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On the Comparison of Akaike Information Criterion and Consistent Akaike Information Criterion in Selection of an Asymmetric Price Relationship: Bootstrap Simulation Results

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Abstract

Akaike's Information Criteria provide a basis for choosing between competing approaches to testing for price asymmetry. However, very little research has been undertaken to understand its performance in the price transmission modelling context. In addressing this issue, this paper introduces and applies parametric bootstrap techniques to evaluate the ability of Akaike Information Criteria (AIC) and Consistent Akaike Information Criteria (CAIC) in distinguishing between competing asymmetric price transmission models under various error and sample size conditions. Bootstrap simulation results suggest that the performance of the model selection methods depends on sample size and stochastic variance. The Bootstrap simulations further indicate that CAIC is consistent and performs better than the AIC in large bootstrap samples. The ability of the model selection methods to identify the true asymmetric price relationship decreases with increase in stochastic variance. The research findings demonstrate the usefulness of Bootstrap algorithms in price transmission model comparison and selection.

Key words

Asymmetry, Akaike's Information Criteria (AIC), Consistent Akaike Information Criteria (AIC), model selection, Bootstrapping.

Introduction

Researchers have developed alternative methods to detect asymmetric price transmission processes in agricultural markets. However there is the need to choose the best model from a set of competing models (or theories) since the different methods leads to differences in inferences and conclusions.

Information theoretic selection criteria have been developed to objectively accomplish the goal of selecting the best model from a set of competing models or theories. For instance, in signal processing problems, Seghouane and Lathauwer (2003) applied bootstrap simulations to investigate the performance of Akaike and Kullback information criteria in evaluating the number of signals. Their studies revealed that the model selection methods performed well in small samples but performance did not improve substantially in larger samples. Traditional information-theoretic criteria such as Akaike's Information Criteria (AIC) (Akaike, 1973) and lesser-known criteria such as Consistent Akaike Information Criteria (CAIC) are used for the purpose of identifying the correct asymmetric model. However, little is known about their relative performance of AIC and its extension in the asymmetric price transmission modelling context. Acquah (2010) sheds light on the relative performance of AIC and CAIC in a Monte Carlo Experimentation but did not consider the use of bootstrap techniques to analyse the relative performance of AIC and CAIC. However, little is understood about their relative performance in selecting the correct asymmetric model in bootstrap samples.

An important question which remains unanswered is how well AIC and CAIC will perform when bootstrap samples are used in the price transmission analysis. In the presence of bootstrap samples, will AIC and CAIC point to the correct model as noted in previous Monte Carlo studies? Using bootstrap methods to construct a series of new samples which are based on original data gives an advantage over the previous Monte Carlo model selection studies which makes implicit assumption about the true values of the parameters.

In order to address these issues, this paper evaluates

the ability of AIC and its extension, CAIC to choose between alternative methods of testing for asymmetry in the presence of bootstrap samples. Fundamentally, the study is intended to understand the behaviour of the model selection criteria in the presence of bootstrap samples. In effect this study compares the relative performance of the well known Akaike Information Criteria with a lesser-known criterion, CAIC (Bozdogan, 1987) in terms of their ability to recover the true data generating process (DGP) in the presence of bootstrap samples. The true asymmetric data generating process is known in all experiments and the Bootstrap simulations are necessary in deriving the model recovery rates of the correct model.

The rest of the paper proceeds as follows. In the following section, an introduction of the model selection criteria is presented. This is followed by an introduction of bootstrap methods and brief description of asymmetric price transmission models. A practical application in which the performance of the model selection methods in selecting the correct asymmetric model are evaluated using Bootstrap samples is presented. Finally, the study ends with conclusions.

Materials and Methods

Model selection criteria

In order to determine the correct underlying model of a data set, one may simply suggest the most appropriate model is the one which provides the best fits to the data. This idea, however, does not work because it will always favour the most complex model among the set of competing models.

The reason is that the most complex model has more degrees of freedom and can therefore fit the data better than any other model in that set of competing models. Thus, to choose the correct model, one needs to establish a tradeoff between how well a model fits the data, which is often measured by the sum of squared residuals and the complexity of that model. In practice, higher order models have to be penalized so that the selected model would be chosen based on its suitability rather than its fidelity to data. In effect, the fundamental difference between all the existing model selection criteria is in the way by which they penalize the higher order models.

Akaike Information Criteria (AIC)

Akaike Information Criteria (Akaike, 1973) is one of the first model selection methods introduced. AIC is based on the idea that a chosen model is correct if it can sufficiently describe any future data with the same distribution and therefore AIC can be regarded as a hypothetical cross validation method. It selects a model that minimizes the expected error of the new observation with the same distribution as the data used for fitting. In short, AIC was developed to estimate the expected Kullback-Leibler distance between the true model and the estimated model. It is defined as:

$$AIC = -2 \log (L) + 2p \quad (1)$$

Where L refers to the likelihood under the fitted model and is the number of parameters in the model. The model with minimum AIC value is chosen to be the best model.

Consistent Akaike's Information Criteria (CAIC)

Bozdogan (1987) proposed a corrected version of AIC in an attempt to overcome the tendency of the AIC to overestimate the complexity of the underlying model. Bozdogan (1987) observed that Akaike Information Criteria (AIC) does not directly depend on sample size and as a result lacks certain properties of asymptotic consistency. In formulating CAIC, a correction factor based on the sample size is employed to compensate for the overestimating nature of AIC. CAIC which reflects sample size and has properties of asymptotic consistency can be defined as:

$$CAIC = -2 \log (L) + p [(\log n) + 1] \quad (2)$$

Where L refers to the likelihood under the fitted model, p is the number of parameters in the model and n is the sample size. AIC differs from CAIC in the second term which now takes into account sample size n. Models that minimize the Consistent Akaike Information Criteria are selected.

The formulation of CAIC shows that AIC can be fairly extended to make it consistent, even though a practical difficulty is that consistency is a weak property (Atkinson, 1980). It can be noted that CAIC is similar to the Schwarz's (1978) criterion of $p \log n$, and that the term $[p \log n + p]$ has the effect of increasing the 'penalty term.' Consequently, the minimization of CAIC leads in general to lower dimensional models than those obtained by minimizing AIC.

The bootstrap method

Bootstrap Method introduced in Efron and Tibshirani (1993) is a resampling procedure for estimating the distribution of a statistic based on independent observations. Generally, the resampling method (bootstrap) allows us to quantitfy uncertainty by calculating parameters of interest such as standard errors and confidence intervals. Resampling procedures require fewer assumptions and give accurate results.

Bootstrapping involves repeated random sampling with replacement from the original data to create new samples referred to as the bootstrap samples. Each bootstrap sample is the same size as the original random sample and can be used to calculate the statistic of interest. The distribution of the bootstrap samples is referred to as the bootstrap distribution.

Parametric Bootstrap

In a parametric bootstrap procedure, the resampling is carried out on a parametric model.

The parametric bootstrap involves estimating regression coefficients for the original data and calculating the fitted values and residuals for each observation. Selected bootstrap samples of the residuals (ε^*) and the fixed values of the explanatory variables (x) are used to obtain the bootstrap y values. Subsequently, the bootstrap y values are regressed on the fixed values to obtain the bootstrap regression coefficients and parameters of interest.

The process where the resampled residuals are added to the original regression equation to generate new bootstrap values for the outcome variable and the coefficients of the new bootstrap regression estimated using ordinary least squares technique are outlined as follows.

1. Generate ε^* by sampling with replacement from $\hat{\varepsilon}_1, \ldots, \hat{\varepsilon}_n$
2. Form $y^* = X\hat{\beta} + \varepsilon^*$
3. Compute $X\hat{\beta}^*$ from (X, y^*)

Resampling of the residuals, adding them to the fitted values and estimating the regression coefficients is repeated a larger number of times to estimate parameters of interest with the bootstrap samples. The parametric bootstrap implicitly assumes that the functional form of the regression model is correct and that the errors are identically distributed.

