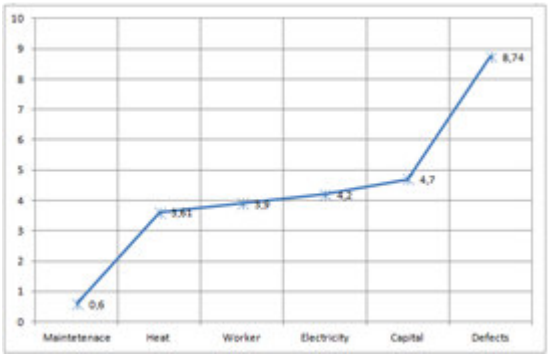

Figure 3.

Figure 4. Shows the percentage of estimated costs with drying defects.

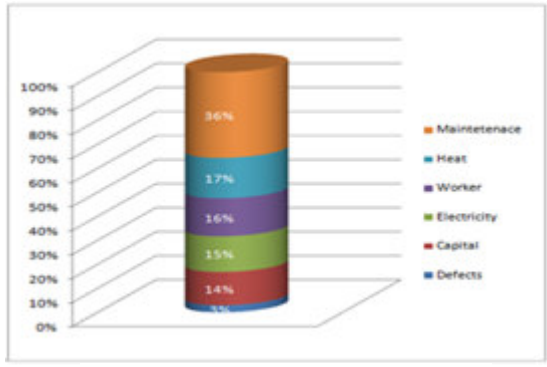

Figure 4.

CONCLUSION

The cost of 1m^3 wood drying in conventional kiln (with dimensions 28*4000mm, from beech timber) including and drying defects is 25.94€/m^3; Without taking into consideration the cost of drying defects the cost of drying is: 17,19€/m^3.

Spending units: (taking into account the cost of defects) cost of defects 8.7€/m^3 or 36%; the investment cost 4.7€/m^3 or 17%; electricity cost 4.2€/m^3 or 16.4%; labour cost 3.9€/m^3 or 15%; the heat energy costs 3.6€/m^3 or 14%, and the cost of maintenance 0,6€/m^3 or 3%.

Spending units (not taking into accounting the cost of defect): cost of investments 4.7€/m^3 or 27.6%; costs of electricity 4.2€/m^3 or 24.7%; labour cost 3.9€/m^3 or 22.9%; the costs of heat energy 3.6€/m^3 or 21.2%; and the cost of maintenance 0,6 €/m^3 or 3.5%.

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ORGANIZATION OF APPLE FRUITS HARVEST

ORGANIZIMI I VJELJES SE FRUTAVE TË MOLLËS

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PËRMBLEDHJE:
Organizimi i vjeljes së frutave varësisht nga potenciali dhe mosha e frutëdhënies të kultivarët e mollës në sistemin e kombinuar "palmetë + kaçubë e thepisur**"** në vendin tonë është pak e hulumtuar. Në hulumtim janë përfshirë 2 kultivar të mollës Idared i shartuar ne nënshartesën MM 106 dhe Jonathan ne M 9. Pemëtorja është mbjellë në vjeshtë të viti 1994 (tetor-nëntor) ne distanca 4 x 3.5 m., me forme te kurorës "palmetë+kaçubë e thepisur". Hulumtimet janë realizuar ne vjeshte te vitit 2010. Qëllimi i hulumtimit ishte që të krahasohen ndikimi i formës së kurorave, mosha e pemës, dhe mënyra e organizimit të vjeljes, në efikasitetin e vjeljes, në sasi dhe cilësi. Dallimet ndërmjet kultivarëve dhe nënshartesave për parametrat e hulumtuar janë analizuar me metodën statistikore ANOVA.
Fjalët kyçe : mbledhja e futave, shpërndarja e arkave, vjelja

SUMMARY
Organization of fruits harvesting depending on the potential and yields age of apple cultivars in combined system "palmet + spindle bush" in our country is less explored. In this organization depends on the profitability, efficiency and intensification of apple production. In this research were included two apple cultivars: Idared grafted on MM 106 and Jonathan cultivar grafted in M 9- rootstock. Orchard is established - planted in the fall of 1994 (October-November) in distance 4 x 3.5 m, with crown on the form of "palmet + spindle bush". Survey was conducted in the fall of 2010. The aim of the research was to compare the impact of the shape of crowns, the age of tree, and ways of organizing the collection, on the harvesting efficiency, quality and quantity.
The differences between cultivars and rootstocks for the parameters investigated were analyzed with ANOVA.
Key words: fruit harvesting, box distribution, picking

INTRODUCTION

Picking the fruit trees is one of the most important operations in planting orchards, because a year could be crowned with success. Picking fruit is the final stage of production, quality of fruits harvesting depends on the quality of the performance and preservation of fruits in refrigerators. Therefore harvesting operation is a process during which we must be always careful that the harvesting can be done in a qualitative way, in optimal time and with much smaller costs.

MATERIAL AND METHODOLOGY

Surveys were conducted during 2010 in private orchard of farmer Skender Blakaj with area of 1.0 hectares in Kovragë - Istok. In research are included three apple cultivars grown on two

apple grafts. Idared cultivar is grafted on rootstocks: MM-106 and cultivar Jonathan in rootstocks M-9 who are planted in the fall of 1994 (October-November). Planting distances are: 4 x 3.50m., Forms of the crown "Craggy Palm + Shrub".

In orchards during a year are applied ordinary cultivation practices by extended ground in the fall and spring, and are made some cultivation and three orchard irrigation during the summer.

Notes on some vegetative growth parameters of apple cultivars are assigned randomly from each cultivar from which were obtained 12 apple troops and we have evidenced these bodies and these parameters were measured: trunk diameter (mm). Height of the trunk (cm), crown height (m), dimensions and crown volume (m^3).

Preliminary evaluation of the orchard fruit production is estimated on the basis of apple fruit production. Evaluation is done by evaluating one tree in each of the 10 trees in diagonal order in the orchard.

The pre-specification of the production is done in order to be taken measures for the planning of fruit harvesting in time according to cultivars and to secure manpower for harvesting, packaging, the transportation of fruits etc. Harvesting is done with classical methods of collection with the help of “bag at Kangaroo“. All operations of the harvest, from preparation till the delivery of fruit for calibration, is measured the time spent in minutes. - Time spent of fruit harvesting (min). Distribution of crates in the trees row (min), the harvest of fruits in the tiers (height) (min).

The results obtained were processed with variance - ANOVA analysis. The significance of the changes between treatments was confirmed by LSD test at 0.05 and 0.01 levels.

RESULTS AND DISCUSSION

Results of the research have included data collection parameters for vegetative growth of the apple cultivars grafted on two vegetative grafts. And time spent on apple fruit picking. These parameters investigated are presented in Table 1.

Cultivars	Trunk Diameter (cm)	Trunk height (cm)	Width and height of the crown			Volume of the crown (m^3)
			Within rows	Between rows	Height	
Idared MM 106	**9.19**	**48.01**	**2.71**	**1.69**	**2.90**	**3.67**
Jonathan M 9	**7.34**	**61.41**	**2.20**	**2.02**	**2.66**	**3.09**

Table 1. Vegetative growth parameters of apple cultivars for 2010

Cultivar		Collection of riped fruits		Crates distribution (min/unit)	Picking of fruits unit/kg			
					First tier		Second tier	
		Quantity (kg)	Time (min)		Quantity (kg)	Time (min)	Quantity (kg)	Time (min)
Idared M106		**8.91**	**2.10**	**0.40**	**93.46**	**22.37**	**5.56**	**2.22**
Janathan M 9		**10.04**	**3.19**	**0.46**	**31.55**	**5.37**	**/**	**/**
LSD	**0.01**	1.87	1.39	30.68	0.36	9.72	3.12	2.01
	0.05	4.32	3.21	0.83	70.77	20.43	7.20	4.65

Table 2. Time lost for the operationalization of works in Kovragë

Based on the results presented in Table 1, a bigger diameter of the trunk has the cultivar Idared in the rootstock MM-106 (19.9 cm), while the smaller diameter has a cultivar Jonathan M-9 (7:34 cm). Average trunk perimeter of the cultivars explored is (6.67 cm).

Greater height of the trunk has cultivar Jonathan M-9 (61.41 cm), while lower trunk has the cultivar Idared in MM-106 (48.01 cm). Based on the data presented by the author Efendija, T. (2002) all these cultivars have a trunk height lower than 60 cm.

Based on vegetative parameters investigated, the largest volume of the crown has Idared cultivar MM-106 (3.67 m^3), while smaller volumes has the cultivar Jonathan in the rootstocks M-9 (3:09 m^3).

The results of our overhead system research cultivars, mentioned above, in vegetative rootstocks M-9 and MM-106 partly overlap with those of the authors Zajmi (1985), Zajmi & Sylanaj (2002, 2003), etc..

The operationalizing works for apple fruits harvesting in Kavragës object is presented in Tab 2.

The most collected ripe fruits for unit had the cultivar Jonathan M-9 (10.04 kg), on the other hand the least had the cultivator Idared-MM 106 (8.91 kg).

Time spent for the ripe fruits harvesting to the cultivar Jonathan was 3.19 min, while for the cultivar Idared, 2.10 min.

Differences in collecting fruits for lost time between cultivars were not significant.

Lose of time for the distribution of crates under the body of trees was bigger at the cultivar Jonathan (0.46 min), while for the cultivar Idared (0.40 min). These differences were not significant.

For the fruits picking a diffrence in time was noticed, depending on the shape of the crown, height of floors and harvested yield.

The quantity of fruit was greater on the first tier of cultivar Idared MM-106 (93.46 kg), where time lost for harvesting was (21:37 min), while a smaller quantity of fruit harvesting was at the cultivar Jomathan M-9 (31.55 kg), wher lost time for harvesting was (5. 37 min.)

The difference in the amount of harvesting the fruit and the time lost was significant.

Picking productivity of 5.56 kg of cultivar Idared MM-106 on the second tire was committed for: 2. 22 min.

Time lost for apple fruit picking at the the crown form "Thrown spear + steep thicket" in the Kovragë object, but using the bag at Kangaroo is presented in Tab.3.

The Cultivar	Collection of ripe fruits		Distribution of crates (min/unit)	Picking of fruits kg /unit			
				First tier		Second tier	
	Quantity (kg)	Time (min)		Quantity (kg)	Time (min)	Quanti ty (kg)	Time (min)
Idared M106	**10.50**	**2.38**	**1.15**	**94.37**	**20.29**	**3.66**	**2.36**
JanathanM 9	**10.25**	**3.37**	**0.43**	**18.86**	**3.42**	**-**	**-**
LSD 0.05	NS	NS	NS	33.4	14.3	NS	NS
0.01	-	-	-	61.3	26.3	NS	NS

Tab.3. Time lost for fruit picking with the help of "Kangaroo saddlebag"

At the facility in Tomoc it was researched the operation of harvesting of apple cultivation system "spear throwing", the cultivar Mundial Gala M-9 ripe fruits were collected for 2.75 kg 0.33 minutes, while the distribution of crates for body was made for 0.20 min .

Time lost in harvesting with kangaroo saddlebag is smaller than the classic harvesting. The amount of fruit for tree at the cultivar Idared MM-106 is (10.50 kg), while the cultivar Jonathan M-9 (10. 25kg.).

Differences between the yield for tree and time lost on the basis of statistical analysis were not significant. Also regarding the distribution of crates for harvesting between the cultivars there were no significant diffrenes.

Compared to the amount of fruit on the first floor and the second floor is different, but also the lost time for harvesting is different. Idared cultivar

MM-106 on the first floor had 94.37 kg for which the time spent in harvesting was (20.29 min). For cultivar Jonathan M-9 to harvest 18.86 kg were spent 3:42 min. The difference between the yield and time lost between these two cultivars has been significant.

CONCLUSION

Based on the results achieved for the spending of time on apple fruit picking it can be drawn the following conclusions:

Crucial importance in fruit picking has yield for tree and helping tools for fruit picking.

The ripest fruits had the cultivar Jonathan M-9 (10.04 kg), whereas the least ripe fruit had cultivar Idared M106 (8.91 kg.). There were no differences in ripe fruit collection between the cultivars

The size of the fruit directly affects the amount of harvest. Mostly fruit for tree had the cultivar Idared MM-106 (93.46 kg), compared to cultivator Jonathan M 9 (31.55kg). Time lost for harvest at the cultivar Idared in 106 MM was 22.37 min.

Use of tools increase the efficiency of harvesting. At the harvest with kangaroo saddlebag for the cultivar Idared MM 106 were harvested (94. 37 kg) for 20.29 min.

Particular importance has the optimizing and racionalization in all work processes as the crates distribution, collection of ripe fruit, the size of tree crown, the classi-fication of fruits and the helping tools for harvesting.

The results of this research could serve as a starting point for the future to have a true picture on the effective operationalization of the operation which is more complex and more significant such as the tree fruit harvesting is.

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THE EFFECT OF WORT PRODUCTION WITH HIGH ORIGINAL EXTRACT ON THE FERMENTATION PROCESS AND THE CHARACTERISTICS OF BEER

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SUMMARY

High-gravity brewing has been progressively introduced into breweries around the world over the past 30 years. By applying this advanced technology beer production capacity grows around 20-30 % compared to conventional production. The purpose of this paper was to investigate the influence of high-gravity wort on the fermentation process and the physical-chemical properties of beer. For this research were used original wort gravity of 10.5, 13 and 15 %; pitching rate of $15 \bullet 10^6$ CFU/ml, fermentation temperature of 15 °C and the maturity temperature at -1 °C. The obtained results showed that the high-wort gravity resulted in the slower and incomplete fermentation, increased fusel alcohols and diacetyl level, which have affected the taste and aroma characteristics of the finished beer.
Key words: Fermentation, High-gravity brewing, Saccharomyces-carlbergensis, Fusel alcohols, Diacetyl.

PËRMBLEDHJE
Prodhimi i birrës me peshë specifike të lartë është futur në mënyrë progresive gjatë 30 viteve të fundit në shumicën e birrarive të botës Duke aplikuar këtë teknologji të avancuar kapaciteti i prodhimit të birrës rritet 20-30% në krahasim me prodhimin e konvencional. Qëllimi i këtij punimi ishte hulumtimi i ndikimit të mushtit me peshë specifike të lartë në procesin e fermentimit dhe vetitë fiziko-kimike të birrës. Për këtë hulumtim është përdorur mushti me ekstrakt origjinal të lart prej 10.5, 13 dhe 15%, dhënia majasë $15x10^6$ qeliza/ml, temperatura e fermentimit 15°C, ftohja në maturim -1°C. Rezultatet e fituara tregojnë së mushti me peshë specifike të lartë rezulton në fermentimi të ngadalshëm dhe jo të plotë, rritjen e nivelit të alkooleve të larta dhe diacetiitl, të cilat ndikojnë ne karakteristikat e shijes dhe aromës të birrës së gatshme.
Fjalët kyçe: Fermentimi, Birra me përqendrim-lartë, Saccharomyces-carlbergensis, Alkolet-larta, Diacetili

INTRODUCTION

Despite the fact that beer brewing is a traditional process, there is in the today's competitive market a constant demand for further process improvement. One of the main targets for improvement in the brewing fermentation process is the fermentation time, wort fermentability and ethanol yield, equipment use and labor costs. High gravity fermentation (HGF) of beer has recently drawn brewer's attention due to its advantage of energy, laboring, and space saving [1]. The high gravity brewing can be described as a procedure which employs wort at higher than normal extract [7]. Traditionally, brewing worts of 12°P are fermented to produce beers of 5% (v/v) ethanol. In high gravity brewing,

wort gravity can reach up to 16-18^{o}P [3] or even higher [11, 12] resulting in higher ethanol concentration in the green beer. After fermentation, the product is diluted, usually with oxygen free water, in order to obtain beer with regular ethanol content (5%) or desired alcohol content. The diluted process is often performed at a later stage in the processing and before packaging [7].

High gravity brewing has been remarkably developed over the past few years due to a number of benefits: increased brewing capacity, hence more efficient use of existing plant facilities; reduced energy, labor, cleaning, and effluent costs; improved physical and flavor stability of beer; more alcohol per unit of fermentable extract due to reduced yeast growth; higher adjunct rates; smoother taste; and greater flexibility [7]. For example, with the use of 15^{o}P wort, energy consumption can lower by as much as 14 % and an increase in manpower productivity of 25-30% or the brewery capacity increases by 50% for 18°P wort [1].

However, this technology still exists some problems:, foam instability [4, 14], and a negative effect on yeast performance due to high osmotic pressure and the production of high levels of ethanol, nutritional deficiency [6, 14] leading to lower fermentation rate as well as longer fermentation time. Fermentation with VHG worts has been associated with reduced fermentation rates, a disproportionately high production of esters [10, 15,], extended lag phase duration [13] increased concentrations of residual sugars in beer [14] and generation of yeast crops with poor fermentation potential[2]. Carbohydrates with high concentrations initially in HGF can bring osmotic pressure to cells, inhibiting its specific growth rate and production activity [5]. Besides, the gradual increased ethanol concentrations during fermentation affected cell growth and even made fermentation stuck [9]. Given this, it is requisite that yeast strains used for HGF should possess superior tolerance properties.

The aim of this paper was to evaluate the effects of high-gravity worts fermentation on the fermentation process and the characteristics of beer.