Asymmetric price transmission models

The data generating process is derived from Granger and Lee (1989) Error Correction Model and can be specified as follows:

$$\Delta y_t = \beta_1 \Delta x_t + \beta_2 (y - x)_{t-1} + \varepsilon_{2,t}$$

$$\varepsilon_{2,t} \sim N(0, \delta^2) \quad (3)$$

where y and x are price series at different levels of marketing chain. In this study, y and x are generated as I(1) non stationary variables that are cointegrated and there exist an equilibrium relationship between y and x which is defined by an error correction term. The long run dynamics captured by the error correction term are implicitly symmetric. In order to allow for asymmetric adjustments, the error correction term can be decomposed into positive and negative components as follows:

$$(y - x)_t^+ = \begin{cases} (y - x)_t, & if\ (y - x)_t > 0 \\ zero & otherwise \end{cases} \quad (4)$$

$$(y - x)_t^- = \begin{cases} (y - x)_t, & if\ (y - x)_t < 0 \\ zero & otherwise \end{cases} \quad (5)$$

The resulting asymmetric model is defined as

$$\Delta y_t = \beta_1 \Delta x_t + \beta_2^+ (y - x)_{t-1}^+ + \beta_2^- (y - x)_{t-1}^- + \varepsilon_{3,t}$$

$$\varepsilon_{3,t} \sim N(0, \delta^2) \quad (6)$$

Asymmetry is introduced by allowing the speed of adjustment to differ for the positive and negative components of the Error Correction Term since the long run relationship captured by the error correction term was symmetric. Symmetry in equation (6) is tested by determining whether the coefficients (β_2^+ and β_2^-) are identical (that is H_0: $\beta_2^+ = \beta_2^-$).

Cramon-Taubadel and Loy (1996) departs from Granger and Lee's model which test for asymmetries in the adjustments in the equilibrium level to propose a complex approach to asymmetry in which asymmetries specified affects the direct impact of price increases and decreases as well as adjustments to the equilibrium level.

$$\Delta y_t = \beta_1^+ \Delta x_t + \beta_1^- \Delta x_t^- + \beta_2^+ (y - x)_{t-1}^+ + \beta_2^- (y - x)_{t-1}^- + \varepsilon_{4,t}$$

$$\varepsilon_{4,t} \sim N(0, \delta^2) \quad (7)$$

Where Δx_t^+ and Δx_t^- are the positive and negative changes in and the remaining variables are defined as in equation (7).

A formal test of the asymmetry hypothesis using the above equation is: H_0: $\beta_1^+ = \beta_1^-$ and $\beta_2^+ = \beta_2^-$. In this case, a joint F-test can be used to determine

symmetry or asymmetry of the price transmission process.

Alternatively, Houck (1979) departs from the von Cramon-Taubadel and Loy (1996) model specification and proposes a model in which asymmetries specified affects the direct impact of price increases and decreases and does not take into account adjustments to the equilibrium level. The Houck method can be written as follows:

$$\Delta y_t = \beta_1^+ \Delta x_t^+ + \beta_1^- \Delta x_t^- \qquad \varepsilon_{5,t} \sim N(0, \delta^2) \qquad (8)$$

The variables in the model are defined as in equation (7). Symmetry is tested by determining whether the coefficients (β_1^+ and β_1^-) are identical (that is H_0: $\beta_1^+ = \beta_1^-$).

Results and discussion

A bootstrap comparison of the performance of AIC and CAIC

The performance of AIC and CAIC in recovering the true data generating process (DGP) is investigated by simulating the effect of sample size and noise levels on model selection.

In accordance with the experimental designs of Holly et al. (2003), the value of β_1 is set to 0.5 and (β_2^+, β_2^-)∈(-0.25, -0.75) are considered for the coefficients of the asymmetric error correction terms in the true model. The different models are fitted to the bootstrap data and their ability to recover the true model was measured. The recovery rates were derived using 1000 bootstrap simulations. The data generation process is defined in equation (6) and the data is simulated from the standard error correction model as follows:

$$\Delta y_t = 0.5x_t - 0.25(y_t - x_t)^+_{t-1} - 0.75(y_t - x_t)^-_{t-1} + \varepsilon \qquad (9)$$

The prices *y* and *x* are generated as I (1) non stationary variables that are cointegrated. The error correction terms denotes the positive and negative deviations from the equilibrium relationship between *y* and *x*. However, we attempt to evaluate the abilities of AIC and CAIC to select the appropriate asymmetry model from competing alternatives.

The relative performance of the two model selection methods are compared in terms of their success rates or ability to recover the true data generating process (DGP) across various bootstrap sample size conditions (i.e. Model Recovery Rates) as detailed in Table 1.

For the purpose of brevity, the standard asymmetric error correction model, the complex asymmetric error correction model and the Houck's model in first differences are denoted by SECM, CECM and HKD respectively.

For each model selection method, the model recovery or success rate defines the percentages of bootstrap samples in which each competing model provides a better model fit than the other competing models. The model selection methods performed reasonably well in identifying the true model, though their ability to recover the true asymmetric data generating process (DGP) increases with increase in bootstrap sample size. In small bootstrap samples (upper part of Table 1), the model selection methods recovered at most 77.5 % of the data generating process. When the bootstrap sample size was large (Lower part of Table 1), the model selection method recovered

Experiment criterion	Model fitted			
	Methods	CECM (%)	HKD (%)	SECM (DGP) (%)
n = 50 σ = 1	AIC	18.9	5.0	76.1
	CAIC	4.4	18.1	77.5
n = 150 σ = 1	AIC	20.0	0.0	80.0
	CAIC	1.9	0.2	97.9
n = 500 σ = 1	AIC	19.0	0.0	81.0
	CAIC	1.1	0.0	98.9

Note: Recovery rates based on 1000 Bootstrap replications.
AIC: Akaike Information Criteria; CAIC: Consistent Akaike Information Criteria;
CECM: Complex Error Correction Model; HKD: Houcks Model in Differences
SECM: Standard Error Correction Model

Table 1: Relative performance of the model selection methods across sample size.

at most 98.9 % of the true model. AIC performs well in small bootstrap samples, but is inconsistent and does not improve in performance in large bootstrap samples whilst CAIC in contrast is consistent and improves in performance in large bootstrap sample size. Generally, model selection performance improved as bootstrap sample sizes increased.

Recovery rates of Consistent Akaike Information Criteria strongly depended on sample size for the true data generating process (DGP). It increased from 77.5 percent to 98.9 percent when the bootstrap sample size was increased from 50 to 500. Alternatively, recovery rates of AIC increased from 76.1 percent to 81.0 percent for the true data generating process (DGP) when the bootstrap sample size was increased from 50 to 500. Although AIC performed well in the small bootstrap samples, it did not make substantial gains in recovering the true model as the bootstrap sample size increased.

The results of the current study are consistent with the Monte Carlo Simulation experimentation of Acquah (2010) which indicated that the ability of AIC to select a true model rapidly increased with sample size but at larger sample sizes it continued to exhibit a slight tendency to select complex models whiles CAIC in contrast is consistent and improves in performance as sample size increased. Generally, these results are confirmed in the bootstrap simulation results presented in Table 1.

In order to illustrate the effects of noise level on model selection, this study considers three error sizes (σ) ranging relatively from small to large and corresponding to 1.0, 2.0 and 3.0. Using 1000 bootstrap replications, data is generated from equation (9) with the different error sizes and a sample size of 150. The data fitting abilities of alternative models are compared in relation to the true model as the error in the data generating process was increased systematically.

Table 2 shows the percentage of bootstrap samples in which the correct model (i.e. SECM) was selected or recovered among competing models by the model selection criteria as the amount of noise in the data generating process was increased. The performance of the model selection algorithms analysed declined with increasing amount of noise in the true asymmetric price transmission data generating process.

Recovery rates of Consistent Akaike Information Criteria decreased from 97.9 percent to 40.0 percent when the error size was increased from 1 to 3. Similarly, recovery rates of AIC decreased from 80.0 percent to 65.2 percent for the true data generating process (DGP) when the error size was increased from 1 to 3. Except for high noise levels CAIC outperforms AIC.

Simulating the effects of sample size and stochastic variance concurrently affirms that a small error and large sample improves recovery of the true asymmetric data generating process and vice versa as illustrated in Table 3.

With a small bootstrap sample of 50 and an error size of 2.0, the true data generating process was recovered at least 32.9 percent of the time by the model selection criteria as illustrated in upper part of Table 3. On the other hand, with a relatively large sample of 150 and error size of 0.5 at least 80.0 percent of the correct model was recovered across all the model selection methods as indicated in the lower part of Table 3. The model recovery rates of the model selection methods are derived under combined conditions of a small bootstrap sample size of 50 and large error size of 2 (i.e. Unstable conditions), and a relatively large bootstrap sample size of 150 and a small error size of 0.5 (i.e. Stable conditions). Under stable conditions,

Experiment criterion	**Model fitted**			
	Methods	**CECM (%)**	**HKD (%)**	**SECM (DGP) (%)**
n = 150 σ = 3	AIC	14.1	20.7	65.2
	CAIC	0.8	59.2	40.0
n = 150 σ = 2	AIC	18.7	4.9	76.4
	CAIC	1.3	23.8	74.9
n = 150 σ = 1	AIC	20.0	0.0	80.0
	CAIC	1.9	0.2	97.9

Note: Recovery rates percentages based on 1000 Bootstrap replications.

Table 2: Relative performance of the selection methods across error size.

Experiment criterion	Model fitted			
	Methods	CECM (%)	HKD (%)	SECM (DGP) (%)
n = 50 σ = 2	AIC	11.9	34.1	54.0
	CAIC	1.8	65.3	32.9
n = 150 σ = 0,5	AIC	20.0	0.0	80.0
	CAIC	1.9	0.0	98.1

Note: Recovery rates percentages based on 1000 Bootstrap replications.

Table 3: Effects of sample size and stochastic variance on model recovery.

model selection performance or recovery rates improves in bootstrap samples.

The results of the bootstrap simulations with regards to the effect of noise levels on model selection are generally consistent with Acquah (2010) Monte Carlo simulations which suggest that the recovery rates of the true data generating process decreases with increasing noise levels in asymmetric price transmission regression models.

An important attribute of the current study is that they generally echo existing empirical work on the performance of model selection methods in other applications. First the results of the Bootstrap simulation indicate that AIC and CAIC points to the true asymmetric price transmission model. Similarly, Tan and Biswas (2012) demonstrated via bootstrap simulation that AIC clearly identified the true data generating process in cosmological modeling framework. Using bootstrap simulation to guide the selection of the true model in multiple regression analysis, Al Mrshadi (2009) finds that AIC points to the true model. Secondly, the current study found that an AIC and related measure performs better in smaller samples. This finding is consistent with empirical applications of Seghouane and Lathauwer (2003) in signal processing modeling.

Conclusions

This study investigated the ability of AIC and its analytical extension CAIC to clearly identify the correct asymmetric model out of alternative competing models in the presence of bootstrap samples. The Bootstrap simulations results indicated that the sample sizes and noise levels are important in the selection of the true asymmetric model. With larger bootstrap sample sizes or lower noise levels, the ability of the model selection methods to identify the correct asymmetric price data generating process improved. Generally, under unstable conditions such as small bootstrap sample and large noise levels CAIC performs better than AIC. These results suggest that CAIC which corrects for sample size performs better in selecting the true asymmetric price transmission model when the number of bootstrap samples is large. The Bootstrap comparison provided sheds light on the empirical performance of the Akaike's Information Criteria and the Consistent Akaike Information Criteria in choosing an asymmetric price transmission model in the presence of bootstrap samples. Bootstrap simulation results further demonstrates the usefulness of combining Bootstrap techniques with model selection methods to identify the correct asymmetric price transmission model. Future research will investigate model selection using Bayesian methods.

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Economics and Technical Efficiency of Dry Season Tomato Production in Selected Areas in Kwara State, Nigeria

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Abstract

Tomato (Lycopersicon esculentum Mill) is one of the major fruit vegetables in Nigeria. In view of its seasonal availability and the need to make it available all-year round, effort must be made to increase efficiency of its production especially during the dry season. A study was therefore carried out to examine the economics of dry season tomato production in Kwara state, Nigeria. It estimated the costs and returns and assessed the technical efficiency of dry season tomato production. A two-stage random sampling technique was used to select 105 respondents for the study. A well-structured questionnaire was used to collect data from the respondents. Major tools of analysis used for the study were the gross margin analysis and the stochastic frontiers model. Results of the study showed that a gross margin of N 18,956.75/ha (US$ 120.74/ha) was realized from dry season tomato production. Furthermore, the result of the stochastic frontier model shows that age, education status of the farmers and access to credit had significant effect on the efficiency of dry season tomato production. This study therefore highlights the need for government to invest in public education and to make credit available to farmers as a way of reducing the burden of high cost of production.

Key words

Tomato production, technical efficiency, stochastic frontier production model, gross margin analysis, Kwara state.

Introduction

Despite the remarkable progress made in increasing world food production at the global level, approximately half of the population in the developing countries including Nigeria does not have access to adequate food supply, with lot of children suffering from vitamin “A” deficiency. Between 100 and 140 million children are vitamin A deficient with an estimated 250,000 to 500 000 vitamin A-deficient children becoming blind every year, half of them dying within 12 months of losing their sight (World Health Organization). Vegetable production can be adopted as a strategy for improving livelihood and alleviating the nutritional status of the people.

Tomato (Lycopersicon esculentum Mill)) is one of the most popular vegetables in the world, grown in practically every country of the world in outdoor fields, greenhouses and net houses. In 2010, the world tomato production was estimated to be about 145 million tons produced on 4.3 million hectares while estimate of tomato production in Nigeria stood at 1.86 million metric tons from total area of about 264,000ha giving an average of 7 tons per hectare (Food and Agricultural Organisation, 2011). It is an important component of the daily diet used in preparation of different delicacies. Tomato may be eaten fresh as salad or they may be processed into pastes or purees, which are used for cooking in soups or stews and producing fruit drinks. Tomato is grown by most dry season market gardeners who regard it as principal crop. Tomato can be processed and exported to other West African nations or sold within the country because demand is very high locally.

According to the United State Department of Agriculture (USDA) National Nutrient Database, tomatoes are packed with a variety of nutrients including fiber, potassium and vitamins A and C, providing about 20 percent of the daily recommended requirements of vitamin A based on a 2,000 calorie diet (United State Department of Agriculture Nutrient Database). A medium tomato also provides about 26 percent of the daily recommended levels of vitamin C. Tomato contains lycopene, a very powerful antioxidant which can help prevent the development of many forms of cancer. Apart from its nutritional significance, tomato production serve as a very important source

of livelihood to small scale farmers being a source of employment and income to both rural and urban dwellers. It contributes significantly to economic growth and it is a source of foreign exchange for the national economy with industries making use of it as raw material for processing into ketchup, sauce and paste, which are mainly used in the kitchen. Studies have shown that dry season market gardening is an important commercial agricultural enterprise dominated by the masses operating on small-scale basis. The bulk of tomato production in Nigeria is carried out during the wet season. In order to make for its all-year round availability, there is a need for an increased production, especially during the dry season (Oladoja, Akinde and Adisa, 2006). With this, farmers who otherwise would have very little income for about half of the year would have been gainfully employed throughout the year, if there is an efficient production in both seasons.

In spite of the nutritional and economic importance of tomato, comprehensive and up-to-date information about the level of technical efficiencies of the farmers is still inadequate. Several methods have been developed to determine the most efficient production frontier by different researchers (Farrel, 1957; Timmer, 1970; Aigner, et al., 1977 and Meeusen and Van den Broeck, 1977). Battese (1992) proved that the econometric modeling of frontier production functions provides useful insights into best practice technology and the measures by which the productive efficiencies of different firms may be compared. Though sufficient information on the status of the allocative and technical efficiencies is available for the agricultural sector, very little attention has been paid to the estimation of the technical efficiency in horticultural crops production in Nigeria. The efficiency, with which farmers use available resources and improved technologies, is important in agricultural production (Rahji, 2005). Enquiry into efficiencies of the farmers and factors that determine their levels of efficiency is very essential in developing policies aimed at raising the productivity of the small scale farmers within the limits of existing resource base and available technology (Yusuf and Malomo, 2007; Hazarika, and Awang, 2003). However, there has been no empirical study of the level of farmers' efficiency and the factors influencing the efficiency of dry season tomato production in the study area. Against this background, this study therefore aims to measure the possibilities of productivity gains from enhancing the efficiency of tomato farmers in the study area. Results from the study will provide guidance to various stakeholders on how to increase tomato production by identifying the extent to which tomato production efficiency could be raised with the available technology and resource base. Hence, the study was designed to:

(i) estimate the cost and returns to dry season tomato production in the study area

(ii) determine the level of technical efficiency of dry season tomato farmers in the study area and

(iii) analyse the determinants of technical efficiency in dry season tomato production in the study area.