MATERIALI DHE METODAT

The effect of wort production with high original extract on the fermentation process and the beer characteristics was performed investigated during normal beer production process at the Beer Factory, Sh. A. “Birra Peja” The experiments were performed by beer analyzer type ANTON PAAR. DMA 4500. Sp-1m. Alkolyzer plus. Spectrophotometer AGILENT 8453. UV-Visible. Gas Chromatograph. Perkin Elmer Sigma 8500. Wort and beer chemical and physical analyses were performed according to European convention for beer EBC 2004. (European Brewery Convention. 2004. Analytica-EBC) [8].

Fermentation conditions

During this research beers were prepared under normal and high gravity fermentation conditions. The origjinal wort extract of 10.5m 13 and 15 % prepared by boiling process with two dekokcione. Pitching rate of 12 x 10^{6} cells / ml were normally used, fermentation temperature was 15 °C, cooling of beer have started when the beer extract decreased down to 3 %, while the end of primary fermentation of 12 % was sent to maturity at -1 °C. The Saccharomyces carlbergensis yeast of the second generation was used, the first generation was imported from the Brewery Union of Slovenia.

Determination of 2,3-butanedione (diacetyl)

Total diacetyl was determined by gas chromatographic analysis of the static headspace. The removal of CO_2 from sample was done by shaking and the precursors present in the sample are transferred to the corresponding diketone with aeration and treatment at 60 °C for 90 min to keep in autosampler, for conversion of acetohydroxy acids in vicinal diketones. Samples were then analysed by headspace Gas Chromatography (Perkin Elmer Sigma 8500, autosampler HS 100. Chromatography column, 60 m x 0.25 mm id, CP-WAX57CB, film thickens of

0.4 microns and with 2,3-hexanedione as an internal standard.

Determination of higher alcohols

Higher alcohols (propan-1-ol, methylpropan-1-ol, pentan-1-ol, 3-methylbutan-1-ol) were analysed by a headspace gas chromatograph with a flame ionised detector (FID) according to the current European Brewery Convention recommended methods. Equilibrated vapor in headspace of unstable compounds in beer, in a sealed bottle were analyzed by Gas Chromatography (Perkin Elmer Sigma 8500, autosampler HS 100, capillary column Chrompack 7773, of length 50 m, internal diameter 0.32 mm, external diameter 0.45 mm, liquid phase CP WAX 52 CB, film thickness of 1.11 microns.

RESULTS AND DISCUSSIONS

The primary fermentation of hopped wort with original extract of 10.5 , 13 and 15 % was performed at the temperature of 15 °C. The initial fermentation temperature was 12 °C and after 24 hours was increased up to 15 °C. The chemical analyses of green beer at the end of the maturity stage are shown in Table 1.

Table 1. Chemical analyses of the green beer at the end of maturation

Wort extract, %	10.5	13	15
Apparent extract, %	1.795	2.455	2.983
Apparent deg. of	82.388	81.078	80.03
Alcohol, % v/v	4.975	5.578	6.384

From the obtained results it can be seen that the increase of wort gravity caused the decrease in apparent degree of fermentation and slowing down of fermentation.

The primary fermentation profiles of hopped wort with original extract of 10.5 %, 13 %, and 15 % which were completed for 72 hours, 96 hours and 108 hours respectively are shown in figures 1-3.

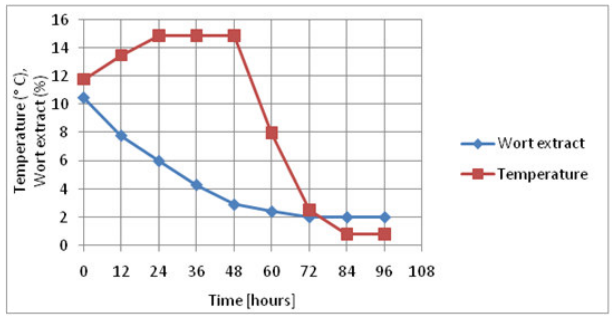

Figure 1. Graphical presentation of wort fermentation profile with original extract of 15 %.10.5 %.

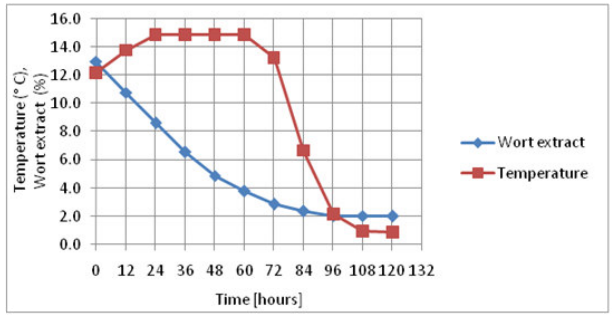

Figure 2. Graphical presentation of wort fermentation profile with original extract of 13 %

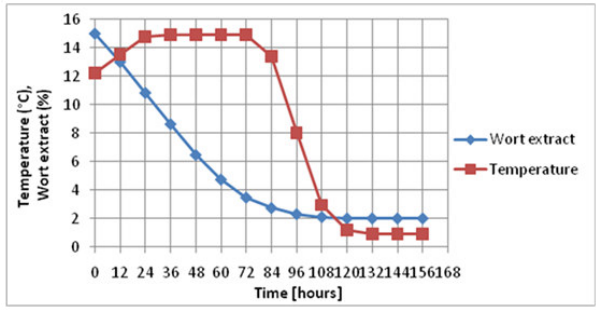

Figure 3. Graphical presentation of wort fermentation profile with original extract of 15 %.

Fermentation profiles are influenced by wort original extrat. Hgh gravity brewing requires longer fermentation time at the same fermentation conditions. High-gravity wort naturally stresses the yeast, thus producing higher levels of fusel alcohols and diacetyl in the finished beer.

The higher alcohols, propan-1-ol, methylpropan-1-ol, pentan-1-ol, 3-methylbutan-1-ol, (also known as fusel alcohols) may have both positive and negative impacts on aroma and flavour. Large quantities of these higher alcohols (>300 mg/l) in beer can lead to a strong, pungent smell and taste, whereas optimal levels impart desirable characters.

Diacetyl (2,3- butanedione) is one of the most important by-products in alcoholic fermentation and it is a key compound in beer maturation. At low levels, it gives beer a slick mouthfeel; at higher levels, the flavor becomes buttery, which decreases the sensory properties of the final product.

The effect of high gravity wort on formation of higher alcohols (propan-1-ol, methylpropan-1-ol, n-pentan-1-ol, 3-methylbutan-1-ol) and Butane-2,3-dione (diacetyl) in beer are illustrated in Figs. 4 and 5.

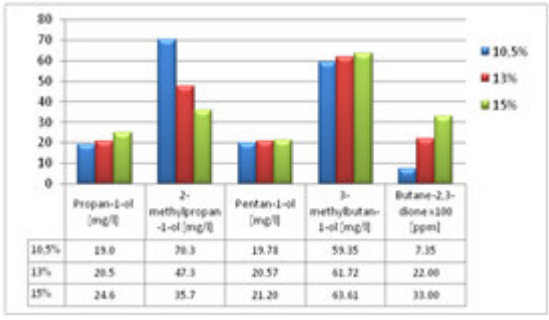

Figure 4. Formation of higher alcohols and butane-2,3-dione in beer with the original extract of 10.5 , 13 and 15 % before the dilution with de-aerated water.

The results given in Figures 4 and 5 indicate that the flavor compounds, such as the higher alcohols: propan-1-ol, methylpropan-1-ol, n-pentan-1-ol, 3-methylbutan-1-ol and the butane-2,3-dione, were significantly affected by wort gravity. With the increase of the wort gravity from 10.5 % to 15%, were increased the formation of n-propan-1-ol, pentan-1-ol and 3-methylbutan-1-ol while the concentration of 3-methylpropan-1-ol was decreased significantly from 70.3 to 35.7 mg/.l. The formation of butane-2,3-dione (diacetyl) was strongly influenced by increase of wort gravity, from 0.07 to 0.33 ppm as shown in 4. But their slightly increased when they were diluted with de-aerated water. The increase of gravity worts tends to increase the concentration of these higher alcohols through increased yeast activity.

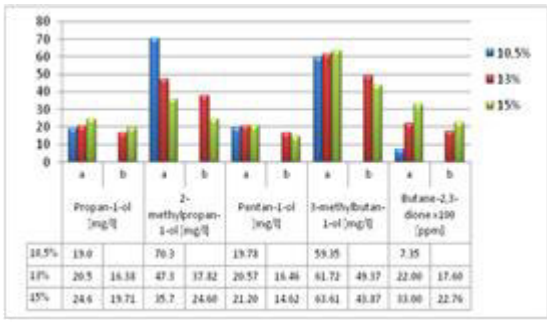

Figure 5. Formation of higher alcohols and butane-2,3-dione in beer with the original extract of 10.5, 13 and 15 % before and after the dilution with de-aerated water (a-undiluted, b-diluted)

CONCLUSIONS

In this study, the effects of high-gravity worts on the fermentation process and the characteristics of beer were evaluated. The primary fermentation of hopped wort with original extract of 10.5 %, 13 % and 15 % was performed at the temperature of 15 °C.

Based on obtained results we arrive at the conclusion that with the increase of the wort gravity fermentation time extended; for the wort gravity of 10.5 % to 72 hours, for wort gravity of 13 % to 96 hours and for the wort gravity of 15% to 108 hours.

With increase in the gravity from 10.5 % to 15%, the concentrations n-propan-1-ol, pentan-1-ol and 3-methylbutan-1-ol were increased slightly while the concentration of 3-methylpropan-1-ol was decreased significantly from 70.3 to 35.7 mg/.l.

The formation of butane-2,3-dione (diacetyl) was strongly influenced by increase of wort gravity, from 0.07 to 0.33 ppm .

In all cases after the dilution with de-aerated water, have been a significant decease of higher alcohols level and butane-2,3-dione compared

with normal density of beer. Such a reduction of the content of higher alcohols and butane-2,3-dione effect positive the flavor.

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MONITORING OF A PHOTOVOLTAIC SYSTEM

MONITORIMI I NJE IMPIANTI FOTOVOLTAIK

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PERMBLEDHJE
Gjatë viteve të fundit është dedikuar një vëmëndje në rritje, qoftë nga autoritetet po ashtu nga operatorët, prodhimit të energjisë nga burimet e rinovueshme. Përvec disa burimeve të ndryshme të energjisë së rinovueshme, energjia e diellore është supozuar të këtë prespektivën më të favorshme teknike dhe ekonomike. Në këtë mënyrë del nevoja e studimit dhe përshkrimit të këtyre sistemeve. Në këtë punim do të trajtohet monitorimi i një impianti fotovoltaik me një fuqi të instaluar prej 1.5kWp. Impianti fotovoltaik është ndërtuar për studime praktike dhe për kërkime në fushën e sistemeve fotovoltaike. Impianti është instaluar në taracen e Fakultetit të Inxhinierisë Elektrike. Për të realizuar monitorimin e vazhdueshëm, impianti është lidhur me rrjetin elektrik me anën e një grid-inverter. Rezultatet e përftuara nga monitorimi i këtij sistemi do të përdoren më pas për studime të mëtejsheme për mundesinë dhe potencialin e prodhimit të energjisë elektrikë nga energjia diellore në Shqipëri.
Fjalët çelës: Impiant-fotovoltaik, Grid-inverter, Energji e Rinovueshme, Rrjeti-elektrik.

ABSTRACT
In recent years, a growing attention, both by the authorities as well as the companies of the electricity sector, had been dedicated to energy production from renewable energy sources. Solar energy is assumed to have more favorable technical and economic perspectives. In this paper will be treated monitoring of a photovoltaic plant with installed power of 1.5kWp. The system will be used for practical exercises in the framework of the course on Photovoltaic Systems and for research of the influence of outdoor conditions on its behaviour. The plant was installed on the roof of the building of Faculty of Electrical Engineering. To achieve continous monitoring, the plant is connected to the grid with a grid invereter. Results obtained from the monitoring of this system will be use the following for further study of the possibility and potential of electricity production from solar energy in Albania.
Keywords: Photovoltaic-systems, Grid-inverter, Renewable-energy, Distribution-system, Solar-energy.

1. INTRODUCTION

Recent years the demand for electricity is growing more and more. Obviously, to meet the electricity needs of our consumers, we must respond with the increase of new energy sources. Nowadays, there are different ways of producing electricity and many of them have found wide application.

In the context of global warming, ozone layer deterioration from different gas emission, mainly carbon dioxide CO2, many countries worldwide have developed sanctioning policies for such entities emitting gases and favorable policies to promote clean and renewable energy.

So the issue of preserving the environment today is taking a primary role.

Recent technologies used for electricity production are through: photovoltaic cells using solar energy, wind farms using wind energy, hydropower plant using water potential, geothermal plants, biomass and exploitation of ocean energy (waves). In this way there is a need for process recognition and the study of these systems.

This paper will describe the monitoring of a photovoltaic system with 1.5kWp installed power.

The photovoltaic power station is installed on the Faculty of Electrical Engineering roof and is built for practical and research studies in the solar energy production domain. To obtain continuous data, PV plant is connected to the power grid distribution system with a grid-inverter. The Panel system is composed of 10 modules with installed power of 150 W, which are connected in series. The Results obtained from the monitoring of this system will then be used for further studys on the potential and possibility of producing electricity from solar energy in Albania.

2. PHOTOVOLTAIC SYSTEM

This section gives a brief functional and identification of settings, qualities characteristic of the elements that make up a Photovoltaic Plant. Usually the basis of a PV plant is the generating unit, where the electricity is produced, while the basic element of the generating unit is the photovoltaic cell.

A typical PV cell produces less than 3 W to 0.5 V DC, and then to have more power generated these cells should be connected with each other under certain series and parallel configuration. But it is known that PV panel produces electricity only in the radiation period. If you have to supply a load in the night hours then it is necessary to have a system where the energy may be stored such as an accumulator battery, etc. Through this system we will supply the load even during cloudy days, during this time the panel does not produce electricity. So it is necessary to install rechargeable batteries, and according to their cycles they will be charged and discharged all the time.

But to keep the batteries in their optimal operating conditions we should not let them to be overcharged and over discharged.

For this we have to implement a regulator that whenever the over-charge or over-discharge of the battery reaches a certain value (given by us), it acts in disconnecting the battery. In addition if we have to supply AC loads then we should put an inverter in the scheme that will make the conversion from DC to AC voltage. If a backup system is present in the scheme it is needed another controller, ex: a diesel generator which will be connected whenever PV panel does not produce or generate the necessary power. In cases when the PV plant is connected in parallel with the grid again it is necessary an interface circuit or a controller that disconnects our PV plant from the grid whenever it looses stability. Besides the components mentioned above we have other support elements such as: wires, fuses, circuit breakers, surge arresters, grounding system, etc. Together the entire elements compose a “Photovoltaic System”.

There are two schemes generally used for a typical photovoltaic system:

a) PV Plant with inverter and battery

b) PV Plant with Grid inverter

The first system is low cost to install and is used in cases when it is isolated (island system) from the distribution network. Their disadvantages are that it requires maintenance for batteries, and requires additional equipment for its monitoring process.

While the second system has an expensive installation due to the relatively high cost of grid inverter, but it has great advantages: it is direct connected to the grid and is easily monitored with the friendly use of grid inverter software.

3. DESCRIPTION OF PV SYSTEM BUILT ON THE FEE ROOF

On the roof of our faculty there are three different types of PV panels: Monocrystalline PV panel with 1500Wp rated power (Figure.1), Polycrystalline PV Panel with 720Wp installed power, mounted in a fixed platform and a rotating solar photovoltaic panel with 220Wp

rated power. Below it will be analyzed the monitoring of the monocrystalline PV Panel.

Figure 1. 1500Wp Photovoltaic Panel

For the first time, the PV panel has been installed in the scheme with inverter and battery, supplying power to some small loads in Dynamic Analysis Laboratory and some other loads in High Voltages Laboratory. The panel consists of two strings, each composed of 10 modules. The modules are connected two by two in series and then all related doubles formed in parallel with each other. These wires go down from the roof to the first floor, where the loads and other auxiliary equipment, control, monitoring are located.

These wires connect to the relevant regulators to charge the batteries. The regulators depending on the charge status of the batteries and internal logic will decide where to transfer more energy to the batteries or more to the inverter.

The disadvantage of this system was that it requires additional equipment to monitor and continuing maintenance of batteries. These were precisely the reasons that led us to choose another way of monitoring through a single monitoring device that collects and then process data called grid inverter. The Grid inverter brand "FIMER" has a 1.75 kW rated power and gives us communication possibilities with the PC. Then through software interface is possible monitoring the photovoltaic plant.

To realize the connection of the panels we needed to do some changes in the scheme of connection modules in order to adapt the input voltages of grid inverter. (Range: 110 V- 430 V). To realize this, all strings were connected in series with each other.

In Figure.2 is given the full electric scheme of PV plant connected to the grid.

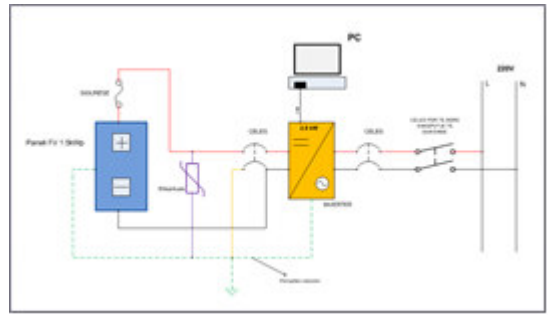

Figure 2. PV Panel connected in parallel with the grid

PV panel consists of 20 modules 75 Wp type monocrystallin all connected in series. It's terminals are connected to the input terminals of the grid inverter. 220V Output of grid inverter is connected to the grid to directly inject power produced by the PV panel. The inverter via a RS232 port will send its data to a PC to display the collected and processed results. This data then can be stored in an archive in PC memory. Regarding the detailed presentation, we have constructed graphs and processed results that will be shown in the following paragraph, which will explain the monitoring procedure in details.

4. PV PLANT MONITORING

In this part we will show the results of the monitoring program and the opportunities for displaying and processing data. With this software, you can see in real time the power and the energy that is injected in the grid (produced by the PV plant). Below is shown a daily graph. It shows the amount of energy that is produced from the PV plant during this day (7.2 kWh), instant power (74 W), and the graph of power produced by the panel throughout the day. The chart belongs to July 15, 2013.

Figure 3. Daily graph of power produced by the PV Plant

This program also offers the possibility of exporting the data into an Excel file enabling further data processing.
Below is the density of solar radiation and electrical energy produced by PV plant on July 15, 2013.

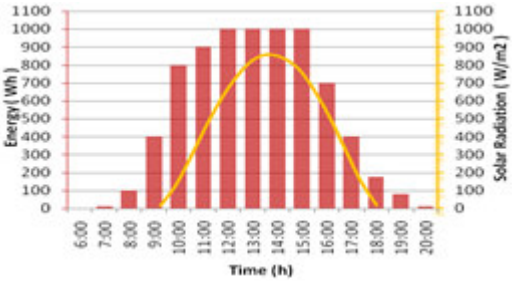

Figure 4. Solar radiation and energy produced of PV plant on July 15, 2013

Looking at the graphs of solar radiation and energy production we notice that the forms of graph are nearly similar. Energy produced is not constant but it depends on solar radiation and the position of the sun into the horizont.
The software gives us the opportunity to build graphs of the energy produced during a month. The following chart shows the energy produced on July 2013.

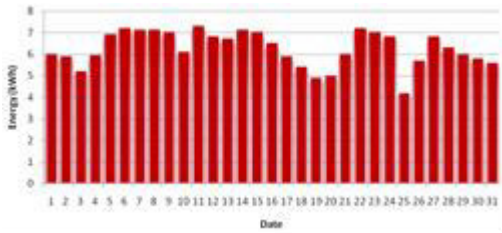

Figure 5. Energy produced on July 2013.

In the Table 1 is provided the produced energy for five months since the installation of the PV monitoring system. From the first day of use of grid-inverter, total energy produced by the PV system is about 1056 kWh power which is injected to the grid and laboratory equipment.

Table 1. Month energy produced by solar plant

Month	June	July	August	September	October
Energy (kWh)	222.7	236.2	227.6	201.3	168.2

From all the above descriptions the idea and the purpose of the build of photovoltaic plant is to demonstrate how photovoltaic systems work, and to help students in practical woks and scientific research on these systems.

5. CONCLUSION

The study and the description of photovoltaic power stations are important for their control and supervision.
Monitoring these systems behaviour conducts in understanding their different problems.
Albanian power system is actually based almost totally on Hydropower production, and for this is always putting his confidentiality in doubt. This system meets about 70-80% of the total demand for electricity. In these conditions, we can say that the main challenge of Albanian power sector is the diversification of energy sources and energy self-sufficiency for local resources, thus reducing dependence on imports. According to measurements of solar radiation, carried by the Hydrometeorological Institute, and the station

latitudes where measurements were made results that our country has an exposure to solar radiation, which varies from 1200 kWh/m2 in the north-east up to 1600 kWh/m2 western area. Most of Albania's surface obtains a solar radiation of 2200 hours / year, while in specific years, the average go up to 2400 hours / year. The number of sunny days in our country varies from 240 to 260 days, with a maximum of 280 days. Field Myzeqe, Vrina and Vurgu are favored regions for solar radiation from 2400 hours / year. From the monitoring results we see the average electricity produced by the plant is about 200 kWh per month, approximately half of the electricity consumption for a family in Albania.

For this reason, it is suggested to develop encouraging policies to the use of photovoltaic systems by reducing the higher cost of installation.

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A STUDY OF THE INFLUENCE OF IMPLEMENTING THE ROBOT PROGRAMMING ON STUDENT'S CREATIVITY OF HIGH SCHOOLS

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SUMMARY
This paper presents a study that was conducted with college students, "Aga Xhite" in Ferizaj, whose goal has been the implementation of programming robots to encourage students' creativity, applying mathematics to advanced technology. The study lasted six weeks and included a total of 32 students of grade X, XI and XII, the Mathematics – Informatics Section. Students were divided into groups and the research was done with each group separately. Students by experimenting with real robots have solved concrete tasks ranging from writing the name of the student on the floor with the help of the robot and the robot's movements through the environment with obstacles, where they develop skills and creativity have been observed. Application of mathematics is based on the use of trigonometric functions in the control algorithm and then designed computer program is transferred and executed on the robot. Using Scribbler 2 robot was the beginning of introducing students with robots, and after the third week the SumoBot robot also has been used. Obtained results are categorized according to hardware and software environment. Experiments in groups bring to the conclusion that the application of mathematics and implementation of the control algorithm in the programming of robots has grown the creativity of high school students.
Key words: Robot, Scribbler S2, SumoBot, Education, GUI, programming

Introduction

Learning of programming and algorithmic thinking development plays an important role in engineering education, especially in electronic systems, robotics and related fields [3]. This paper presents a pilot project that has been developed in college "Aga Xhite" using mobile robots for advanced learning technology and mathematics, in order to increase the creativity among students.
Robotics, being an important area of technology today and in the future, brings knowledge, skills and many ideas [5]. Taking into consideration above mentioned, the use of computer science and education has become an integral part of the purpose of processing information and solving various problems of robotics. .
Robots have been implemented in the education of high school students in the final years of the 1970s, when the teacher Seymour Papert published his Lego robots, along with the Logo programming language designed for children [7], [8] .
During study case, in the beginning analysis have been carried out, to estimate whether the design, construction and programming of robots could be used to address problems raised from the use of mathematical apparatus and physical problems. Afterwards, it has been studied how motivating would work with robots in problem

solving be. Further, the use of robots can provide an opportunity to process the data in visual form to enrich thinking of students in different situations, and in the end, the application of curricula dealing with applied mathematics. Supplementary materials and resources by using Scribbler S2 robot, have been adapted a number of students who had previously expressed a desire to be challenged with implementing technology and mathematics.

Student's participation

The project is developed in the first semester, where all the necessary measures for the welfare of starting work plan has been taken, starting from the selection of students and the accompanying infrastructure. In project, a group of students of grade X, XI, XII Mathematics-Informatics Section has participated. The total number of participants was 32, who were divided into groups by grade.

Participants in the project had earlier expressed willingness to be part of it and being divided into groups according to age, while the work plan was the same for all participants. Groups consist of a maximum of six students who had available two robots to work and experiments.

Theory framework

Program for the project is divided into four phases as follows:

- Introduction to hardware
- Algorithms
- Programming and solving mathematical problems
- Application of robot

Throughout the project development process modifications have been made in the work plan, depending on the age of the students and their preliminary preparation. Once students of grade X and XI had no information about algorithms and programming languages, for these two categories have been lectured extra hours in order to advance knowledge in this field.

Educational objectives and expected outcomes are designed to meet the general educational objectives:

- Development of practical technology skills
- Application of robotics and programming
- Understanding the complexity and empirical calculations
- Understanding the nature of science
- Increased interest in cultivating the learning of science, technology, engineering and mathematics
- Development of skills in team work and
- Reflection and application of knowledge in the real world.

Project implementation is done in optimal conditions in the laboratory of the college ICT "Aga Xhite" and environment for testing has been enough for team work.

Introduction to hardware

In the first phase, students first learned about the types of robots, their designs and then began physically building robots, sensors and types of movements. Through this experience, they have gained knowledge on the types of hardware and physical possibilities of robot action, in order to begin to gain an understanding of engineering and design principles.

Scribbler S2 mobile robot is a compact robot used in many educational institutions, starting from lower secondary schools up to universities, thus Scribbler S2 is not a toy and is recommended for age greater than 14 years [3].

Considering the dimensions of which are given in Figure 1 and its compactness, Scribbler robot S2 represents the best opportunity for the application of this age group of participants.

Figure 1. Scribbler S2 robot dimensions [1].

Scribbler S2 mobile robot contains the following features that are presented in the following [2]:

- 3 Light sensors
- 2 Sensors for obstacle avoidance
- 2 Line tracking sensors
- 2 Independent DC motors wheels
- Wheel encoders for maneuvering
- Engines sensors for wheel stops
- Pencil port to write on paper
- Microphone that includes the full range of musical notes
- Programmable lights
- Microphone for detecting voices from other Scribbler S2 robots.
- Two-color LED for visual connection feedback
- Hacker port for connection to external sensors, RF devices and servos.

The distance between the wheels of the robot is 14.6 cm, while the middle where the pen is placed half of this distance, i.e., 7.3 cm. Taking an example the maximum developed speed of S2 Scribbler robot, it is noted that for 1s it crosses the distance of 11.5 cm, and to determine the time required for certain length the ratio method has been used, that students have to know since middle school.

SumoBot robot as shown in Figure 2 has been used in the second half of the course.

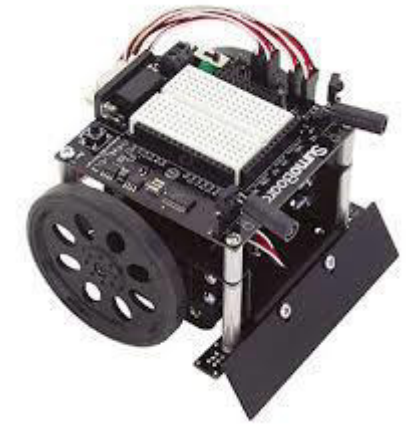

Figure 2. SumoBot robot view [9].

Students practice their skills in electrical installation of the sensors, electronics and controller programming using BASIC Stamp2 PBASIC language, while devices like sensors, photocells sensors, infrared sensors and ultrasonic sensors have been used to perform certain tasks similar those that have been performed with S2 Scribbler robot. SumoBot robot requires students to work more closely with hardware, without having built the chassis.

Algorithms

At this stage students have been informed about the importance of algorithms and its implementation in further work. Phase algorithm deals with blocks entry, exit, descriptive, conditioning, loops, and connections for control, Figure 3.

Figure 3. Blocks of algorithm.

The blocks represent the visual presentation of the program flow. This form of program flow enabled the students to be introduced with the performance of a program planning, ranging from the most simple task, start of the robot until putting conditions and loops enable the robot to have an independence actions from outside.

Programming

Given the initial level of students in programming, programming phases have been developed using the GUI software.

Students first got enough knowledge of the program Scribbler program maker and then continued with the implementation of algorithms.

Software developed by Parallax, have a wide range of use [6] at these levels of education:

- Middle School / High
- Home School
- College / University
- Elementary School / Continuing Education
- Robotics and similar clubs
- Independent Learning.

Once the program is given in the form of blocks, students had no problems after introduction to algorithms to implement them.

By using the Scribbler program maker and implementation of algorithms, students needed to introduce technical and programming capabilities of it. This program provides numerous opportunities of usage, but also technical limitations in terms of ranging from the minimum time adjusting the movement of the wheels of the robot which is 0.05 s, whereas the maximum movement is 5 s. For this reason, if the movement does not comply with these technical possibilities, then the approximated result has been taken.

The speed of movement of the robot Scribbler S2 which is controlled through the GUI is as follows: 100 = maximum forward speed, 0 = stop, -100 = maximum back speed [6].

During this phase, students have been exposed to problems of physics and mathematics, where the robot helped to illustrate the problems in practice.

Basic programming concepts covered and included the following actions: sequential execution, statements, conditional and logical operations, repetition, and errors removing.

These programming concepts have been split into three sections and topics were covered in each section of the programming included:

Basic part - Start / Finish, Motors, Time, Stops, Music;

Sensors - Wait for the event, If / Then, Loops.

Mathematical solution of problems

The use of applied mathematics was the purpose of the study project, in which has been analyzed the relationship between the empirical calculations and results obtained with the use of the robot. Due to errors and approximations of values observed for small deviations of the results, but the purpose of demonstration met planned objectives.

The distance movement of the robot is calculated by the equation:

$$d = \sqrt{\left[(x_2 - x_1)^2 + (y_2 - y_1)^2\right]} \qquad (1)$$

Also, for the definition of the necessary angles the ratio method has been used, since after return to the right for 90^0 left robot wheel should move with maximum speed of 100, while the right rear wheel speed with maximum speed of 100 with interval of 1 sec. Using mathematical methods and comparison with previous measurements, errors are evident but do not affect the accuracy of the work.

Following are the necessary formulas used for geometric calculations, starting from the calculation of the perimeter of the robot's right wheel $P_R = 2\pi(r - w)$ and the left wheel circumference is calculated according to the formula $P_L = 2\pi(r + w)$ and calculation speeds:

$$left\_wheel\_velocity = \frac{2\pi(r + w)}{t}$$

$$right\_wheel\_velocity = \frac{2\pi(r-w)}{t} \quad (2)$$

To calculate the speed of any Scribbler S2 robot wheel, when are given necessary radius (r) and the distance between the wheels of the Scribbler S2 robot that is (2W), which is given in Figure 4, the following ratio is used:

$$\frac{right\_wheel\_velocity}{left\_wheel\_velocity} = \frac{r-w}{r+w} \quad (3)$$

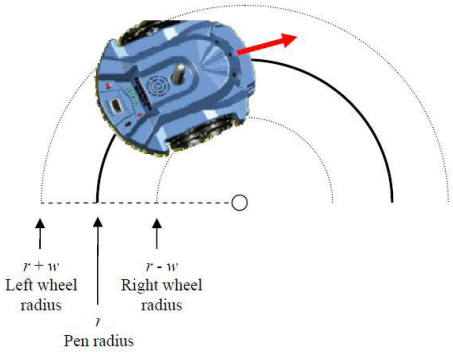

Figure 4. Rotational movement of the Scribbler S2 robot.

As for setting the angles, which are necessary to describe the robot trajectory, trigonometric functions are used that are derived from the triangle given in Figure 5.

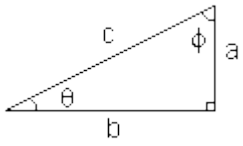

Figure 5. Angle definition.

$$\sin\theta = \frac{a}{c} \quad \cos\theta = \frac{b}{c} \quad tg\theta = \frac{a}{b} \quad ctg\theta = \frac{b}{a}$$

$$\theta = arctg\frac{a}{b} \quad c^2 = a^2 + b^2 \quad (4)$$

For setting the radius of the arc is used formulas $radius = \frac{H}{2} + \frac{w^2}{8H}$ based on Figure 6.

Where are:
w- the width of the base of the arch
H- height measured at the middle point of the base.

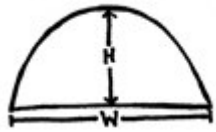

Figure 6. Radius definition [3].

Robot application

The fourth phase focuses on the application of knowledge to solve complex problems. Students are challenged with problems within the group, allowing them to apply the knowledge gained and apply them in practice. And finally, students made presentations on their solutions, to share with each other the knowledge gained but also to promote new ideas for solving problems. By sharing in groups, students were able to reflect on the overall learning process.
During the execution of various tasks, students have created the table which helped their implementation easier and faster.

Table 1. Definition of movement time of the Scribbler S2 roboti for certain angles.

Right/Left	1 s	2 s	3 s	4 s
100/-100	90^0	180^0	270^0	360^0
50/-50	45^0	90^0	135^0	180^0

In the application is demonstrated the usage of a robot to write the name of one of the students, and the goal was application of mathematical knowledge to geometry and apply them to the robot. Name "ARBEN" is written in the notebook in which font value is set to 2 cm according to x axis, while the y axis value was 4 cm, Figure 7. Due to demonstration, the robot values are increased by 10 times. Compiled written in the GUI is shown in Figure 8.

Figure 7. Coordinate definition of given name. Figure 8. Compiled program on GUI.

While the movement of the robot with obstacles is realized in order to demonstrate the application of sensors that contains Scribbler S2 and SumoBot robot. The demonstration has enabled students to get more acquainted with the functions of conditioning and loops, but also the response of sensors in certain cases.

In held competitions a program has been implemented so that the robot imitate the dog, which in this case are activated the infrared sensors features, where all the time these sensors have received information and then the robot has followed this signal with the condition of twice excitation and stopped after the object has emerged from the observation area. Given program is shown in Figure 9.

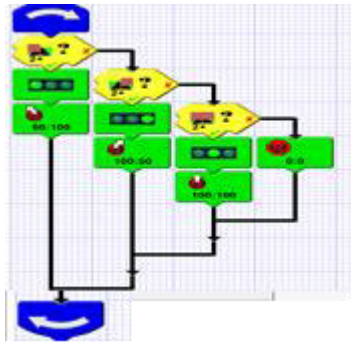

Figure 9. Program for dog immitation of the Scribbler S2 robot.

Conclusions

The application of robots in schools in developed countries has a historical use, while in Kosovo the use of robots in the education process is in the initial stage. In this paper are given practical examples of how the use of robots will help in applying mathematics to students with the aim of increasing their creativity and performance.

Given the obtained results from the case study in this paper, one can conclude that the implementation of programming and the use of robots will help the increased interest of technology use to young people, where science will become an important part of elementary and high school curricula in our country.