Material and methods

Area of Study

This research work was carried out in Kwara state, Nigeria. The state has sixteen Local Government Areas, situated between parallels 8° and 10° north latitudes and 3° and 6° east longitudes. The population of the state is put at 2,371,089 and covers an estimated land area of 32,500km2 out of which 75.3% is cultivable (Federal Office of Statistics 2006). Agriculture is the mainstay of the state's economy accounting for about 70 percent of its labour force. The state has two main climatic seasons, the dry and wet season with annual rainfall ranging between 1000 to 1500 mm while the average temperature lies between 30ºc and 35ºc. The climate is conducive for growing fruits and vegetables, such as mangoes, pineapples, bananas and tomatoes. The rainy season lasts between April to October while the dry season starts in November and ends in March of the following year giving ample opportunity for dry season tomato production. The state is divided into four main agro-ecological zones by the Kwara state Agricultural Development project (KWADP), namely: Zone A: Baruteen & Kaima; Zone B: Edu and Patigi; Zone C: Asa, Ilorin East, Ilorin South, Ilorin West & Moro; and Zone D: Ekiti, Ifelodun, Irepodun, Isin, Offa, Oke-Ero & Oyun (Kwara State Agricultural Development Project (KWADP), 2006).

Sampling Technique

The target population for the study was dry season tomato farmers in Kwara State. A three stage random sampling technique was used to collect data for the study. Zone C was purposively selected for the study because of the predominance of dry

season tomato farmers in the zone. There was a random selection of two Local Government Areas from the zone (Moro and Ilorin East) after which 3 villages were randomly selected from each of the two local government areas. The final stage involves a random selection of 20 dry season tomato farmers from each of the villages. A total number of 120 questionnaires were administered out of which 105 contained adequate information used for analysis.

Method of data analysis

The data collected was analysed using; descriptive statistics, gross margin analysis and the stochastic production frontier.

Gross Margin Analysis

The cost and returns to dry season tomato production were estimated using the gross margin analysis. It is given as follows;

$$GM/ha = TVO/ha - TVC/ha$$

Where:

GM/ha = Gross margin in naira per hectare

TVO/ha = Total value of output in naira per hectare

TVC/ha = Total variable cost in naira per hectare.

Stochastic frontier production (SFP) and efficiency measurement

The model employed for the stochastic production function of individual farm economic efficiencies in this study is in the form of the Coelli and Battese (1996) inefficiency model. The model overcomes the deficiency of the deterministic production function employed by earlier studies with parameters computed using mathematical programming techniques, inadequate characteristics of the assumed error term, and has an inherent limitation on the statistical inference on the parameters and resulting efficiency estimates (Ogundari and Ojo, 2006). The stochastic frontier model was originally proposed for the analysis of the panel data by Battese and Coelli (1995). However, a general stochastic frontier production function for the cross-sectional data is considered in this paper and it is basically specified as a composed error model of the general form:

$$Y_i = f(X_i\beta_i) \exp (V_i - U_i), \quad i = 1, 2, \qquad (1)$$

Where

Y_i = output of the i-th farm,

X_i = vector of input quantities whose values are functions of inputs and other explanatory variables for the i-th farm

β_i = vector of unknown parameters to be estimated

$f(.)$ = an appropriate function (e.g. Cobb Douglas, translog, etc)

V_i = symmetric error which accounts for random variation in output due to factors beyond the control of the farmer e.g. weather, disease outbreaks

U_i = non negative random variable representing inefficiency in production relative to the stochastic frontier

The random error V_i is assumed to be independent and identically distributed as $N(0, \sigma v^2)$ random variables independent of the Uj which are assumed to be non-negative truncation of the $N(0, \sigma u^2)$ distribution (i.e. half-normal distribution) or have exponential distribution (Aigner, Lovell and Schmidt, 1977).

The technical efficiency of an individual farmer is defined in terms of the ratio of the observed output to the corresponding frontier output given the available technology (Onyenweaku, and Effiong, 2006)

Technical efficiency (TE) = Y_i/Y_i^*

$$= f(X_i, \beta_i) \exp (V_i - U_i) / f(X_i, \beta_i) \exp (V_i)$$
$$= \exp (-U_i) \qquad (2)$$

So that $0 < TE < 1$.

Where

Y_i = observed Output

Y_i^* = Frontier Output

Technical inefficiency effect model proposed by Battese and Coelli (1995) is described by

$$U_{it} = \delta_0 + \delta_i Z_{it} \qquad (3)$$

Where

U_{it} = non negative random variable representing inefficiency in production relative to the stochastic frontier in the t^{th} time period

Z_{it} = Vector of explanatory variables associated with the technical inefficiency effects in the t^{th} time period

δ = Vector of unknown parameters to be estimated

If $U_i = 0$, the farm were 100 percent efficient.

Maximum-likelihood estimates of the parameters in the model are obtained using FRONTIER 4.1 which is developed by Coelli (1994). In case of cross-sectional data, the technical inefficiency model can only be estimated if the inefficiency effects U_i's are stochastic and have particular distributional properties (Battese and Coelli, 1995). As a result, it is important to test the null hypotheses that technical inefficiency effects, γ (gamma), which is the variance ratio, explaining the total variation in output from the frontier level of output and defined by $\sigma^2/\sigma^2+\sigma^2$, are non-stochastic. The parameter, γ has a value between zero and one, such that it is desirable to test the null hypothesis of H_o: γ = 0 whether traditional production function is an adequate representation of the sample data. If so, the non-negative random variable U_i, is absent from the model. The generalised likelihood-ratio test statistic can be calculated from the logarithms of the likelihood function associated with the unrestricted and restricted maximum likelihood estimates for the special case in which the appropriate parameter is zero by using the program FRONTIER 4.1 (Battese and Tessma, 1993).

Test of hypothesis for the parameters of the frontier model is conducted using the generalized likelihood-ratio statistics, λ, defined by

$$\lambda = -2 \log [L(H_1) - L(H_0)] \quad (4)$$

Where L (H_0) is the value of the likelihood function for the frontier model, in which parameter restrictions specified by the null hypothesis, H_0, are imposed; and L (H_1) is the value of the likelihood function for the general frontier model. If the null hypothesis is true, then λ has approximately a chi-square (or mixed square) distribution with degrees of freedom equal to the difference between the parameters estimated under H_1 and H_0, respectively.

Cobb-Douglas Model

For this study, the production technology of dry season tomato farmers in the study area is assumed to be specified by the Cobb Douglas frontier production function. Despite its well-known limitations which include: Its rigidity emanating from assuming a perfect substitution between production factors and having its substitution elasticities summing up to one (Klacek, et al., 2007). However, its ease of computation and interpretation and its requirement of few parameters for estimation (Bravo-Ureta, and Pinheiro, 1997; Battese and Coelli, 1995) gives it an edge over the more flexible but complex translog production function which is difficult to interpret, requires greater number of parameters that have to be estimated thereby imposing hard constraints on the result feasibility, and with high probability of the occurrence of harmful collinearity among production factors (Pavelescu, 2010b; Allen and Hall 1997). The Cobb-Douglas functional form has been widely used in farm efficiency analysis for both developing and developed countries. Ekanayake and Jayasuriya (1987) estimated both deterministic and stochastic frontier production of the Cobb-Douglas type for rice and other field crops in the Mahaweli System. Dinh Xuan Tung and Rasmussen (2005) Using a cross section survey of 360 smallholder poultry keeping farms located in three agro-ecological regions in Vietnam adopted the Cobb-Douglas production functions to analyse and compare semi subsistence and semi-commercial smallholder poultry systems in the three regions. Considering the number of parameters included in the model and other econometric criteria, the Cobb Douglass production function was adopted for this study and estimated using the maximum likelihood method.

The function has the following form

$$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln_7 + v_i - u_i \quad (5)$$

Where ln denotes logarithms to base e

Y_i = output of tomato (kg)

X_1 = Farm size (ha)

X_2 = Labour (man day)

X_3 =Water (in liters)

X_4 = seed (in liters)

X_5 = Fertilizers (kg)

X_6 = Herbicides (in liters)

X_7 = Pesticides (in liters)

β_0 = constant

β_1- β_7 are unknown parameters to be estimated,

v_i = random error term

μ_i = technical inefficiency effect

In order to determine factors contributing to the observed technical efficiency, the following model was formulated and estimated jointly with the stochastic frontier model in a single stage maximum likelihood estimation procedure using the FRONTIER version 4.1 (Coelli, 1994):

$$U_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 \quad (6)$$

Where

Ui = Technical efficiency of the i-th farmer

Z_1 = Age of farmers (in years)

Z_2 = Educational status (in years)

Z_3 = Access to credit (Dummy; Yes = 1, No = 0)

Z_4 = Non-Agricultural income (in naira)

δ_s are unknown parameters to be estimated.

Results and discussion

Socio-economic characteristics

A summary of the socio-economic characteristics of the dry season tomato farmers is given in table 1.

Characteristics	Frequency	Percentage
Gender		
Female	23	21.9
Male	82	78.1
Total	**105**	**100**
Age of Respondents		
21-30	13	12.4
31-40	47	44.76
41-50	22	20.95
51-60	17	16.19
>60	6	5.71
Total	**105**	**100**
Marital status		
Married	78	74.29
Single	21	20
Widow/separated	6	5.71
Total	**105**	**100**
Educational status		
No formal education	33	31.43
Quranic education	28	26.67
Primary education	26	24.76
Secondary education	14	13.33
Post secondary education	4	3.81
Total	**105**	**100**
Household size		
1-5 members	24	22.86
6-10 members	62	59.05
11-15 members	17	16.19
>15	2	1.9
Total	**105**	**100**
Farming experience		
1-5 years	23	21.91
6-10 years	59	56.19
11-15 years	17	16.19
>15 years	6	5.71
Total	**105**	**100**

Table 1: Summary of the socio-economic characteristics of the dry season tomato farmers.

Table 1: Summary of the socio-economic characteristics of the dry season tomato farmers - continuation

As shown in Table 1, dry season tomato production in the study area is male dominated (78.1%). This indicates dominance of male folk in dry season tomato production in the study area. This could be in view of the fact that the area is a Muslim dominated area and men have greater access to land than women. The mean age of the respondents was 38.27 years, revealing the presence of young and middle aged individuals who are known to be active with the youngest farmer being 26 years and the oldest 67 years. The study revealed that more than 74% of the respondents are married. The mean family size was 7 persons per household and the modal family size was 6 to 10 persons. The relatively large family size could be as a result of the practice of polygamy in the study area and the need for family labour. The study also revealed that 31.43% of the respondents had no formal education with only 13.33% and 3.81% having secondary and post secondary education respectively. The low level of education of the farmers could affect their adoption of appropriate technology. The average farming experience of the farmers was 8.68 years and about 63% of the respondents had more than 7 years experience in dry season tomato production. This is an indication that a good number of the farmers are highly experienced in dry season tomato production and could affect their productivity.

Costs and Returns Analysis

Table 2 gives a summary of the costs and returns analysis. The total value of output (TVO) in Naira per hectare less total variable cost (TVC) also in naira per hectare gave a positive value. This shows that dry season tomato production is a worthwhile venture with high returns. The total output produced was valued at the prevailing market price.

From the analysis of costs and returns to dry season tomato production, a gross margin of N 18, 956.75 ($US 120.74, at an exchange rate of N157 to a dollar) per ha per farmer was obtained. This therefore, implies that dry season tomato

production is a profitable business in the study area. The implication of this is that given the rising unemployment in the country, more people can take dry season tomato production as their primary source of livelihood by getting involved in large scale production of it and as a result improve their livelihood.

Variables	**Value in N/ha**
Total Value of Output	**149,969.56**
Less	
Total Variable Cost	**131,012.81**
Labour	67,096.85
Water	24,715.58
Seed	7,599.30
Fertilizer	9,603.33
Herbicide	2,380.38
Pesticide	4,217.30
Fuel	15,400.02
Equals	
Gross Margin	**18,956.75**

Table 2: Summary of Gross Margin Analysis in Dry Season Tomato Production.

Technical Efficiency of the Dry Season Tomato Farmers

The maximum-likelihood estimates of the parameters in the stochastic production frontier model and those in the technical inefficiency effect model are presented in Table 3. The results obtained indicate that technical inefficiency effects are significant for the dry season tomato farmers with σ^2 being significantly different from zero. hence, indicating that Cobb-Douglas production function is a representative model and that the majority of error variation is due to the inefficiency error u_i (and not due to the random error v_i). The magnitude and significance of the estimate for the variance parameter, γ, also supported the results from the likelihood-ratio tests. The maximum-likelihood estimate for the parameter γ is 0.844. This indicates that 84.4% of the variation in output of tomato production is probably due to the inefficiency of the dry season tomato farmer. Farm size, Labour and herbicides were statistically significant at 1% level of significance, while seed was significant at 5% level of significance. Since Cobb Douglas type production function was used, the estimator directly represents elasticity of independent variables. The estimated Maximum Likelihood (ML) coefficient

Variables	Co-efficient	Standard-error	t-ratio
Production function			
Constant	0.728	0.381	0.191
Farm size (ha)	0.667***	0.181	3.686
Labour (manday)	0.123***	0.0419	2.921
Water (litres)	0.127	0.225	0.565
Seeds (kg)	0.701**	0.355	1.98
Fertilizer (bags)	-0.305	0.246	-0.136
Herbicides (litre)	0.114***	0.022	5.18
Pesticides (litre)	0.125	0.27	0.462
Inefficiency model			
Constant	0.459	0.262	0.176
Age	-0.113*	0.064	-1.76
Education	-0.405**	0.206	-1.98
Access to credit	-0.490**	0.228	-2.15
Non-farm income	0.146	0.452	0.323
Sigma squard (d2)	0.332	0.416	0.799
Gamma (g)	0.844	0.106	0.794
Log likelihood function	0.3004		
One sided error	0.5003		

* Significant at 10% ** significant at 5 % ***significant at 1%

Table 3: Maximum Likelihood Estimates of the stochastic frontier production model.

Technical efficiency (%)	Minimum (%)	Maximum (%)	Frequency	Percentage
Less than 60	32.3	54.58	9	8.57
60.00 – 69.99	60.24	69.96	12	11.43
70.00 – 79.99	70.19	79.97	19	18.1
80.00 – 89.99	80.04	89.77	47	44.76
90.00 – 99.99	90.64	99.91	18	17.14
Total			105	100
Mean efficiency: 78.94%				

* Significant at 10% ** significant at 5 % ***significant at 1%

Table 4: Efficiency Distribution of Dry Season Tomato Farmers.

of farm size showed positive value of 0.667, and was significant. Therefore increments of farm size by one percent will increase output by 0.667%. This implies that farmers with greater access to farm land are likely to be more efficient. Similarly, the estimated ML coefficient for labour showed positive and significant value. Therefore increment of labour usage by one percent will increase the output by 0.123%. The implication of this is that farming households with larger household size are likely to be more efficient. The positive impact and significance of seed and herbicides indicates that improved seed varieties and usage of herbicides are highly responsive and tends to give higher productivity in dry season tomato production.

The estimated coefficients of the explanatory variables in the model for technical inefficiency effects are of interest and have important implications as shown in Table 3. Given the specifications of the preferred model with inefficiency effect, it is noted that the age of farmers has a negative effect on inefficiency and significant at 10%. This indicates that older farmers have higher technical efficiency than younger farmers. Older farmers may take benefit of their experience to use inputs more efficiently for tomato production; hence age of farmers is a decisive factor in improving the efficiency of farms. The coefficient of education is negative and statistically significant at 5%. Kumbhakar, Biswas and Bailey (1989) and Battese and Coelli (1993) also identified farmers' level of education as a determinant of technical inefficiency effects. This could be due to better access to information and good farm planning also, farmers with more education respond more readily in adopting new technology and produce closer to frontier output.

The coefficient of access to credit was negative and statistically significant at 5%. This implies that farmers with better access to credit are more efficient. This could be in view of the fact that they would have better access to the needed production inputs.

Table 4 shows the efficiency distribution of dry season tomato producers. The table explains how efficient the tomato farmers are in their dry season tomato production.

The mean technical efficiency of 78.94% obtained in this study is rather high. However, a gap still exists between the efficiency of the least technically efficient farmer 32.3% and that of the mean technical efficiency. This suggests that considerable amount of productivity is lost due to inefficiency. The result therefore indicates that potential still exists for the farmers to increase output using the available resources. A pie chart representation of the efficiency distribution of the dry season tomato farmers is given in figure 1.

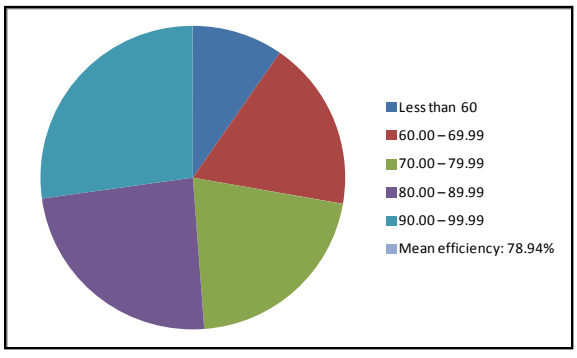

Figure 1: Efficiency Distribution of the Dry season Tomato Farmers.

Conclusion

This study has shown that the dry season tomato farming is a profitable business.