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THE EVALUATION OF HYDRODYNAMIC CHARACTERISTIC OF A SMALL CRAFT USING DATA OF THE NPL SYSTEMATIC SERIES AND CAD APPLICATION

VLERESIMI I KARAKTERISTIKAVE HIDRODINAMIKE TE NJE MJETI TE VOGEL DETAR DUKE PERDORUR TE DHENAT E SERISE SISTEMATIKE NPL DHE APLIKACIONET CAD

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PËRMBLEDHJE
Parashikimi i rezistencës në rimorkim është një prej elementëve kyç për procesin e projektimit të anijes. Për vlerësimin e karakteristikave të rezistencës projektuesit e anijeve mund të përdorin të dhënat statistikore, seritë sistematike, të dhënat eksperimentale të provave me modele në vaskë dhe rezultatet e rrjedhura nga CFD. Për disa tipologji anijesh seritë sistematike janë një instrument i vlefshëm ne duart e projektuesit për parashikimin e rezistencës dhe fuqisë. Punimi ka si qëllim prezantimin e procedurave te ndjekura, ne një rast konkret, për vlerësimin e rezistencës dhe fuqisë të një mjeti të vogël detar. Në punim paraqiten rezultatet e llogaritjeve dhe paraqitjet përkatëse grafike te rezistencës, fuqisë dhe këndit të pjerrësisë në lëvizje për mjetin e marrë në shqyrtim. Punimi gërsheton aplikacionet CAD me të dhënat e serisë sistematike NPL. Punimi është realizuar pas kërkesës së pronarit të mjetit për vlerësimin e disa karakteristikave hidrodinamike të mjetit të tij.
Fjalë çelës: Anije, Seri Sistematike, Rezistencë, Vaskë

SUMMARY
Prediction of resistance is one of the key elements of the ship design process. To predict the characteristics of resistance the ship designers can use statistical data, systematic series data, experimental data of test with models, and results derived from CFD. For some typology of ships systematic series are a valuable instrument in the hands of the designer to predict the resistance and power. The paper aims to present the followed procedures for the evaluation of resistance and power of a small marine vehicle. In this paper are presented the results of calculations and the corresponding graphical representations of resistance, power and trim angle for the craft taken in consideration. The paper combines CAD applications with the data of NPL systematic series. The work was conducted following the request of the owner vehicle to evaluate of some hydrodynamic characteristics of his boat.
Key Words: *Ship, Systematic Series, Resistance, CAD*.

INTRODUCTION

Prediction of ship propulsion power is one of the most important elements for the ship design process. Knowing the required power, in order that ship reaches the maximum speed required, allows the dimensioning of the propulsion plant, determining the amount of fuel for a certain autonomy and the completion of the evaluation process of weights and center of gravity of ship.
Evaluation of ship resistance is one of the key elements for determining the installed power of ship. To evaluate the resistance of a ship the designer has several options available, that are traditional methods, standard systematic series,

regression based methods, direct model test and Computational fluid dynamics (CFD). The choice of method depends not only on the capability available but also on the accuracy desired and the funds available. [1],[2],[3].

The design process for the prediction of resistance and power of ship traditionally uses tests with models as the most reliable tool to predict the hydrodynamic performance of the ship. For traditional ships the calculations based on statistical and systematic series data can provide estimates of power almost with the same accuracy obtained from experimental tests. In this way for many types of ships the systematic series and statistical data are a valid instrument in the hands of the designer to predict the resistance and power.

In literature there is a great wealth of data available to the designer and analyst in the form of model data and more particularly in model data relating to standard series hull forms. [1],[2],[3].

In this article we do not intend a comprehensive treatment of all systematic series used to predict the hydrodynamic characteristics of the hull, because for this should probably write a entire book, but will treat a specific procedure that we implemented in a concrete assessment case of hydrodynamic characteristics of a small boat.

Prediction of these characteristics is made after the request of the owner of this boat.

Prediction of these characteristics is realized by combining CAD applications and the data of NPL systematic series.

MATERIAL AND METHODS

Systematic series of ship hull are experimental summaries of resistance and power in a family hull derived from a parent model with similarity criteria. [1],[2],[3].

In generating a series of systematic, are altered systematically the key parameters of shape such as, L/ B, B / T, CP, etc. .., to determine the effect of these parameters on resistance in calm seas. The accuracy of value of the calculated resistance for a whatsoever hull can be more satisfactory if the hull on examination is very similar to the parent hull of the series.

The weakness of a systematic series appears when the hull to be designed falls outside the limits of the definition of the series.

For the correct application of a systematic series is needed the recognizing of key ratios of the hull dimensions, recognizing of some key characteristics of hull as, displacement ∇ and the longitudinal position of center of buoyancy LCB, recognizing of coefficient of fullness as prismatic coefficient, block coefficient etc.

Traditionally calculation of hydrostatic characteristics necessary for the application of systematic series is done through the application of manual methods of approximation, which:

- require long time to realize the calculations, delaying the process of power prediction and other processes associated with it;
- lead to errors, sometimes significantly, which subsequently affect the final result obtained from the application of series;
- Due to the large volume of calculations sometimes is created fatigue and boredom of engineers involved in the implementation of these calculations.

CAD is an advantageous environment that helps on:

- Reducing the time of the ship hydrostatic calculations versus traditional process.
- Increase the flexibility of design analysis enabling the designer to see the impact of change of the geometric characteristics of the hull resistance and power and finding the optimal solution.

In this way, to enable the assessment of hydrostatic parameters of hulls, the designer firstly must make the hull modeling on a CAD modeling program and then conduct an analysis of built CAD model on a CAE program.

For the boat to which we must make the calculations of the hydrodynamic predictions, were available only theoretical hull lines drawing, which was made available to us by the boat owner.

For the implementation of the predictions of hydrodynamic characteristics of the boat taken in

consideration firstly we have designed a schematic flow chart to be followed. In Figure 1 is presented the developed flow chart for this purpose.

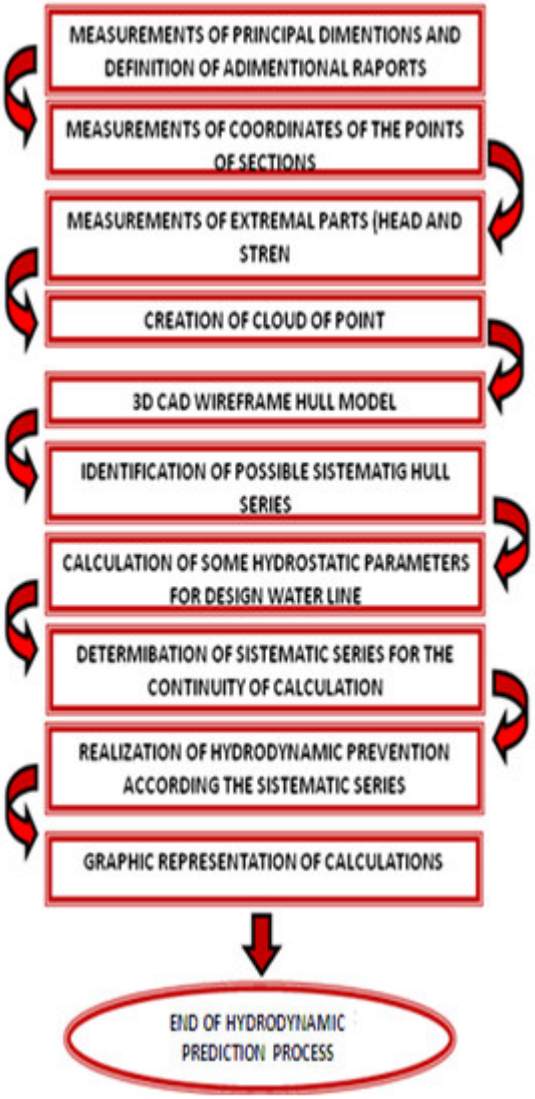

Figure 1. The overall schematic flow chart for hull hydrodynamic predictions using systematic series and CAD applications.

RESULTS AND DISCUSSIONS

The above flow chart is applied to predict the resistance and power of a small craft with the following dimensions:

- Length overall 9.200 m
- Length on design waterline 8.740 m
- Length between perpendiculars: 8.125 m
- Maximum Breadth 2.000 m
- Breadth on water line 1.715 m
- Draft 0.420 m
- Depth 1.020 m
- Maximum navigational speed 20 nyje
- Scale of Design 1:5

In the ship lines plan are realized the necessary measurements for the creation of the cloud of points. On the basis of these measurements and the cloud of points is realized the 3D CAD model of the craft. The number of measured points in the ship lines plan is 411.

The number of section in body plan is 27. The distance between sections is 0.325. According to lines plan of the ship results that the after perpendicular coincides with section number 0 and the forward perpendicular coincides with section number 26.

This hull presents a small cylindrical body. Keel line of the hull coincides with baseline only in the region that lays between sections 18 and 21. From ordinate 18 the keel line undergoes a linear increase towards stern with an angle equal to approximately 2,250. The forward body of this hull starts at section 21 and goes to the forward extreme in the form of a steep bow.

In total, in drawing are shown 16 water lines where 8 water lines belong to underwater part and 8 water lines belong to hull part exposed in air.

At the stern the sections of this hull are U-shaped sections which gradually are transformed in V-shaped sections in the forward part. In the lines plan drawing of the craft not result any appendage.

For the construction of 3D model of the hull surface is used the methodology of reference [4].

In figure 2 is presented the 3D wireframe model of the hull. The model is realised in Software MAXSURF PRO.

From visual inspections performed, as in paper format of ship lines as well as in 3D CAD model, results that the series that approximates this hull is the NPL series, with parent model 100A NPL.

In table 1 are presented the characteristics of the parent model of the NPL series (100A) and data of the hull craft under investigations. [5]

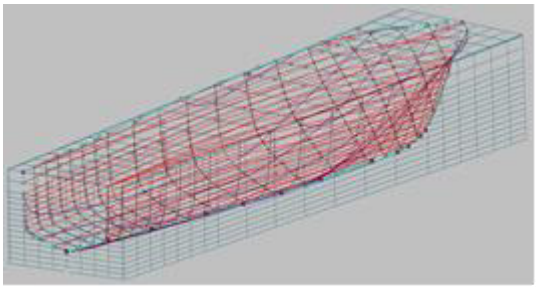

Figure 2. The 3D model of the ship hull modelled. Based on the 3D model are performed the hydrostatic calculations of the craft.

Table 1. Comparisons of characteristics 100A NPL with those of the modelled hull

Symbol	NPL Series	3D hull model
Block coefficient C_B	0,397	0,395
Pristatic Coefficient C_P	0,693	0,689
Coefficient of max. area	0,673	0,649
LCB Position	6,4 % ALWL	0,519 m A = 6,3877 %

As can be easily ascertained, the main features of NPL series and the main features of the designed hull are very close to each other, so the calculations of hydrodynamic performance can be performed without corrective effect.

From calculations the hull wetted surface is approximately 13 m^2 while the displacement is Δ=2.947 T.

Since in the report of NPL systematic series [5] are presented the specific residual resistance values, i.e. ratio R_R/Δ, the calculations of total resistance (R_T) are made according the following formula:

$$R_T = R_F + \left(R_R/\Delta\right)\cdot\Delta \quad (1)$$

Where friction resistance RF is calculated according to ITTC friction line 57, on the basis of the friction coefficient calculated according the following relationship:

$$C_F = \frac{0,075}{(\log_{10}R_N - 2)^2} \quad (2)$$

The values of R_R/Δ ratio are calculated on the basis of coefficient M and volumetric Froude number F_∇.

$$M = 1,0083\cdot \frac{L}{\Delta^{1/3}} = \frac{1,0083\cdot 8,125}{2,497^{1/3}} = 6 \quad (3)$$

With the value of coefficient M = 6 and the ratio L/B = 4.55 we have defined the values of specific residual resistance. In Figure 3 are shown graphically the results of calculations.

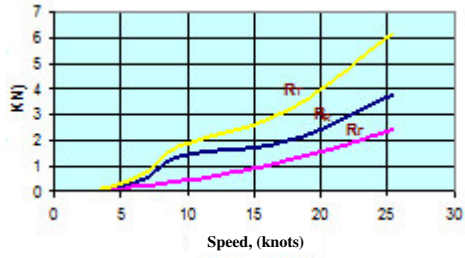

Figure 3. Graph of specific resistance V.S velocity;

Calculation of the residual resistance R_R, frictional resistance R_F, total resistance R_T, total resistance coefficient C_T, residual resistance coefficient C_R and coefficient of friction resistance R_F is achieved using ITTC procedures. [1],[6],[7]. Figure 4 shows the graphs of the resistance coefficients.

Based on calculations of total; resistance R_T is calculated the effective power:

$$P_E = R_T\, V \quad (4)$$

Similarly, we have realized the calculations of trim angle.

Calculations are made using the published data of NPL series [5] in function of coefficient M, L/B ratio and Froude number.

In this case these values are M = 6, L/B = 4.55 and the field of F_∇ [0 – 3]. In Figure 5 are presented graphically the results of calculations.

Table 2 shows a summary of the results of calculations.

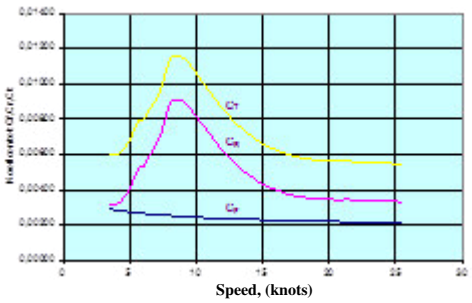

Figure 4. Graph of resistance coefficients.

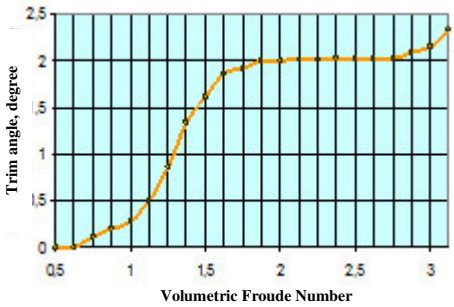

Figure 4.Graph of trim angle

Table 2. Summary of the calculation results.

F_∇	V nyje	R_R/Δ	R_R	R_F (KN)	R_T (KN)	CF	C_R	C_T	PE KF	τ
0.6	4.23	0.04	0.10	0.09	0.19	0.00280	0.00327	0.00607	0.56	0
1	7.05	0.24	0.59	0.23	0.81	0.00258	0.00666	0.00924	3.95	0.27
1.4	9.87	0.58	1.43	0.42	1.85	0.00244	0.00830	0.01074	12.60	1.3
1.8	12.69	0.65	1.61	0.67	2.28	0.00235	0.00565	0.008	19.96	1.92
2.1	14.81	0.69	1.70	0.89	2.59	0.00229	0.00439	0.00669	26.49	2.01
2.5	17.63	0.80	1.98	1.23	3.21	0.00224	0.00361	0.00584	39.02	2.03
2.8	19.74	0.97	2.39	1.51	3.91	0.00220	0.00347	0.00567	53.23	2.03
2.9	≈ 20	1.02	2.53	1.61	4.15	0.00219	0.00343	0.00561	58.51	2.08

CONCLUSIONS

In this paper was presented a complete procedure for predicting the effective resistance for a particular case of the prediction of resistance and power of a small boat. The procedure is implemented by combining CAD applications and the data of NPL systematic series. In function of speed are calculated resistance components, effective power and resistance coefficients. Results of calculations are presented either in graphic or in tabular form. Based on the results of calculations for the design speed 20 knots the values of effective power and trim angle are respectively P_E = 58.51 HP τ = 2.08 degrees.

After the completion of these predictions the ship design process can continue with the dimensioning of other of elements such as propellers, main engine, shaft of propulsion plants, etc..

The procedure can also be applied successfully in the case of other Albanian ships for which there is a lack of information about the hydrodynamic characteristics.

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ON THE CHALLENGES OF PLANNING AND MODELING A WIDE AREA NETWORK

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PËRMBLEDHJE
Planifikimi dhe modelimi i WAN rrjetave sot është në rritje dhe shtrihet në regjione me kushte të ndryshme. Ndërtimi i rrjetave të tilla nuk është veprim i thjeshtë. Ekzistojnë shumë arsye që e vështirësojnë krijimin e WAN rrjetave por më të rëndësishmet janë: nuk ka koncept konkret si të krijohet një WAN rrjetë, njohuritë që janë të nevojshme për funksionimin dhe ndërtimin e rrjetave nuk janë çdoherë të njohura për ekipet e dizajnimit të rrjetave dhe ekziston numër i madh teknikash e teknologjish për rrjeta. Ky punim ka për qëllim të zhvillojë metodologji për planifikim dhe modelim të harxhimeve të krijimit të një WAN rrjete në një regjion të caktuar gjeografik i cili do t'u përgjigjet kërkesave dhe kostoja do të jetë minimale. Krijohet graf, nyjet e të cilit paraqesin qytete dhe degët paraqesin distanca. Krijohet matrica elementet e së cilës paraqesin numrin e popullsisë për secilën qytet(nyje). Përdoret algoritmi Dijkstra dhe Flloyd-Warshal për llogaritjen e shtegut më të shkurtër për topologjinë e krijuar. Bëhet llogaritja kuantitative e komunikacionit në rrjetë, kostoja e tij dhe zgjidhet çmimi minimal. Rezultatet e këtyre llogaritjeve japin parametra në bazë të cilëve krijohet rrjeta adekuate dhe përcaktohet modelimi i harxhimeve.
Fjalë çelës: Metodologji për planifikim, modelim të harxhimeve, WAN rrjetë

SUMMARY
The planning and modeling of WAN networks nowadays is growing and it spreads in regions with various conditions. Building a network is not a simple action. There are many reasons that make creating WAN networks difficult but the most important are: there isn't a concrete concept how to create a WAN network, the knowledge that is necessary for creating and running a network isn't always known for the network designing teams and there is an enormous number of techniques and technologies for networks. This paper tries to develop a methodology for planning and modeling the costs for designing a WAN network in a certain geographical region which will fulfill the requirements and the cost will be minimal. A graph is created, the vertexes represent cities and the branches represent distances between them. A matrix is created and its elements represent the number of inhabitants of each city. The Djikstra and Floyd Warshall algorithm for finding the shortest path are used in the created topology. The quantitative calculation of the traffic inside the network and its cost are made, the minimal cost is chosen. The results of these calculations give parameters and based on these parameters the network is created and the cost modeling is made.
Key words: Planning methodology, cost-modeling, Wide Area Networks.