Within the limit of partial productivity analysis, farm size, availability of labour, type of seed, and usage of herbicide are important factors in dry season tomato production. Thus, to increase efficiency in dry season tomato production, availability of improved seed and other inputs as shown by the results of the study may be appropriate for the improvement of productivity in dry season tomato production. The inefficiency effects is explained by age, education of the farmer and access to credit and are decisive factors in determining the efficiencies of the dry season tomato producers.

In line with the results of the study, it is recommended that, government should invest in public education and review agricultural loan policies in government banks, private banks and microfinance institutions (MFIs) to increase credit access to smallholder tomato farmers. This will reduce the burden of high cost of production on the farmers and encourage the farmers to expand their farm size and increase production. Also, improved seed should be made available to the farmers to raise their productivity. Given the rising unemployment rate in the country, people should be encouraged to go into dry season tomato production. Increased awareness on the need to increase average yield of the farmers through the adoption of appropriate technological change and wise use of chemicals is also recommended.

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Economic Impact of Support Service Program on Micro and Small Enterprises: The Case of Dire Dawa Administration, Ethiopia

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Abstract

Special attention has been given to untie the constraints of Micro and Small Enterprises in Ethiopia for they are important vehicles to address the challenges of unemployment, economic growth and equity in the country. The government is implementing different support service programs, in the forms of financial and business development, in different parts of the country. This study is aimed at evaluating economic impact of MSEs support service programs on enterprise sales, employment and capital asset formation in Dire Dawa Administration, Ethiopia. Propensity Score Matching is employed to estimate the impact of support service program. The result revealed that the program resulted in average increment of monthly sales by 28%, employee level by 42%, and capital asset formation by 60%. It is, therefore, indispensable to strengthen and expand the support service program to non participant enterprises by giving special attention to the major problems that participant enterprises are currently facing.

Key words

Micro and Small Scale Enterprises, propensity score matching, economic impact, support service programs, Ethiopia.

Introduction

Micro and small enterprises (MSEs) play vital roles in poverty reduction, income and employment generation as well as economic development in developing countries like Ethiopia. The sector is now increasingly recognized unlike the previous pessimist notion that these sectors are not linked to the modern and formal sectors and would disappear once industrial development is achieved (McPherson, 1996). The Ethiopian MSE sector include a diverse set of operators ranging from petty traders to small restaurant owners, shoeshine boys to small shoes making enterprises, peddler in the street to grocery business operators, and the likes. Even though, the increased role and contribution that the MSE sectors could provide to the country's economy is immense, the sector is largely constrained by various structural, institutional, and policy related problems and bottlenecks that stifle its rapid growth and development (FeMSEDA, 2004). The major constraints facing the sector comprises the stringent legal and regulatory environments, poor access to markets, shortage of finance, inadequate business information, absence of business premises (at affordable rent), lack of technical and managerial skills, very limited access to appropriate technology, absence of access to quality business infrastructure, and in some cases discriminatory regulatory practices (Mead, 1998). Research findings of Amha and Ageba (2006) which focused on MSEs in major urban centers of Ethiopia revealed that access to markets and finance are the most pressing constraints of the sectors. This sector faces similar constraints throughout Ethiopia including Dire Dawa Administrative region.

A number of African countries adopted poverty reduction strategies that mainly emphasized on development and promotion of micro and small enterprises (MSEs) as a major way to reduce poverty particularly among urban dwellers (Liedholm, 1993). The Ethiopian government recognized the sector in 1997 through the issuance of MSEs promotion and development strategy which was reviewed in 2011 in view of the country's dynamic economic progress, program feedback and experience of other countries (MoTI, 2011). Special attention has been given at all levels to untie the constraints of MSEs for they are important vehicles to address the challenges of unemployment, economic growth and equity in the country. The government of Ethiopia has

been implementing and incorporating the program as a strategic agenda in three consecutive five years national developmental plans of the country i.e. the 1st five years plan called Poverty Reduction and Sustainable Development Program (PRSDP), in the 2nd five years plan called Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) and currently in the 3rd five years plan which is called Growth and Transformation Plan (GTP) covering the years from 2010/11 to 2014/15 (MoFED, 2011). In view of this, the government is implementing different support service programs in different parts of the country for helping MSEs attain their intended objectives.

The support service program for the promotion and development of these enterprises has been launched in Dire Dawa Administration since 2005. The elements of the program include an enabling legal framework and streamlining regulatory conditions and specific support services (financial and business development services). The financial service includes credit and saving scheme where as the business development services (BDS) include trainings, technology transfer, counseling, provision of working premises and the likes. In Dire Dawa, financial services are being provided through Dire Micro Finance Institution (DMFI) and the business development services are being provided by Dire Dawa Micro and Small enterprise Development Agency (AdMSEDA). Since the start of the support service programs, millions of dollars have been poured into the sector to ensure a healthy growth. The sector in Dire Dawa Administration comprises various set of enterprises under trade/ shop, services, and manufacturing category. It is, therefore, necessary to assess the impact brought about by the support service programs in Dire Dawa. Attempts made so far in this regard simply focused on qualitative evaluation of outputs and activities rather than on final outcomes of the program. This study is, therefore, an attempt to qualitatively and quantitatively evaluate the impact of the support service programs on final program outcomes in terms of changes in sales, employment opportunities, and capital accumulation of the enterprises.

The main objective of this study was to evaluate the impact of support services programs on the economy of micro and small enterprises in Dire Dawa Administration. Specifically it was intended to identify determinants of enterprise participation in support service program; and assess the impacts of support service programs on sales, employment and capital asset of MSEs.

Methodology

1. Description of the study Area

Dire Dawa Administration has 9 urban kebeles and 38 rural kebeles. The population of the Administration was 342,827 of which 68% are urban dwellers and the remaining 32% are rural dwellers (CSA, 2007). The administration is located between 90 27'- 90 49' north latitude and 41038'-42019' east longitude. According to the Central Statistical Agency of Ethiopia, the total area of the administration is 128,802 ha of which only 2% is urban and the remaining 98% is rural. The city is 515km away to the East from Addis Ababa. The topography of the administration varies from very high steep mountains to flat plains where altitude ranges from 950-2260 masl. The climate of the administration is classified as semi arid; the seasonal rainfall has a bimodal distribution with mean annual rainfall of 657mm and the mean annual air temperature of 25.30c. The Administration enjoys a sunny climate with mean and daily value of brighter sunshine for 8 hours. Trade and industry are the predominant sectors of the economy in Dire Dawa administration. Dire Dawa city is recognized to be a center of trade and industry for urban dwellers whereas the livelihoods of rural households depend on agro-pastoral way of livelihoods.

2. Sources and Method of Data Collection

Both primary and secondary data were the main sources of information for the study. The primary data were collected from randomly selected samples using structured questionnaire and interviews which were undertaken in May, 2011. Secondary data were gathered from relevant published and unpublished sources.

A multi-stage sampling technique was employed to select sample respondents. In the first stage, four kebeles were selected purposively out of the 9 kebeles based on population density and extent of enterprise activities. In the second stage, MSEs were stratified into two stratums, stratum one representing treatment group who participated in the support service programs, and stratum two representing the control group who do not participate in the program. In the third stage, using simple random sampling technique 83 program participant MSEs and 80 non-participant MSEs were selected randomly using probability

proportion to size sampling technique constituting a total sample of 163 MSEs.

3. Methods of Data Analysis

Both qualitative and quantitative analytical tools were employed to assess the impact of support service programs of MSEs. Actually, good impact evaluations often combine both quantitative and qualitative methods to the extent possible (Heckman and Robb, 1985). Recently, the use of qualitative impact evaluation method has got increasing acceptance because it can provide critical insights into the program context and in-depth explanations to the results observed in a quantitative analysis (Friedlander and Robins, 1995).

The most frequently used non experimental method available for evaluating impact of a given program in the absence of baseline and time series data is propensity score matching (PSM) method (Jalan and Ravallion, 2003). This method neither requires randomization nor pre-intervention data and it is also used in the post-intervention data only. Unlike econometric regression methods, PSM does not rely on parametric assumptions to identify the impacts of program and it does not impose a functional form of the outcome thereby avoiding assumptions on functional form and error term distributions (Dehejia and Wahba, 2002). Besides these, PSM compares outcome for observation, who share similar observable characteristics using matching methods. This method involves matching program participants with a comparable group of individuals who did not participate in the program. PSM compares the actual observed outcomes of the program participants with counterfactual outcomes i.e. the hypothetical outcomes that would have prevailed in the absence of a program (Jalan and Ravallion, 2003). The central objective of this method is to estimate these unobserved counterfactual outcomes.