Introduction

WAN is a network composed of Local Area Networks (LANs) or a collection of smaller WANs in one region [1,8]. Nevertheless, WANs do not just necessarily connect physically disparate LANs. A Campus (or Corporate) Area Network (CAN), for example, may have a localized backbone of a WAN technology, which connects

different LANs within a campus. This could be to facilitate higher bandwidth applications, or provide better functionality for users in the CAN. Thus, these kind of regional networks represent an infrastructure through which are provided various services, simple or complicated. Internet as a global network uses the infrastructure created with regional and local networks in an efficient way. In the field there is a continuous growth in data volume, which also increases the necessity of their saving and distributing. All efficient and strong systems for data transfer grow and improve every day, whereas the technology perfection through regional networks increases even more the number of users. Creating such efficient networks, which fulfill the needs of a certain region with minimal cost, is still a challenge. For this reason, problems in this field are an object of study for researchers around the world. In this paper, some pertinent parameters which could be indicators for creating a regional WAN network and defining its cost are reviewed.

Theoretical Background and Methodology

In certain regions and at certain point of time, the communication in the network is variable. For this reason, precursory calculations of the data communications in the network are necessary to be made. Afterwards, according to these indicators the networks' capacity borders could be determined. These indicators are helpful for a better analysis of the communication in the respective network.

The graph theory helps for creating the communication matrix. A graph is created, whose nodes correspond with the network's nodes, respectively (i.e. cities). After designing the graph, the matrix is structured and its elements represent average value of quantity of data transfer between graphs nodes. This value is different between two nodes and in different points of time. The calculation of the communication matrix is based in the number of the inhabitants in a city (node), number of households, and time of using the network. By the term "household" we understand a collective family composed from a number of people that live together in a house or institution. In a city there are two types of households: residential and commercial. The usage of the network by these two categories is not the same based on the time of the usage and the volume of data transfer. The number of households for one node of the graph can be calculated by the following equation [2]:

$$T = \frac{P}{N} \qquad (1)$$

- T: No. of households
- P: No. of city's inhabitants
- N: No. of inhabitants in one home (e.g. in Macedonia this number is 3.5) [2,4].

The total traffic for any city is calculated as:

$$TF = C * \frac{P}{N} * \frac{CC*CL}{24} + R * \frac{P}{N} * \frac{CR*RL}{24} \qquad (2)$$

- TF: The total traffic for any city
  - C: Commercial households in percent
- P: No. of inhabitants per city
- N: No. of inhabitants per household
- CC: No. of calls per commercial household per day (24 hours)
- CL: Commercial call duration (in hours)
  - R: Percent of residential households
- CR: No. of calls per residential household per day
- RL: Residential call duration (in hours)

The traffic between cities A and B is calculated by entering the respective values in:

$$T_{AB} = T_A * \frac{P_B}{P_T} \qquad (3)$$

- T_{AB}: Traffic between cities A and B
- T_A: Traffic from city A with other cities
- P_B: Number of inhabitants in city B
- P_T: The total population for all 21 cities

TABLE I. THE TRAFFIC FROM VARIOUS CITIES

Cities	Population	N= 3,5 T	CT(15%)	RT(85%)	TC (CT*CL+0) 24, CL=0.2 h	TR (RT*RL*1) 24, RL=0.2 h	TF= TC+TR
Struga	63376	18107,43	2716,11	15391,31	226,34	320,65	547,00
Ohrid	55749	15928,29	2389,24	13539,04	199,10	282,08	481,17
Bitola	95395	27252,86	4087,93	23164,93	340,66	482,90	823,56
Debar	19562	5588,43	837,51	4745,91	69,79	98,87	168,67
Kicevo	47700	13628,57	2044,29	11584,29	170,36	241,34	411,70
Krushevo	9864	2766,86	415,03	2351,83	34,58	49,00	83,58
Prilep	76768	21935,71	3290,36	18643,66	274,27	388,41	662,68
Gostivar	81062	23154,86	3473,23	19681,63	289,44	410,03	699,47
Tetovo	86580	24737,14	3710,57	21026,57	309,21	438,06	747,27
Skopje	506926	144836,00	21725,40	123110,60	1810,45	2564,80	4375,25
Kumanovo	104484	30138,29	4520,74	25617,54	376,73	533,70	910,43
Kriva Palanka	20820	5948,57	892,29	5056,29	74,36	105,34	179,70
Sveti Nikolle	18657	5284,86	792,73	4492,13	66,06	93,59	159,65
Veles	47796	13656,00	2048,40	11607,60	170,70	241,83	412,53
Veles	55508	15745,14	2361,77	13383,37	196,81	278,82	475,63
Kocani	30092	10883,43	1632,51	9250,91	136,04	192,73	328,77
Radovish	29244	8069,71	1210,46	6859,26	100,87	142,90	243,77
Negotino	19312	5488,14	823,37	4665,77	68,61	97,20	165,82
Kavadarci	34741	12568,86	1660,33	9408,53	138,36	196,01	334,37
Strumica	54176	15621,71	2343,26	13278,46	195,27	276,63	471,91
Gevgelija	22988	6568,20	985,20	5582,80	82,10	116,31	198,41
Σ	1492410	426402,86	63960,43	362442,43	5330,04	7550,88	12880,92

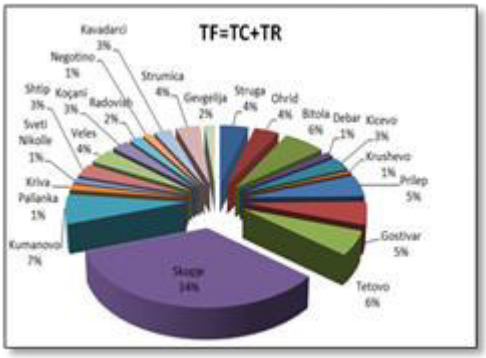
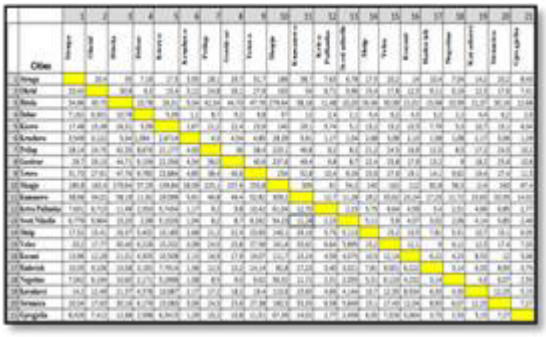


Figure 1. The traffic distribution between cities

TABLE II. TRAFFIC MATRIX BETWEEN 21MACEDONIAN CITIES



Usage of the Algorithms for Finding the Shortest Path Between Vertices of the Graph

For finding the shortest path between vertices of the graph in this case, we use two algorithms: Dijkstra and Floyd-Warshall. Dijkstra's algorithm finds the shortest path from one vertex (source) to all other vertices [3,7,10,12]. At each node (city) a router is placed which processes the data of the value of graph's branches (links). Thus, a database for branches value (Link-state database – LSDB) is created. Each router has information for every other router and it involves the Dijkstra algorithm. The graph in this case has 21 vertices which represent cities for a WAN network in a certain region.

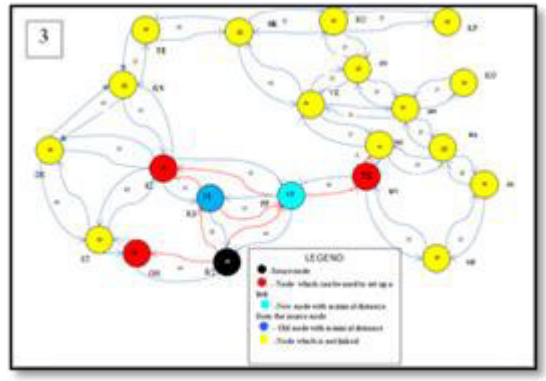


Figure 2. Graph with 21 nodes

The obtained data for the shortest path are registred in rooting tables which are called Forwarding Databases. The router has another database called Adjacency Database [6].

TABLE III.GRAPH ADJACENCY DATABASE

1	ST	OH/13	KI/45	DE/40		
2	OH	ST/13	BT/46			
3	BT	KS/38	PP/40	OH/46		
4	DE	ST/40	KI/35	GV/43		
5	KI	DE/35	KS/31	GV/33	ST/45	PP/53
6	KS	PP/25	BT/38	KI/31		
7	PP	KI/53	KS/25	BT/40	KV/38	
8	GV	KI/32	DE/43	TE/25		
9	TE	GV/25	SK/30			
10	SK	KU/25	VE/42	TE/30		
11	KU	SK/25	KP/52	SN/35		
12	KP	KU/52				
13	SN	KU/35	VE/22	SHT/25		
14	SHT	SN/25	VE/33	KO/27	RA/25	
15	VE	SK/42	SN/22	SHT/33	NG/37	
15	KO	SHT/27				
17	RA	SHT/27	NG/35	SU/28		
18	NG	KV/9	RA/35	VE/37		
19	KV	NG/9	PP/38	GE/53		
20	SU	RA/28	GE/35			
21	GE	KV/53	SU/35			

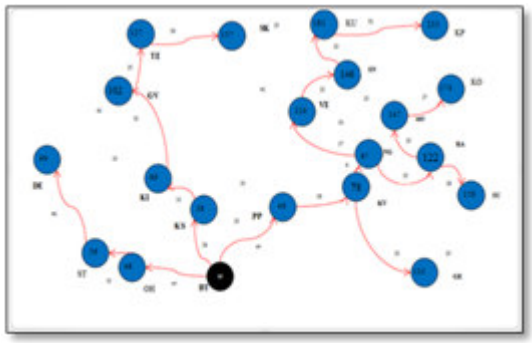
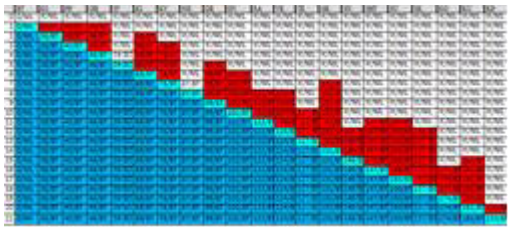


Figure 3. Shortest path from BT-node with Dijkstra

After the finalizing of all steps of the Dijkstra algorithm we will have the shortest paths from the base node (e.g. BT) with all other nodes of the graph.

In the following table we see the algorithm's steps for reaching the final stage where the shortest paths from the base node are found

TABLE IV.STEPS OF DIJKSTRA'S ALGORITHM



The Floyd-Warshall algorithm serves for finding the shortest path for all the couples of vertices in the graph, by utilizing matrices [3,5,7,9]. If A_k is an *nxn* matrix where $A_k[i,j]$ is the shortest path from *i* to *j* which goes through nodes <=*k*, we define:

$$A_0[i,j] = \begin{cases} 0 & if\ i = j \\ value & from\ i\ to\ j\ for\ i \neq j\ and\ (i,j) \in E \\ \infty & if\ i \neq j\ and\ (i,j) \notin E \end{cases}$$

We are searching for the shortest path *p* from *i* to *j* which goes through nodes 1…*k*. For path *p* we have two possibilities:

- *p* does not go through *k* and in this case the path stays unchangeable: $A_{k-1}[i,j]$
- *p* goes through *k* and in this case branch's value in the graph will change: $A_{k-1}[i,k] + A_{k-1}[k,j]$ [5,11].

The lowest value of the branch in the graph will be:

$$A_k[i,j] = \min(A_{k-1}[i,j], A_{k-1}[i,k]+A_{k-1}[k,j]$$

This algorithm can also be used for the graph with 21 nodes which represent routers in cities with respective branches as can be seen in Fig. 4.

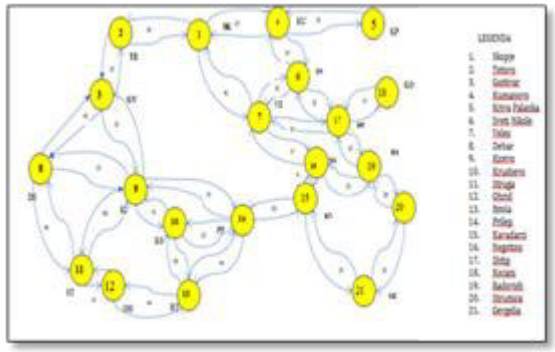
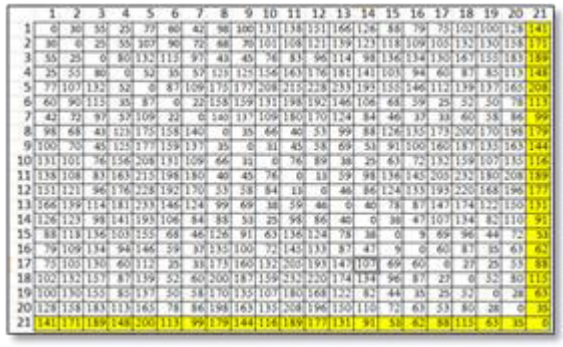


Figure 4. Graph where Floyd-Warshall algorithm is used

According to the graph, a table in form of a matrix is created. The elements of the matrix represent distance between nodes of the graph. In the case where *i=j*, the element of the matrix takes the value 0. In cases where the link between nodes exists, this value is written as a value in the matrix element. If the link between nodes does not exist, the value of the element in the matrix is marked with the symbol $\propto$.

TABLE V.THE SHORTEST PATH – FLOYD-WARSHALL



After finishing the steps of the Floyd-Warshall algorithm we will have a matrix with elements which represent the shortest path between all couples of graph nodes, respectively, i.e. the

shortest path between cities which compose the WAN.

Conclusion

The calculation of a set of parameters gives indicators which help planning and modeling WAN networks with adequate capacity and minimal cost. These include: the communication matrix for each city, the number of households, the number of network users, the total traffic for any city, the communication matrix between all cities, and the shortest path between nodes of the graph, found using respective algorithms like Dijkstra and/or Floyd-Warshall. The rationale behind the identification and the evaluation of these parameters is very straightforward: to develop a model which will determine the exact cost of the network that performs within the limits set by the demands of prospective users, by including some socio-economic variables that capture different levels of technological development and presumably affect the values in the communication matrix.

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DEGRADATION OF REINFORCED CONCRETE STRUCTURES, SOME METHODS FOR PROTECTING AND REPAIR

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SUMMARY
The paper presents some structural problems caused by the degradation of concrete, the presence of cracks, the steel corrosion therefore a reduce capacity of reinforcement concrete structures. It is focused on cracked reinforced concrete elements presenting the model of corrosion for steel reinforcement and relative volume of different types of rust products in the presence of pore water. The carbonation, the effect of sulfate salt, chloride and bacterial corrosion are four factors that are taken to illustrate the process of concrete degradation. The method of protecting the concrete surface, the method of eproxy coating of steel reinforcement, the method of galvanized steel bars and the cathodic protection are some methods for protecting of reinforced concrete structures. In most cases, repairing and retrofitting a concrete structure is much more complicated than building a new structure. Crack width limitation is a well established durability concept in reinforcement concrete design.
Key-words: Corrosion, crack, concrete, steel bars, protect.

1. Introduction

Nowadays, reinforcement concrete is considered the most important material in the construction industry in Albania. The main challenge that faces the engineer working is the corrosion of steel reinforcement bars. The paper presents the causes of corrosion, the concrete parameters, and the environmental conditions surrounding the structure that cause the start of corrosion and affect the corrosion rate. In some cases, cracks parallel to the steel bars and in the worst case, the steel bars can be seen directly, because the concrete cover has failed. When the corrosion occurs, its major impact on structure safety will be the danger of the concrete cover falling, as is the case when the structure loses its strength due to reduction on the concrete cross-section dimension and also reduction on the cross-section of the steel bars due to corrosion. The spalling of concrete cover happens as the steel bars with corrosion increase their volume, with the effect of putting high stress on the concrete cover, this causes cracking and then the cover falls. Based on European Code, Eurocode2 and Durable of Concrete Structures, CEB the article will discuss different kinds of mechanical and chemical corrosion of steel in concrete structures

2. Materials and Methodology

The corrosion process occurs slowly and propagates with time, so the deterioration rate varies. Corrosion on steel bars affects a structure's safety, which depends on the surrounding environmental conditions that mainly affect the corrosion rate, the location of

the member in the building, and the type of the member. Understanding the corrosion process and how it occurs will be the first step to knowing how to protect steel bars from corrosion and to differentiate among the different protection methods. In the case of steel embedded in concrete,

the concrete is a porous material containing water in the void due to the process of curing or because of rainy weather or any weather with high relative humidity. Thus, the concrete will contain humidity, which is a common cause of corrosion but the concrete is alkaline in its nature and alkalinity is opposite to acidity. As a result of its alkalinity, concrete can protect the steel bar from corrosion.

3. **Results and discussion.**

After the passive layer is broken down, rust will appear instantly on the steel bar's surface. The chemical reactions are the same in cases of carbonation or of chloride attack. The electrons will accumulate according to the following equation, which presents the anodic reaction:

$$Fe \rightarrow Fe^{2+} + 2e^{-} \quad (3.1)$$

If the electron will be accumulated on the other part of the steel reinforcement but cannot accumulate with huge numbers in the same location, there is another reaction that uses the number of the electrodes with oxygen and water—the cathodic reaction.

$$2e^{-} + H_2O + 1/2O_2 \rightarrow 2OH^{-} \quad (3.2)$$

$$Fe^{2+} + 2OH^{-} \rightarrow Fe(OH)_2 \quad (3.3)$$

$$4Fe(OH_2) + O_2 + 2H_2O \rightarrow 4Fe(OH)_3 \quad (3.4)$$

$$4Fe(OH)_3 \rightarrow Fe_2O_3 \cdot H_2O + 2H_2O \quad (3.5)$$

The hydrate ferric oxide or the rust is $Fe_2O_3 \cdot H_2O$

Black corrosion occurs when there is a large distance between anode and cathode locations and also if oxygen is not available. This usually occurs in cases of buildings immersed in water or when a protective layer prevents presence of oxygen. It is called black corrosion because, when it cracks, the bars will have a black or green color. This type of corrosion is critical and causes a problem because it does not provide any warning of cracks or falling concrete cover when corrosion occurs.

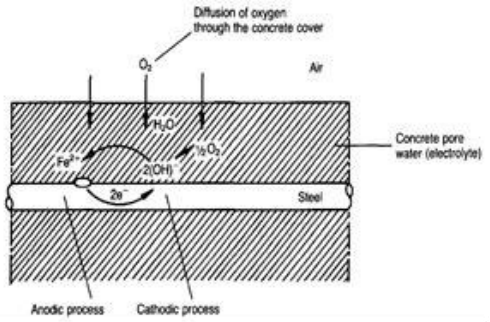

Fig.3.1 The model for corrosion of reinforcement in concrete.

Bacterial corrosion. The foundation is considered the main element exposed to this type of corrosion. These bacteria will convert sulfur and sulfides to sulfuric acid. The acid will attack the steel and then cause initiation of the corrosion process. Other bacteria that attack the sulfide exist in the steel reinforcement FeS due to reactions. This type of corrosion is often associated with a smell of hydrogen sulfide and smooth pitting with a black corrosion product when steel bars are exposed to soil saturated with water.

Carbonation is the result of the chemical reaction between carbon dioxide gases in the atmosphere and the alkaline hydroxides in the concrete, causing a decrease in alkalinity. The carbonic acid does not attack the cement paste, but rather neutralizes the alkalis in the pore water, mainly forming calcium carbonate:

$$CO_2 + H_2O \rightarrow H_2CO_3 \quad (3.6)$$

$$H_2CO_3 + Ca(OH)_2 \rightarrow CaCO_3 + 2H_2O \quad (3.7)$$

The carbonation process occurs quickly when the concrete cover is not very thick. It may also occur when the concrete cover over the steel bars is thick because the carbonation transformation will happen as a result of the existence of pore voids open in the concrete that assist the quick propagation of CO2 inside the concrete.

Carbonation moves inside concrete according to the diffusion theory. The diffusion rate is in inverse proportion to the distance between the steel bars and the concrete surface, which is the concrete cover thickness:

$$dx/dt = D_0/x \qquad (3.8)$$

x=the distance from the concrete surface
t=the time
Do= the diffusion rate, which depends on the quality of the concrete.

The rate of carbonation depends on the thickness of the concrete cover and also on its quality in terms of the mixing ratios that achieve the highest quality. This is necessary to resist the spread of carbonation inside concrete. When the concrete is of high quality and the process of compaction as well as the curing process has been well done, it would be a difficult task to let CO2 spread inside the concrete. The carbonation process is the main reason for corrosion of reinforcing bars in old structures, those that have been poorly constructed, or structures containing a small proportion of cement content in the concrete mix. The carbonation transformation process is affected greatly by the amount of moisture in concrete. The concrete quality parameter in relation to carbonation is the permeability, which for a given environment depends on the pore structure. Diffusion of CO2 is only possible in air-filled pores. For this reason, totally water saturated concrete will not carbonate.

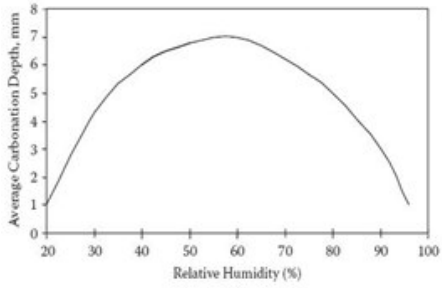

Fig.3.2. Effect of relative humidity on carbonation depth.

Chloride attack: Chlorides can attack concrete from more than one source. The first source is from inside the concrete during the casting process or the second is to move concrete from outside to inside. When casting takes place, chlorides exist in concrete as a result of the following: using seawater in the concrete mix, using calcium chloride in additives required to accelerate setting time,aggregate that contains chlorides must be washed well, additives that have a higher chloride content than that defined in the specification, water used in the concrete mix that has a higher number of chloride ions than that allowed in the specifications.

Chlorides can propagate inside concrete from the external environment by concrete exposed to seawater spray or continuous exposure to salt water, using salt to melt ice, presence of chlorides in chemical substances that attack the concrete structure, such as salt storage.

In most cases, the impact of chlorides is from external sources such as seawater spray or use of salt in melting ice. The effect of chlorides on corrosion occurs very quickly in cases of existing chlorides in the water mixing compared to the effect of chlorides from environmental conditions surrounding the building. Chloride attack is the result of the chemical reaction:

$$Ca(OH)_2 + 2Cl^- \rightarrow CaCl_2 + 2OH^- \qquad (3.9)$$

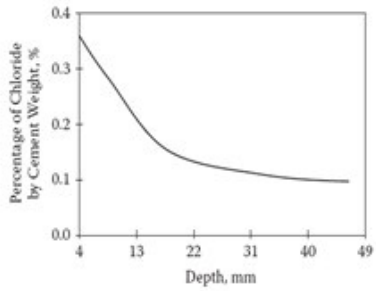

Fig.3.3. Chloride concentration at different depths sea.

The concentration of chlorides is reduced rapidly whenever propagation occurs inside the concrete. It is difficult to identify chloride concentration directly on the surface, where the concentration changes with time from 0–100%, depending on the dry or wet surface. Therefore,

it is common practice to measure concentration of chlorides about 5 mm from the surface.

Sulphate attack: Sulphate attack is characterized by the chemical reaction of sulphate ions with the aluminate component and ions of sulphate, calcium and hydroxyl of hardened Portland cement or cement containing Portland clinker, forming mainly ettringite and to a lesser extent gypsum. The reaction between these substances, if enough water is present, causes expansion of the concrete, leading to cracking with an irregular pattern. Sulphate attack is the result of the chemical reaction:

$$Ca(OH)_2 + (SO)_4^{-2} + 2H_2O \rightarrow CaSO_4 \cdot 2H_2O + OH^- \quad (3.10)$$

The degree of impermeability needed for a concrete to be sulphate resistant may be expressed as limiting values for depth of water penetration over a fixed period of time. The different types of cement may be classified according to their ability to resist sulphate attack. In Europe, limits aluminates to a maximum of 3% is generally accepted for high sulphate resistance. It is important to realize that classification of cements for sulphate resistance only takes sulphate resistance as such into consideration. In cases of combined attack, other factors may influence the choice of cement. An example is the different behaviour of low alumina Portland cement and Portland blast-furnace cement with a high slag content. Both are high sulphate resistance, but they have a very different permeability for chloride ions. Low alumina Portland cement results in the highest permeability towards chloride ions. This must be taken into consideration if corrosion of reinforcement is at stake.

The minimum requirements in various codes are often insufficient to ensure long-term durability of reinforced concrete in severe exposures. Protecting the concrete structure is easier and less expensive than repairing it. The first method of protection of steel reinforcement is to perform good quality control in design and construction. These specifications vary with the different weather conditions to which a structure is exposed. The second line of defense in protecting the steel bars is by external methods. These methods include use of:

- Galvanized steel bars, epoxy-coated steel bars, or stainless steel.
- Cathode protection.
- External membranes to prevent water permeability.

The process of galvanization is through the use of a layer of zinc. To illustrate this briefly, galvanization immerses the steel rod in a zinc solution at a temperature of 450°C and then puts it through a process of cooling. Hence, the zinc cover forms on the steel bar. This cover consists of four layers. The outer layer is pure zinc and the other layers are a mix between zinc and steel. Zinc is a metal in which corrosion will happen over time. The rate of corrosion under different weather factors can be calculated by the corrosion on the zinc layer and the time required for it to corrode. Note that the relationship between the layer thickness and lifetime is represented by a linear relation.

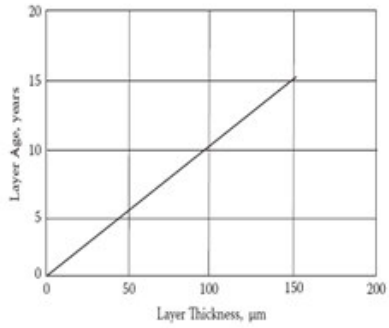

Fig.3.4 Relation between zinc layer thickness and expected lifetime.

Eproxy coating of steel reinforcement have been used in painting reinforced steel for bridges. It is important to paint steel bars using certain types of epoxies able to protect steel from corrosion. This method yielded positive results, especially in steel exposed to seawater. The coated steel bar must follow ASTM A 775M/77M-93, which sets allowable limits as the following: Coating thickness should be in the range of 130–300 μm.

Bending of the coated bar around a standard mandrel should not lead to formation of cracks in the epoxy coating. The number of pinhole defects should not be more than six per meter. The damage area on the bar should not exceed 2%.

Stainless steel: This process is more expensive, so normal steel bars coated by a layer of stainless steel 1–2 mm thick are used. Here, recall the same precautions that have been mentioned for galvanized steel. The steel bars coated by stainless steel should not be put beside uncoated steel bars because this would lead to a fast process of corrosion.

Cathodic protection: There are two main methods for cathodic protection. The first depends on using a sacrificial anode and is called sacrificial protection. The anode will be from zinc and the corrosion will happen to zinc instead of to the steel reinforcement. The oxidation process will cause the zinc to move to the steel reinforcement and the negative electron will form upon it. This is the required cathodic protection. The second method of cathodic protection will generate electrons on the steel reinforcement in concrete by using outsources of electricity.

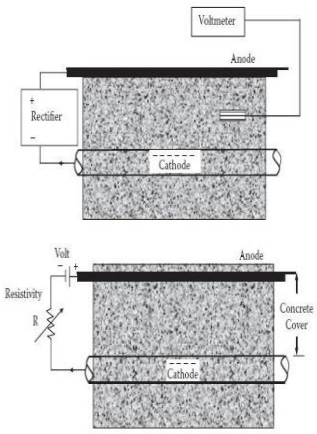

Fig.3.5. Cathodic protection methods

Sacrificial protection is used in submerged structures, the concrete is immersed in water so that there will be little electron movement and the potential voltage between the two materials will be small. This will maintain the cathodic protection for a long time.

External membranes are materials that are used to paint the surface of concrete. These will spread through the concrete to reach steel at speeds of 2.5–20 mm per day up to the surface of steel by capillary rise, such as water movement, through penetrating concrete with water in cases of chloride attack or through propagation by gas such as carbon dioxide when exposed to the surface carbonation. When these materials reach the surface of steel, an isolation layer around the steel bar's surface will reduce the oxygen in the cathode area to the surface on the cathode and reduce the melting of steel in the water in the anode area, thereby delaying the process of corrosion and reducing its rate.

4. Conclusions:

Crack width limitation is a well established durability concept in reinforcement concrete design.

Most forms of chemical attack are therefore concrete problems before they are corrosion problems. Carbon dioxide and chloride ions are very unusual in penetrating the concrete without significantly damaging it. Only carbon dioxide and the chloride ion have been shown to attack the steel and not the concrete.

Precaution is better than repair. Protecting the concrete structure is easier and less expensive than repairing it. It is protection of the investment during the structure's lifetime.

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RISK IDENTIFICATION AND EVALUATION IN CONSTRUCTION PROCESSES

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SUMMARY
The realization of important engineering construction projects is followed by an elevate exposure to risks. The risk identification, evaluation and management is an important and delicate part of construction processes, where their underestimation may affect directly the quality, time, costs and personnel safety. The aim of this paper is to make a detailed study on all risks that can be found in a construction project, calculating the probability (p) that a risk may occur and the impact R= f(p,C) in the short and long period. The methodology used on this paper consists in a literature review correlated to "Project Management" methodologies, the use of empiric formulas to calculate impact, the statistic analyzing of data provided from two main Albanian construction companies operating in civil construction and highway infrastructure. Furthermore, the methodology includes the submission of a specific questionnaire to engineers who were attending an engineering project implementation.
Key words: Risk, identification, probability, cost, impact.

1. Introduction

The construction industry in our country has undergone to an important expansion during the last 20 years. The transition from a centralized economy to a liberalized one has brought enormous changes in the Albanian economy, whose dynamics and evolution has increased exponentially in few years. In a developing country where the requirements for commercial exchange and freight transport grow every day, it is inevitable the growth of the need for the development of road and aero-port infrastructure and the construction of civil - industrial facilities. This development broadened the market access for private companies that in this way were able to operate in the field of construction in order to meet the requests of the economic system, which that was in dire need for services and engineering works. Prior to 1990 the operation in the field of construction was exclusive to the state, where every stitch in civil infrastructure and industrial facilities was carried out only by state entities. It is undeniable that before the 90's some facilities of particular importance such as hydropower engineering, ports, railways etc have been completed, but monetary and human costs have not been exactly calculated. The market access of private construction companies was initially difficult due to the lack of managerial experience in the context of a liberalized economy, although at the top of these companies were mainly engineers and economists who had previously worked in building state corporate. Over the years, construction companies created a sizeable portfolio of works, which allowed them to grow economically. However, after several years of experience in the construction field, it can be noted that many companies have substantial technical and management problems, and also some other ones related to the delivery and quality of works. And why is this situation considering the fact that have been many

investments in the engineering infrastructure from the Albanian State, the European Union and Foreign Banks? This state of things shows that there have been gaps in the management of these companies, where the cost and time spent on a project has significantly over passed the initial forecasting. So the object of this paper is to address the management of the engineering project, specifically the management of risks that threaten the progress of the work, and also the realization of a major engineering project according to the European Standards.

2. Used methodology

For the realization of this paper have been used 4 different methods, which helped the extraction of the final results. Initially, it has been reviewed the available literature, addressing the engineering project management. In this literature there is important information for Pram techniques (Project Risk Analysis and Management)[4] that can be used to assess the risks in construction. North American countries and South Asian societies have their methodologies that suit their economic market and the legislation in force, while European countries have their own methods, which are more strict and conservative. In this paper, it has been used the first method, which includes the use empirical formulas to calculate the impact of risks $R = f(p, C)^2$, where p is the probability that risk may occur and C is its cost. The study of statistical data is an important part of the risk calculation, because according to the previous data it is possible the accurate calculation of the probability of a risk's occurrence, which directly affects the impact calculation. And the last method consists in the preparation of a specific questionnaire on the implementation of major engineering projects, which is divided into two sections and is submitted to engineers that run two important construction companies operating in Albania.

The Pram methodology[4] or technique is used to identify the necessary interventions in order to reduce the negative impacts. This technique is appropriate for the risks associated with the starting phase of the engineering intervention, in accordance with project phases.

The Project Risk Analysis and Management (Pram)[4] has as primary focus the assessment of internal uncertainties and the transformation of the project, which may happen because of the occurrence of a highly probable event with a negative impact, or a low probability event with a reduced negative impact or with a positive impact in better cases.

This technical approach is based on actions: forecasting and responsive.

Pram methodology consists of several processes: Risk Management Planning, Risk Identification, Risk Assessment, Risk Quantification, Risk Response Planning, Risk Monitoring and Control [1 7].

The initial phase of the implementation of a significant engineering work is the most delicate stage because there are many uncertainties and ambiguities, and the decisions taken at this stage will affect the progress of project implementation.

3. Data analysis and results

In the Picture.1 are presented the implementation stages of an engineering work[1 4]:

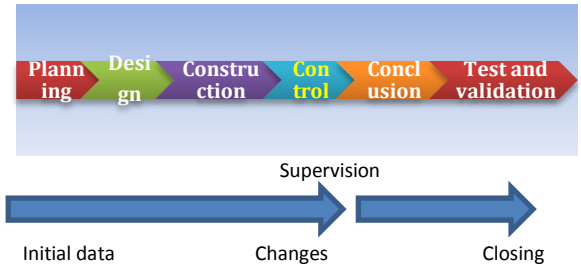

Figure 1. Implementation stages of an engineering project

- *Risk management Planning*[4 5]

This is the initial phase of the risks calculation and, during this time, decisions upon the techniques and systems to be used for their management are taken. The level of research, the use of appropriate instruments and the time left to risk assessment process will be also determined.