Now a day, matching, especially in its propensity score flavor, has become a popular program evaluation method in many applications of interest due to the high dimensionality of the observable characteristics. Consequently, in both academic and applied literature, the amount of research based on matching methods has been steadily increasing. The basic idea of the propensity score matching method is to match program participants with non participants typically using individual observable characteristics. Each program participant is paired with a small group of non participants in the comparison group that are most similar in the probability of participating in the program. The most frequently estimated parameter for such studies is the average treatment effect on the treated (ATT) which is the difference between the observed mean outcome of the program participants and the mean outcome of the constructed counterfactual (Caliendo and Kopeinig, 2008).

In the estimation of average treatment effect on treated (ATT) using PSM method the first task is estimating the propensity scores. A logit model is used to estimate the p-score using composite pre-intervention characteristics of sampled enterprises (Rosenbaum and Robin, 1983). The binary logit mode for obtaining the p-scores is specified as follows:

The probabilities of the MSE to participate and not to participate in the program are expressed, respectively, as:

$$P_i = \frac{1}{1 + e^{-Z_i}} \text{ and } 1 - P_i = \frac{1}{1 + e^{Z_i}}$$

where

$$Z_i = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + U_i$$

Now the odds ratio (Pi/1-Pi) is

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i}$$

The natural log of this equation is logit which is expressed as

$$L_i = \ln\left[\frac{P_i}{1 - P_i}\right] = Z_i = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + U$$

Where:

L_i = is a function of an explanatory variables (X_i)

i = 1,2,3,4...,n; β_0 = Intercept; β_1 = Regression coefficient to be estimated

X_i = Pre intervention characteristics

U_i = Disturbance term;

In this particular study, in order to assess impact, the dependent variable is participation in support service programs of MSEs; outcome variables are sales, capital assets and employments; and the independent variables are sex, years of schooling, marital status, family size, enterprise location, formality of business, enterprise age, and prior business experience.

After obtaining the predicted values conditional on the observable covariates (p-score) from logit estimation, matching was done using matching algorithm which is selected among the commonly used matching methods (nearest neighbor matching, caliper and radius matching and kernel matching) based on the matching criteria: estimator which have low pseudo R2, large matched sample size and large number of covariates with insignificance mean difference between the two groups of enterprises. Then the average effect of enterprise participation in the program on outcome variables (sales, capital asset and employment) was computed and it was specified as:

$$\tau_i = Y_i(D_i = 1) - Y_i(D_i = 0)$$

Where τ_i is treatment effect (effect due to participation in the intervention), Y_i is the outcome on enterprises, D_i is whether enterprise has got the treatment or not (i.e. whether an enterprise participated in the intervention or not).

However, one should notice that $\tau = Y(D = 1)$ and $\tau = Y(D = 0)$ cannot be observed for the same enterprises at the same time. Depending on the position of enterprises in the treatment (intervention participation), either $\tau = Y(D = 1)$ or $\tau = Y(D = 0)$ is unobserved outcome (called counterfactual outcome). Due to this fact, estimating an enterprises treatment effect τ_i is not possible. One has to shift to estimate the average treatment effect of the population than the individual one. The most commonly used average treatment effect estimation is the average treatment effect on the treated ( ) and is specified as

$$\tau_{ATT} = E(\tau|D = 1) = E[Y(1)|D = 1] - E[Y(0)|D = 1]$$

As the counterfactual mean for those being treated, $E[Y(1)|D = 1]$ is not observed, one has to choose a proper substitute for it in order to estimate ATT. One may think to use the mean outcome of the untreated enterprises, $E[Y(1)|D = 0]$ as a substitute to the counterfactual mean for those being treated, $E[Y(1)|D = 1]$. However, this is not a good idea especially in non-experimental studies. Because, it is most likely that components which determine the treatment decision also determine the outcome variables of interest.

For our particular case, variables that determine enterprise decision to participate into the program could also affect enterprise sales, capital asset and employment. Therefore, the outcomes of individuals from treatment and comparison group would differ in the absence of treatment leading to a self selection bias.

By rearranging and subtracting $E[Y(1)|D = 0]$ form both sides, one can get the following specification for ATT.

$$E[Y(1)|D = 1] - E[Y(0)|D = 0] = \tau_{ATT} + E[Y(0)|D = 1] - E[Y(0)|D = 0]$$

Both terms in the left hand side are observables and ATT can be identified if and only if $E[Y(1)|D = 1] - E[Y(0)|D = 0] = 0$ i.e. when there is no self selection bias. This condition can be ensured only in social experiment where treatments are assigned to units randomly (i.e. when there is no self section bias. In non-experimental studies one has to introduce some identifying assumption to solve the selection problems. The following are two strong assumptions to solve the selection problem.

Conditional independent assumption

Given a set of observables covariates (X) which are not affected by treatment (in our case, intervention participation), potential outcome (sales, capital asset and employment) are independent of treatment assignment (independent of how program participation decision is made by enterprises). This assumption implies that the selection is solely based on observable characteristics and variables that influence treatment assignment (program participation decision made by enterprises) and potential outcomes (sales, capital asset and employment) are simultaneously observed.

Common support region

This assumption rules out perfect predictability of D given X. That is $0 < P(D = 1|X) < 1$ .This assumption ensures that enterprises with the same X values have a positive relation of being both participants and non- participants.

Given the above two assumption, the PSM estimators of ATT can be written as

$$\tau_{ATT}^{PSM} = E_{P(x)|D=1}\{E[y(1)|D = 1, P(X)] - E[Y(0)|D=0,P(X)]\}$$

Where P(X) is the propensity score computed on the covariates X. The above equation indicates that the PSM estimators is the mean difference in outcome over the common support, appropriately

weighted by the propensity score distribution of participants.

In the final stage the robustness of the evaluation results were tested for their sensitivity for the hidden variables that may affect participation decision of enterprises.

Results and Discussions

1. Descriptive Results of Pre treatment characteristics

The survey result indicates that the mean of the two groups were significantly different with respect to operators education level (years of schooling), operators prior business experience, enterprise age, and enterprise location at 5%, 5%, 1% and 5 % probability levels, respectively. In contrast to non participants, participants have low years of schooling, small share of operators who have prior business experience, low years of enterprise age, and are located nearer to owners' residential areas. These might be due to the fact that enterprises with better educational attainments, better years of experiences, and older ages since establishments are not in need of the support services as they are now economically in a better position to expand their business. Besides these, the result disclosed that lack of working premises, lack of raw material supply and lack of working capital were the three critical problems facing the enterprises in the area. With regard to the quality of direct support services (both financial and BDS) so far provided to participant enterprises, owners of only 17% of enterprises responded that they are satisfied with the support services.

The survey result further revealed that the mean differences between the two groups in terms of the outcome variables, sales, capital asset and employment were statistically significant at 5%, 5% and 1% probability levels, respectively (Table 1).

Generally, the descriptive results of all variables are based on pre-intervention characteristics of enterprises, and it does not indicate whether the observed differences are exclusively because of the program.

Those enterprises which are engaged in manufacturing sector gained more income and save more as compared to the other two sectors followed by those which are involved in service sectors and retail trades in that order. Those enterprises engaged in manufacturing accumulated higher capital asset as compared to those in the service sector. Enterprises which are engaged in trade/ shop sectors did not create adequate capital asset as compared to the other two sectors. Furthermore, enterprises which are engaged in retail trades did not recruit employees and are almost operated by owners; whereas enterprises which are engaged in service and manufacturing sectors have 2 to 10 employees.

All participant enterprises undeniably underlined the importance of both support services (financial and BDS). However, they indicated that the loan size (intensity of loan) was too small to expand their businesses. Besides, they also revealed that the interest rate and other additional fees (service charges and registration fees) were very high. With regard to the second support service (BDS), they indicated that the service is very limited in coverage and contents; the service provider institutions lack capacity particularly in terms of man power; there is weak and loose contact between extension agents and MSEs; and there is poor linkage between

Characteristics	All sample (N=163)		Particip. (N=83)		Non- Particip. (N=80)		t- Value
	Mean	SD	Mean	SD	Mean	SD	
Education (years)	7.83	3.92	7.12	3.63	8.58	4.09	2.403**
Family size (no.)	4.45	2.16	4.59	2.33	4.3	1.97	-0.858
Enterprise age (yrs)	7.6	6.62	6.25	4.93	9	7.55	2.759***
Sales (Br)	6,647	5,880	7,723	6,466	5,531	5,003	2.415**
Capital Asset (Br)	25,431	24,335	31,297	14,292	19,345	16,171	2.45***
Employment (no.)	1.9	1.23	2.37	0.89	1.41	1.35	5.386***

Note: *** and ** means significant at 1% and 5% probability levels, respectively.