Belong to this stage, is the study of the available literature in order to lay out all the necessary methodologies for risk management. Furthermore in this stage will be determined the way Pram techniques will interlink with other techniques of Project Management.

- *Risk identification*[5]

This stage has a special significance because it carries out the identification of risks throughout the period of the project implementation.
There are used the methodologies of the previous data studying for a similar project and the realization of a questionnaire for engineers of two important construction companies that operate in Albania in the implementation of major engineering projects. The first part focuses on the acquisition of general information through simple questions about the difficulties and risks faced during the implementation of an engineering project. Whereas the second part consists in presenting a long list of various risks and research by engineers questioned about the probability scale for each risk and from what actors involved in the project are caused.

During the realization of an engineering project can be identified some of these risks [4 5]:

1. Design risks
2. Risks associated with the location and the terrain
3. Risks associated with the construction process
4. Environmental Risks
5. Financial Risks
6. Maintenance Risks
7. Risks from major forces, earthquake, flood, rains
8. Risks associated with legislative changes and government decisions
9. Risks associated with the quality of materials
10. Risks related to the safety of employees
11. Risks associated to the lack of cooperation between actors
12. Risks of the lack of technical skills of the staff.

After we make a list of risks, we also make the risk register, which contains the list of identified risks and specific information about them. Furthermore during the realization of the project for any risk related are noted for the reaction and the solution that was given to each of them.

- *Risk assessment*[4]

After we process the risks identification of a specific project their quantitative evaluation is made by calculating the probability of a risk occurring and the impact that it will have on monetary, time, quality, safety terms and its environmental cost. The quantitative assessment is carried out to determine the appropriate priority risk that will be analyzed and will give the answer according to its importance and time to be displayed. In this way we rank all risks according to the threat they pose upon the project. Probability of occurrence of each risk is calculated by the methods mentioned above, and has a scale from 0 to 1.

After we have found the probability for each risk[1], we find the value of the impact that it will have:

$$R = f\ (p, C) \qquad R = f\ (p, C) \tag{1}$$

that depends on the cost in monetary values, time, human and environmental. A valid method to create a clear picture of the situation is creating for each risk an impact - probability matrix.

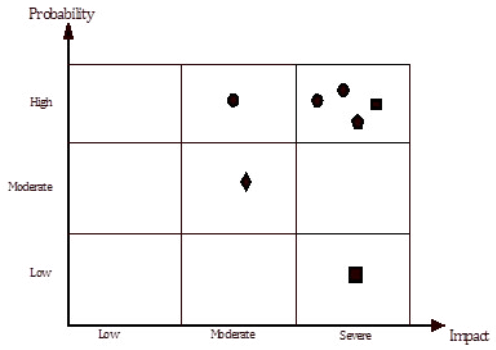

Figure 2. Impact/Probability matrix

- *Risk quantification*[4]

The process of calculating the quantum of risk is a very important part of risk assessment. Through empirical formulas we make a quantum calculation of each risk that affects the development of the project engineering. We make a list ordered accordingly to importance of each risk, which enables the organization to set the priorities for the review and the resolution of each of them.

Furthermore we compute the joint effect of all risks that occur during the period of project implementation.

At this stage we calculate the value of importance[3] of each risk which is expressed by the formula:

$$r_{ij}^k = \alpha_{ij}\beta_{ij}^k \qquad (2)$$

Where: r_{ij}^k [3] is the value the importance of each risk *i*, the actor *j* and project objective *k.* α_{ij}. is the probability of occurrence of each risk *i* and the actor *j.* β_{ij}^k [3] is the impact of each risk *i* from each actor *j* in each objective *k.* We calculate the index of significance for each risk[3]:

$$R_i^k = \frac{\sum_{j=1}^{k} r_{ij}^k}{n} = \frac{1}{n}\sum_{j=1}^{k} \alpha_{ij}\beta_{ij}^k \qquad (3)$$

where R_i^k [3]for each risk *i* , objective *k* and the number of its repetitions *n* in each phase of the project.

The two formulas above are very important for calculating different risks, where the formula (2) expresses the importance of any probable risk at a given moment and a specific objective. By having a look at the table below, we notice that a risk (eg: Design changes (DCh) does not affect in the same way, the objectives of the realization of the work or the engineering project, and its impact is different in cost (0.61), time (0.52) and quality (0.39). Formula (3) expresses the value of index of the significance of risk, which is the sum of the value of any risks, that is repeated several times during the implementation of the engineering work, and that is caused by different actors in different periods of time. In the table below are presented the values of the index of the significance of risk for each objective which affects:

Risks that effect costs	Risk index significance
Price changes of construction materials (PChCM)	0.7
Incorrect calculation of the coast of each construction item (ICCCI)	0.65
Design changes (DCh)	0.61
Floating exchange rates (FER)	0.58
State Bureaucracies (SB)	0.52
Payment delays (PD)	0.47
Short deadlines of project conclusion (ShDPC)	0.45
Unsuitable program scheduling (UPS)	0.43
Meteorological conditions (MC)	0.39
Managements of subcontractors (MsC)	0.32

Table 1

Risk that effects security and environment.	Risk index significance
Short deadlines of project conclusion (ShDPC)	0.58
Lack of professionalism and experience of construction company (LPECC)	0. 40
Meteorological conditions (MC)	0.36
Non-conformity with technical rules (NCTR)	0.35
Critical technical condition of the machineries (CTCM)	0.33
Unsuitable program scheduling (UPS)	0.31
Lack of coordination of stakeholders (LCS)	0.30
Site location (SL)	0.28
Improper management of subcontractors (IMS)	0.28
Lack of control by the state bodies (LCSB)	0.25

Table 2

Risk that effects time and deadline	Risk index significance
Short deadlines of project conclusion (ShDPC)	0.55
Design changes (DCh)	0. 52
Meteorological conditions (MC)	0.47
Funders requirements changes(ChRF)	0.40
Lack of coordination of stakeholders (LCS)	0.35
Unsuitable program scheduling (UPS)	0.32
Critical technical condition of the machineries (BTCM)	0.30
State Bureaucracies (SB)	0.29
Improper management of subcontractors (IMS)	0.23

Table 3

Risk that effects quality	Risk index significance
Short deadlines of project conclusion (ShDPC)	0.58
Unsuitable program scheduling (UPS)	0. 40
Design changes (DCh)	0.39
Non-conformity with technical rules (NCTR)	0.38
Critical technical condition of the machineries (CTCM)	0.36
Price changes of construction materials (PChCM)	0.35
Lack of professionalism and experience of construction company (LPECC)	0.31
Frequent change of the program of work (FChPW)	0.30
Improper management of subcontractors (IMS)	0.28
Design changes (DCh)	0.28
Lack of coordination of stakeholders (LCS)	0.25

Table 4

To get a better orientation of the importance of each risk in the objectives of the engineering projects, following there is a scheme that explains it:

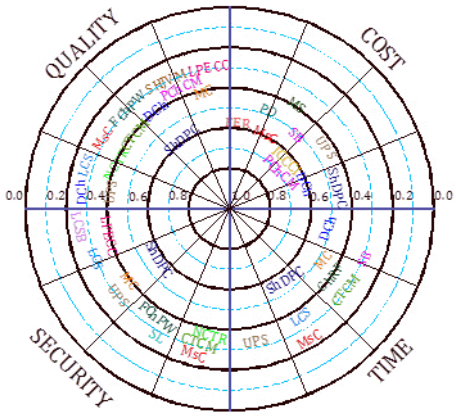

Figure 3. Risk index significance

As we notice in the above presentation, some risks as the Short Deadline of Submission of the Work (ShDSW) does not have the same impact on quality, cost, safety and deadlines. The same applies to Design changes (DCh), which has a different impact on quality and cost. We also see that the Price changes of construction materials (PChCM) has no effect in safety and in time. From the above quantitative calculations , we recognize that the risks that may have a significant impact are: Short Deadlines of Submission of Work (ShDSW), Design changes (DCh), Price changes of construction materials (PChCM) and Improper management of subcontractors (IMS). Risk Response Planning and Risk monitoring and control are not part of this study, therefore, it was not considered further.

4.Conclusions

This study has identified 18 important risks in different periods of the engineering project, which affect the time, cost, and quality assurance of the processes. Quantification of risks made possible the creation of an accurate ranking by the level of their importance, which served us to take the appropriate measures for each risk at the right time, and to return it from something unknown, into a calculated impact. We, also conclude that some risks are repeated more than once during the project, but they do not always have the same monetary and environmental impact.

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HYGROTHERMAL PERFORMANCE OF WOODEN WALLS OF HOUSES USED FOR TOURIST PURPOSES IN ALBANIA

PERFORMANCA TERMOHIGROMETRIKE E MUREVE PREJ DRURI TË SHTËPIVE PËR QËLLIME TURISTIKE NË SHQIPËRI

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PERMBLEDHJE
Zhvillimi i turizmit në Shqipëri inkurajon përdorimin e shtëpive prej druri për qëllime turistike në zona bregdetare dhe malore. Ato i nënshtrohen një klime të ndryshueshme gjatë vitit me ndikim në jetëgjatësinë e tyre. Studimi evidenton tipet e konstruksioneve të mureve prej druri te perdorur nga firma te ndryshme vendore. Studimi vlerëson performancen termohigrometrike me anë të diagramës Glaser te mureve prej druri kundrejt rrezikut të kondensimit të avujve të ujit gjatë depërtimit të tyre ne to. Dallohen 4 tipe konstruksionesh prej druri masiv 4, 5 dhe 10 cm dhe paketë termike 12 cm me lesh xhami 5 cm të perdorur në shtëpite prej druri. Për paketën termike u ndryshua materiali termoizolues. Tipet e mureve prej druri plotësojnë kushtet e mbrojtjes nga lagështia sipas standardit EN DIN 4108-3, kurse zëvendësimi i materialit termoizolues lesh xhami me lesh mineral nuk i përmbush kërkesat e standardit.
Fjalët çelës: performanca higrometrike, diagrama Glaser, mur druri

SUMMARY
Development of tourism in Albania encourages the use of wooden houses for the tourist purposes in coastal and mountainous areas. They are subject to a variable climate throughout the year with an impact on their lives. The study identifies the types of constructions of wooden walls from various local firms. The study evaluates the hygrothermal performance by Glaser diagram of solid wooden walls against the risk of condensation of water vapor during their permeation into the wall. There are four types of solid wooden structures 4, 5 and 10 cm and 12 cm thermal package with 5 cm of glass wool used in wooden houses. For thermal package was changed thermo-isolating material. The types of wooden walls meet the requirements of protection from moisture and are in compliance with DIN EN 4108-3, but replacing the glass wool with the mineral wool does not meet the standard.
Key words: hygrothermal performance, Glaser diagram, wooden walls

INTRODUCTION

Our country is experiencing a growing demand to increase for a sustainable development of coastal and mountain tourism. Expression of this development is the use of wooden houses on the increase. They are produced in the country or are imported. Today there is a great variety of types of wooden houses and of the types of walls and roofs. They start out with simple constructions of massive wooden walls to prefabricated walls. In conditions of open competition these local products are subject to a continuous improvement of the design and of building materials under coastal and mountainous climate, with the purpose of certification of

building materials and of certification of their environmental performance.

These wooden houses are subject to a variable climate throughout the year with an impact on their lives. Dominant climate in these regions is half the dry mountain climate, characterized by cool wet winters and warm summers. Outside air temperatures during winter are near or below the freezing point in December and January. And external air temperatures in summer often stay above the values of thermal comfort for most of the period from April to October [2,7].

Considering the weather conditions and the use of energy in Albania, energy consumption by 50 to 100 kWh/m2 per year, can be accepted feasible and comparable with the trend in neighboring countries such as Greece, Serbia and FYROM [5,6].

It is necessary to evaluate the hygrothermal performance by Glaser diagram of solid wooden walls and of wood-framed walls against the risk of condensation of water vapor during their permeance into the wall, to improve maintenance of them, because of condensation on high value and not fast drying wall, caused mold, fungi and wood to decay.

MATERIALS AND METHODS

Materials:

• Basic data were received from Nautilius Fier with almost 20 - year experience in manufacturing and assembly of wooden houses in the coastal area of Vlora, Dukat, Fier, etc.

• Data were also taken from promotional brochures of local firms: Alb-Eraldo and Drulam in Tirana.

• Thermal calculations and the building of GLASER diagram were simulated by Knauf Insulation Bauteilrechner 1.2 program (www.knauf.at).

• The weather conditions are taken in accordance with the standard DIN 4106-3 [2].

Methodology:

The study was based on:

•Identification of various types of construction of wooden houses on coastal and mountain tourist areas, used by local firms.

•Comparing the values of the coefficients of resistance of diffusion of water vapor.

•Building the dropping curve of partial pressure and the dropping curve of saturation pressure of water vapor by Glaser diagram.

•Determining the amount of condensed water.

•Determination of the place of condensation in the wall depth.

•Assessing the likelihood of drying in case of water condensation.

Simulation of the construction of walls and the building of Glaser diagrams were conducted with the help of the program Knauf Bauteilrechner 1.2 which meets the above requirements on the evaluation of thermal and moisture performance. Outside air temperature was taken -10 º C as the most common value among the three lower temperatures for mountainous territory of Albania [7].

Hygrothermal evaluation is also simulated for change of insulating material of thermal pack.

RESULTS AND DISCUSSIONS

Construction of wooden houses for the tourist is mostly realized by pine wood with density 500 to 700 kg/m^3 [1]. It took into account four main types of massive wooden walls: the massive wooden wall with thickness 4 cm, 5 cm, 6 cm and 10 cm; and thermal pack 12 cm with fiberglass 5 cm as insulating material. In the case of the use of thermo-isolating material layer is formed in part by 83.6% from thermo-isolating material and 16.6% wood [4]. Table 1 shows the types of constructions of massive wooden walls defined as typical in the biulding of wooden houses for tourist purposes in coastal and mountainous areas of Albania.

For these multi-layered walls are calculated the coefficient of thermal transmittance and the coefficient of thermal Conductivity, presented in table 2, where:

-Wooden wall in accordance of DIN EN 10456 [3]

-Glass wool NW 0,038 – I-st Quality in accordance of DIN V 4108 5.1 [3]

-Number of stratum in accordance of layer material is presented.

Table 3 presents Glaser diagrams for each of the types of walls. Graphic presentation of decay curves of partial vapor pressures gives the possibility of evaluating the risk of the appearance of condensing vapors. Precisely the point of interruption is their the place condensate vapors. Also the amount of condensed vapor is calculated to assess the possibility of quick drying wall without consequences (decay, mushrooms, etc.).

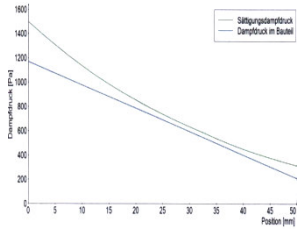
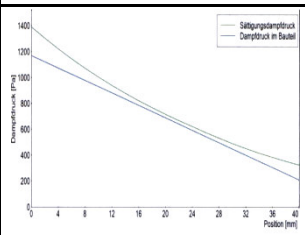
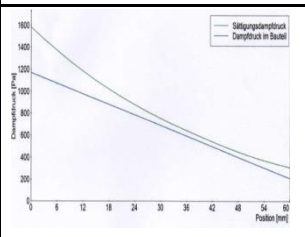
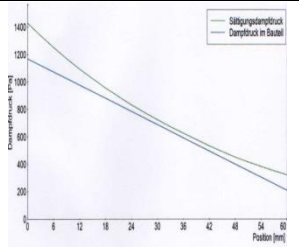
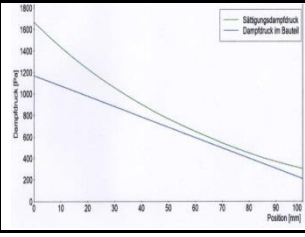
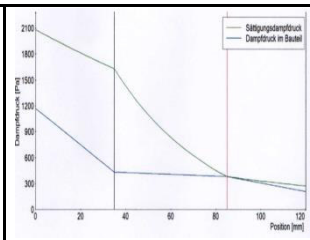
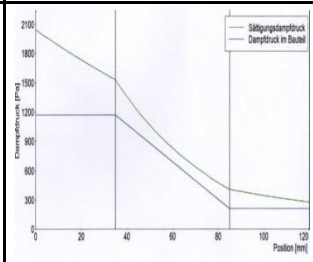
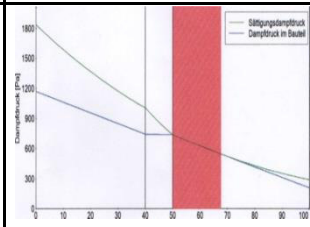
Table 1. Types of wooden walls

Denomination of wooden wall	**Layers mm** **Denomination of materials**
Massive wooden wall 40 mm/500 kg/m3	40 WW
Massive wooden wall 50 mm/500 kg/m3	50 WW
Massive wooden wall 60 mm/500 kg/m3	60 WW
Massive wooden wall 60 mm/700 kg/m3	60 WW
Massive wooden wall 100 mm/700 kg/m3	100 WW
Thermal wooden pack with mineral wool: 500 kg/m3	35 WW -50 MW – 35 WW = 120 mm
Thermal wooden pack with glass wool: 500 kg/m3	35 WW -50 FG – 35 WW = 120 mm
Thermal wooden pack with air stratum	40 WW - 10 Air - 50 WW= 100 mm

Table 2. Determining of U-thermal transmittance and of λ-thermal conductivity

Thermal Transmittance	No. of	Thickness mm	Thermal Conductivity	
U W/(m^{2}K)	Stratum	Materials	Λ W/mK	%
2,093	1	40 WW	0,130	100,0
1,803	1	50 WW	0,130	100,0
1,583	1	60 WW	0,130	100,0
1,987	1	60 WW	0,180	100,0
1,378	1	100 WW	0,180	100,0
0,572	1	35 WW	0,130	100,0
	2	50 WW	0,130	16,7
	2	50 MW	0,036	83,3
	3	35 WW	0,130	100,0
0,632	1	35 WW	0,130	100,0
	2	50 WW	0,130	16,7
	2	50 FG	0,046	83,3
	3	35 WW	0,130	100,0
0,988	1	40 WW	0,130	100,0
	2	10 AIR	R=0,150 m2K/W	100,0
	3	50 WW	0,130	100,0

Table 3. Glaser diagrams of wooden walls

No.	Denomi-nation	Diagram GLASER
1	40 WW	
2	50 WW	
3	60 WW 500 kg/m3	
4	60 WW 700 kg/m3	
5	100 WW	
6	35/50 MW/35	
7	35/50 FG/35	
8	40/10 Air/50	

CONCLUSIONS

•The coefficient of thermal transmittance for the types of wooden walls of buildings is ranging from 2.093 W/m2K for the thin wall 40 mm to 0.572 W/m2K for thicker thermal pack no.6.

•There is no risk of condensation by the diffusion of water vapor on the walls: no. 1, 2, 3, 4, 5, and 7. Hygrothermal protection is in accordance with the standard DIN EN 4108-3.

•Wooden wall, no. 6, does not meet the conditions for protection, because condensation occurs at depth 85 mm between layer 2 and 3 in the ratio 911/1155 g/m2 amount of condensed steam against the amount of entrained vapors (79% of vapors condensed). This means that the risk of wood decay is present.

•Condensation occurs in the no.8 wall in depth from 50 to 67.6 mm, but to a lesser extent, namely 314 / 1123 g/m2 amount of condensed water against the amount of vapors (28 % of

condensed vapors). However this wooden wall meets the requirements of hygrothermal protection, because this amount of water dries quickly.

•On the same wall, uncontrolled replacement of glass mineral wool with wool brings the risk of condensation of vapor.

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APPLICATION OF GIS TECHNIQUES ON THE ASSESSMENT OF FOREST ACCESSABILITY

(Case study on the forests of Fushkuqe-Zavaline, Region of Elbasan)

APLIKIMI I GIS NË VLERËSIMIN E MBRITSHMËRISË NË PYJE

(Rast studimi në ekonominë Fushkuqe-Zavalinë, Qarku Elbasan)

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PERMBLEDHJE
Planifikimi racional i punimeve dhe ndërhyrjeve silvikulturore në një ekonomi pyjore parashikon që të administrohet në mënyrë eficiente edhe infrastruktura rrugore. Hyrja, apo mbërritja në pyll përbën një ndër kushtet themelore për të mundësuar realizimin e një silvikulture intensive (Hippoliti 1976, 2003). Pohimet e mësipërme përcaktojnë edhe rëndësinë e madhe që merr pikërisht vlerësimi i mbritshmërisë në një ekonomi për të kuptuar gjendjen aktuale dhe planifikuar në mënyrë sa më racionale zgjerimin e rrjetit rrugor pyjor brenda territorit të saj. Një ndihmë mjaft të madhe në këtë drejtim, pra në vlerësimin e mbritshmërisë, ofron teknologjia kompjuterike e Sistemeve të Informacionit Gjeografik (GIS), si në lidhje me saktësinë e vlerësimit ashtu edhe me shpejtësinë e kryerjes së tij. Pikërisht përdorimi i teknologjisë GIS për të vlerësuar mbritshmërinë pyjore është dhe synimi i këtij studimi dhe për këtë qëllim është marrë si objekt studimi ekonomia pyjore FushëKuqe-Zavalinë në D.SH.P. Elbasan
Fjalë kyçe: GIS ArcMap, Imazhe satelitore, Hyrje ne pyll, Dendesi e infrastructures se rrugeve pyjore

SUMMARY
Forest accessibility is a conception work in the field of forestry management with extremely high requirements on investments and long-term utilization. Actually the Geographic Information Systems (GIS) are being fruitful in many fields of social activities, including forestry so far. The evaluation of the forest accessibility level is relatively difficult, especially for the large extended forest management units. Using GIS software it is possible to realize the evaluation of semi-automatic type, defined prophetess models based on several parameters (Dibari, 2005). The study was conducted in Fushkuqe-Zavalina's forest, Elbasan region. The goal of this study is to identify the sub-parcels used as "production forest", which can be assessed from the forestry service in order to fulfil, within an appointed time of interval, the silvicultural practices. Through a case study, the application of GIS techniques on Fushekuqe-Zavaline forests (Elbasan's District), for the evaluation of forest accessibility, is carried out.
Key word: GIS ArcMap, Satellite imagery, Forest Accessibility, Density of Road Infrastructure

INTRODUCTION

Actually the Geographic Information Systems (GIS) are being fruitful in many fields of social activities, including forestry so far. To take over the decision making process GIS rise from the human needs to possess powerful tools in data gathering and analyzing. Evermore everything that happens may occur anywhere. The identification of the location where something happen it's of a crucial importance" (Goodchild, 2001). It is estimated that the 80% of human activities have geographic references, which

mean that 80% of the possess data have a spatial component

The applications of GIS technology on the forestry sector belong, mostly managerial applications and as goal have the implementation of an informative system, able to fulfil all the informative demands, useful to identify the best managerial alternatives and to present the information on the form of thematic mapping. The most frequent application of GIS technology in forestry is related with the implementation of management plan, where a very important aspect would be the evaluation of forest accessibility.

The evaluation of the forest accessibility level is relatively difficult, especially for the large extended forest management units. Using GIS software it is possible to realize the evaluation of semi-automatic type, defined prophetess models based on several parameters (Dibari, 2005).

MATERIAL AND METHODS

The study was carried out in Fushe Kuqe-Zavalina, a forest district covering approximately 3280ha of Shpati's edge, c.a. 20km from Elbasan city, middle Albania. Figure2 demonstrates the 3D map of study area. The area is located between 40º57' and 41º03' Longitude and from 20º10' to 20º21' of latitude. The altitude ranges between 760 to 1880m above sea level. The majority of area is covered by forests (2504.4ha). The rest is divided in areas covered by scarce trees (143.5ha), agricultural land (53.1ha), pastures and meadows (111.4ha), urban area (6.4ha), wasteland (69.1ha) and unproductive land (380.2ha).

Based on the management form 94.4% are high forests, 1.3% are shrubs and 3.9% are pastures; meantime based on the forest status 71.1% are productive and 28.9% are protective forests. Regarding the species composition: 52.5% are Beech, 0.9% Fir and Beech, 0.6% Mixed Coniferous and Beech, 23.3% Mountain Pines, 1.4% are macquis and 21.3% Balkan Pine forests (Myteberi 2009).

There exist many methods and ways to solve the problem of making access to forests and forest complexes that are always influenced by the type of used method, input indicators and background data, or the approach and solution of a particular author. Planning appropriate roads in order to connect the forestry units located in mountainous areas through conventional route projection with dividers methods based mainly on the contour lines would be a very time consuming job. Today, integrative management of available information in the maps and considering these factors in road planning has been possible through GIS (Kunwoo, 1990).

The goal of this study was the identification of sub-parcel qualified as "*productive forest*", which can be assessed by the staff of forestry service, within a given preconcert time.

The disposition of this problem is based on a formula called the formula of "maximal time for normally forest accessibility" (Hippoliti, 1976, 1997, 2003).

This empirical formula on a criterion, just accepted and easily applied, is based, which as pleasantly served are defined by the forest road network and referring the forest parts that can be walking accessed within an interval time of 6% of all working day (going and return). This interval-time, which in absolute value corresponds with 30 minutes, is identified as the "*maximal time to normally enter on the forest*" (Hippoliti, 1976).

By the altimetric criterion expressed (Hippoliti 1976) "as good served forests" are peace of forests on an attitudinally (elevation) level difference not more than 100m, hypothesized that:

- *The human normally is capable to climb within one hour on an altitudinal difference of c.a. 400m (on a flat terrain in a distance of 4km);*
- *The shifting velocity is estimated 4km/hour.*

The slope is the most important identified factor because strongly affects on the level of the forest access and on the selection of the adopted harvesting and transportation type.

On the graph below the relation between the terrain slope and horizontal distance per 100 altitudinal difference (fig. 1) is done.

$$d = \frac{h}{p\%} \times 100 = \frac{100}{p\%} \times 100$$

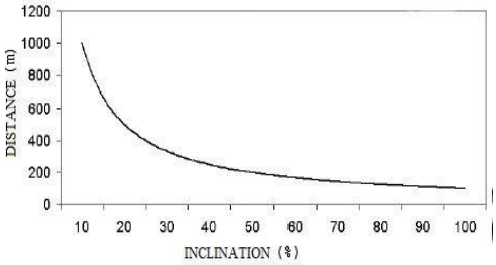

Fig.1. The relation between the slope and the distance

For the evaluation of forest accessibility was used "Buffer" analyze, by GIS software. Buffer represents one of the most important functions of special analyses of ArcGis9.

Two were the necessary layers for this action:

(i) informative layer of road network within the forest management unit; and

(ii) the map of the territory slope, within the forest management unit.

From the GIS of Fushe Kuqe-Zavaline forests only the layer of "road. shp" was available and the providing of the slop mapping was necessary. For as much as the classification of the area slope on the management plan is not corresponded with the classification of the forest accessibility defined by Hippoliti (1998), where the slope on five categories is classified (0-20%; 21-40%; 41-60%; 61-80% and 81-100%), the data from management plans are not available in performing a slope map.

Creating surfaces models, GIS offers possibilities to solve this problem. 3D-Analyst (additional extension) of ArcGIS 9, use two surfaces models: (i) raster (DEM-Digital elevation Model) and vector (TIN-Triangulated Irregular Networks).

TIN particularly is used for the modelling of zones with high preciseness and on small areas (e.g. in the case of engineering applications etc.). To perform the model of the surface in above mentioned forest economy was used TIN software.

When we are talking for forest accessibility or for a better service on the forest, we have in mind sub-parcels classified as "productive forests" on the management plan. There are avoiding the protective forests or these with very low productivity, which have not necessity for the road system. On the cases of parks and forests with specific protective status a minimal road infrastructure is recommended (Kotro, 2006).

RESULTATS AND DISCUSSIONS

After collecting required information and processing them, using GIS, a series of maps including topographic, slope, altitude, aspect, and land form were extracted. The layer of forest roads network was overlapped so far in the above mentioned maps, using topographic map and satellite imagery.

The actual state of the road system in Fushe Kuqe-Zavaline on the below picture (Fig. 2) is presented. It would be stress out that partly the road system by satellite images (high resolution-Google Earth) is updated.

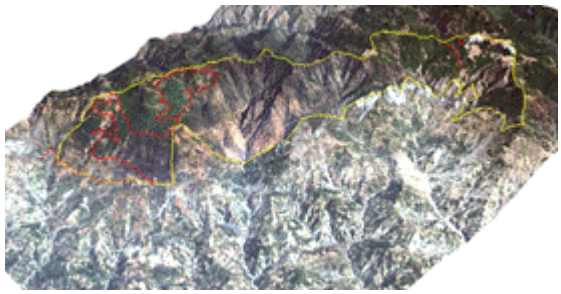

Fig.2 3D Map of the study area

Based on contour lines layer of 10m contour intervals, within the forest economy bounders TIN-slope was performed (Fig. 3), which represents the model of terrain surface according to the slope. In the study case TIN is elaborated on such way that the slope to be classified in 5 interval classes (0-20%; 21-40%; 41-60%; 61-80% and 81-100%).

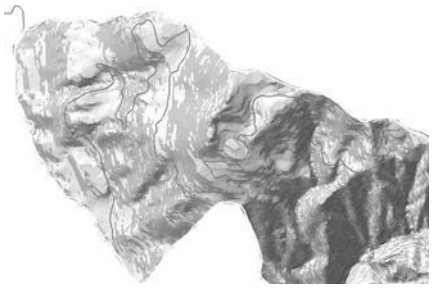

Fig.3. TIN-slope map

Analyzing this map results that road network of the forest economy is extended on terrains the slope of which, in both sites of the road fluctuates from 20-50% (30% average value).

The next step of assessing forest accessibility through buffer analyse, beginning from both sites of the road, is the identification of the belt, with the broadness calculated by Hippoliti's formula (1998)

$$d = \frac{h}{p\%} \times 100 = \frac{100}{30} \times 100 \approx 330m$$

As the result of this procedure the map of interval classes (Hippoliti 2000) for the assessment of forest accessibility is provided (fig. 5).

Fig.5. Map of accessible parcels

Based on Hippoliti (2000) criterion, only 132 sub parcels with total area of 1061ha are accessible.

The general surface of the sub parcels, within accessible borderline is 894 ha, from wich 775 ha produced forest. Forest accessibility in percentage was determined by the formula:

$$M_b = \frac{775}{1789} \times 100 = 43.3\%$$

where S_{tot} = 1789 ha is the total area covered by productive forests

For as much as the declination on both roads sites change on the fully undefined limits and on the variability during its length, then the average value of 30% identified would not be precisely representative; consequently the buffering average distance of 330m would not precisely determined the boarders of forest accessibility, according to Hippoliti's (2000) criterion.

To verify the realized products preciseness was respected the follow procedure:

- 3D model of the forest economy's map was build up;
- The contour lines, roads and the sub parcels of accessibility's map are overlapped this model.
- On visual way the evaluation of the Hippoliti's (2000) criterion is donne, so the elevation diferences 100m on both sites of the road.

3-D model of forest economy by ArcScene software, using TIN is realized. Over this model the roads, contour lines (10m contour interval), roads buffer and sub parcels layers are overlapped. On the fig. 6 a fragment of realized 3-D scene, where the total area of the sub-parcels intersected by the buffers boarder as well as the surface of these sub-parcels within this boarder are presented.

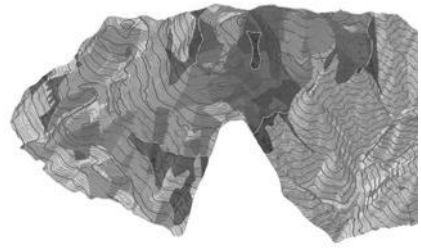

Fig.6. 3D model of sub-parcels intersected by the buffers boarder (330m)

From the visual control over this model results that within buffers boarders the value of the land level amplitude between the boarder and the road exceed on several parts the planed value of 100m and positively on the sub-parcels 5a, 26a, 27a, 28c, 32a, 39a, 52a and 54b; this is explained by the fact that the slope of the land in these sub-parcels are higher then average value 30% identified

Operating with "3D Analyst" extensions over raster presentation of land slope within the forest economy, for each sub parcel the profiles of land slope are build up and then average slope of the land slope within buffer board are defined (Fig. 7).

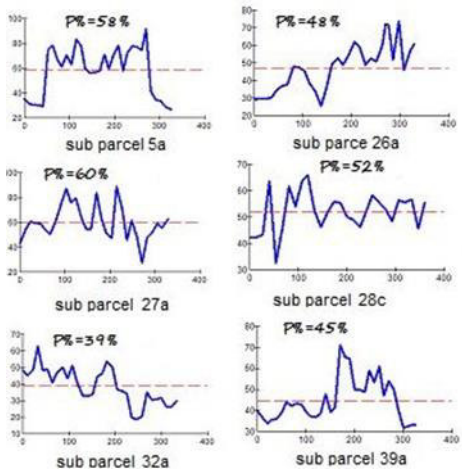

Fig.7. Land slope and average values

With the average values of the slopes, the distances of buffers road per each sub parcel are accounted and on the table below are presented.

Table 1. The distances of buffers

Sub parcel	5a	26a	27a	28c	32a	39a	52a	54b
Distance (m)	170	210	170	190	250	220	100	140

Based on these distances is realised corrected buffer, fully dependent from the land slope, on a second distance, which represents arithmetical average of 200m.

The accessible surface within corrected board is estimated to be 860ha, from which 760.3 ha produced forest. The differences between uncorrected and corrected buffer areas results ΔS=34 ha (14.7 ha produced forest).

The accessibility corrected per sub-parcels in production is:

$$M_b = \frac{S_{mb}}{S_{tot}} \times 100 = \frac{760.3}{1789} \times 100 = 42.5\%$$

For this analyze results that the standard deviation on the assessment of forest accessibility based on the constant buffering distance on all road length is relatively unconsidered (ΔM_b = 43.3 – 42.5 = 0.8%).

CONCLUSIONS

Application of GIS technology on forest accessibility as subsidiary tool is characterized by a high exactness, shorter time procedure, and higher quality on graphic presentation, than classical manual method of evaluation.

From this study results that for the forests extended on the mountainous steep slope and where the slope on both sites of forest roads have not sensitize differences, the limits of forest accessibility, according to Hippoliti's formula, can be identify by a uncial and constant buffer distance.

Using available tools, forest road planners can analyze a variety of road variants rapidly and evaluate environmental and economical conditions using GIS

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