Table 1: Summary of descriptive results for some pre-intervention characteristics.

service providers and enterprises.

2. Econometric Model Results

2.1. Estimation of propensity scores

Prior to running the logistic regression model, a test of multi-collinearity problem and problem of hetroscedasticity were done. There was no explanatory variable dropped from the model since there is no series problem of multicollinearity. This is because for all explanatory variables VIF values were by far less than 10. Furthermore, hetroscedasticity test was done using Breusch-pagan (Cook-Weisberg) test. This test resulted in rejection of the existence of heteroscedasticity hypothesis because the p-value was 0.1418 (14%) which is insignificant, implying absences of hetroscedasticity problem.

In order to measure the average treatment effect on the treated (ATT) for the projected outcome the usual PSM steps were performed: logit model was run to estimate the p-score using pre intervention characteristics, selection of best matching estimators and matching performed, common support and overlap were checked, matching quality test and effect estimation were done and finally sensitivity analysis were performed to correct the hidden bias and common support problems.

The logistic model result revealed low pseudo R2 (0.15) indicating that the variables included in the model are simultaneously affecting both the probability of participation decisions into the program and the outcome variables. Besides these it showed that the explanatory variables are independent of participation and hence, it becomes easier to find a good match between participant and non-participant enterprises.

2.2. Factors affecting program participation

According to the logit result, four explanatory variables determined participation decision: years of schooling at 5%, prior business experience at 1%, enterprise age at 5% and location at 1%. The estimated results revealed that those operators who do not have prior business experience, who have low level of education, and enterprises that have short business life and located nearer to the owners' residence were those which are more likely to participate in the support service program (Table 2).

2.3. Matching sampled enterprises

Before matching, three main tasks were accomplished. First, predicted values of program participation (propensity scores) were estimated for all sample respondents. Second, a common support condition was imposed on the propensity score distributions of sample respondents. Finally, observations whose predicted propensity scores fall outside the range of the common support region were discarded. Accordingly, the estimated propensity scores vary between 0.028 and 0.933 (mean = 0.604) for participant enterprise operators and between 0.018 and 0.80 (mean = 0.410) for non-participant enterprises. The common support region would then lie between 0.028 and 0.80. In other words, enterprises whose estimated propensity scores are less than 0.028 and larger than 0.80 were discarded for the matching exercise.

Then matching was performed using propensity score of each observation using alternative matching methods. The choice of best matching method involves a trade-off between matching quality and its variance. The result indicated that

Independent variables	Coefficients	Std. Error	Z-value
Sex	-0.09	0.37	-0.24
Marital status	0.54	0.41	1.31
Years of schooling	-0.12**	0.05	-2.24
Family size	0.13	0.08	1.62
Prior business experience	-1.07***	0.38	-2.81
Enterprise age	-0.09**	0.04	-2.25
Location	-1.04***	0.37	-2.81
License	0.05	0.42	0.12
Constant	2.68***	0.94	2.85

Note: *** and ** means significant at 1 percent and 5 percent probability levels, respectively.

Table 2: Logistic results for factors affecting enterprise participation in the programs.

kernel matching with a band width of 0.1 is found as the best estimator for the data at hand as it satisfies the three important criteria; estimator having higher number of variables with no statistically significant mean difference between the mean of the estimated propensity scores in both treatment and control groups, an estimators having low pseudo-R2, and large matched sample size. Thereafter, the estimation results and discussion are the direct outcomes of the kernel matching algorithm with a band width of 0.1.

After choosing the best performing matching algorithm, the next task is to check the balancing power of estimation (propensity score and covariate) using different matching quality test methods: reduction in the mean standardized bias between the matched and unmatched enterprises, equality of means using t-test and chi-square test for joint significance for the variables used by applying the selected matching algorithm (in our case kernel matching 0.1 band width). In the present matching models, the standardized difference in X before matching is in the range of 13.5% and 48.9% in absolute value. After matching, the remaining standardized difference of X for almost all covariates lie between 1.8% and 10.5%, which is below the critical level of 20% suggested by Rosenbaum and Rubin (1985). The process of matching thus creates a high degree of covariate balance between the treatment and control samples that are ready to use in the estimation procedure. Similarly, t-values show that before matching all of the chosen variables exhibited statistically significant differences while after matching all of the covariates are balanced. The low pseudo-R2 and the insignificant likelihood ratio tests support the hypothesis that both groups have the same distribution in covariates X after matching. These results clearly show that the matching procedure is able to balance the characteristics in the treated and the matched comparison groups. Thus, the results used to evaluate the impact of program interventions on participant enterprises which have similar observable characteristics allowed comparing observed outcomes for participant enterprises with those of a comparison groups sharing a common support region.

2.4. Testing overlap and conditional independence assumptions

The result indicated that the value of pseudo R2 is fairly low after matching indicating that the unconfoundedness assumption is plausible. In addition to this, the study uses p-scores to test the plausibility of the overlap assumption. The results of matching exercise indicated that there appeared unmatched observations in the treated groups before common support condition is imposed. However, after matching the data using kernel matching method with band width 0.1, the common support condition has trimmed out a total of 18 participant observations from the model signifying that the overlap assumption is also plausible for the estimator.

2.5. Treatment effect on the treated (ATT)

The impact of MSEs support service program on outcome variables (sales, capital asset, and employment) are evaluated for their impact on participant enterprises. After controlling the differences in pre intervention characteristics of treatment and control enterprises, it was found that program intervention improved sales of participant enterprises by birr 2,248 (38%) per month. The program also improved capital asset of participant enterprises by birr 11,091.68 (60%) and employment by 1.02 (42%) as compared to non-participant enterprises (Table 3). These were achieved through the specific support services provided which helped them in improving product quality, improving their competitive power, getting access to finance and financial management skills, getting access to the market and to have access to production and sales outlets and the likes. Furthermore, the specific support services (financial and BDS) provided in the area focused on healing the critical challenges of enterprises that restrain business start up and expansion.

Variable Sample	Obs.	Treated	Controls	Difference	S.E.	t-value
Sales	145	8,113.88	5,865.62	2,248.25	1073.83	2.09**
No of employees	145	2.43	1.4	1.02	0.21	4.83***
Capital asset	145	29,615.51	18,523.83	11,091.68	6,368.19	1.74*

Note: ***, ** and* means significant at 1%, 5% and 10% probability levels, respectively.

Table 3: Average treatment effect on the treated (ATT).

2.6. Sensitivity analysis

Sensitivity analysis is aimed to assess the sensitivity of estimated results with respect to deviation from conditional independence assumption. Thus, Rosenbaum bounds were calculated for program effects that are positive and significantly different from zero.

Under the assumption of no hidden bias (log of odd ratio one) for each outcome variables, the upper bound significance levels (sig^+ = test statistics) give similar result indicating the significance of treatment effect. For sales and capital asset the upper bound on the significance level for gamma value of 1.05 - 1.75, 2 and 3 are 0.00, 1.10, and 2.4, respectively; and also for employment the upper bound on the significance level for gamma value of 1.05 - 1.75, 2 and 3 are 0.00, 5.10, and 1.3. This implies that capital asset and sales are insensitive to a bias that would multiply the odds of participation by a factor of 1.05 - 1.75 but sensitive to a bias that would double and triple the odds.

In conclusion, the results show that the inference for the effect of the program interventions is not changing, though participants and non-participant enterprises have been allowed to differ in their odds of being treated up to 1.75 in terms of unobserved covariates. Thus, impact estimates (ATT) are insensitive to unobserved selection bias and pure effect of support service program.

Conclusions and Recommendations

1. Conclusions

This study evaluated the impact of support service program on sales, capital asset and employment of micro and small enterprises (MSEs) in Dire Dawa Administration. The study used cross sectional data collected randomly from four urban kebeles out of the nine urban kebeles in Dire Dawa, Ethiopia. The data were analyzed using propensity score matching (PSM) approach.

The econometric result revealed that participation decision is significantly influenced by four explanatory variables: years of schooling, prior business experience, enterprise age, and location of enterprise. The PSM result revealed that the support service program has brought positive impact through augmenting gross income (sales) and saving, capital asset formation, employment generation. Specifically, the program intervention has improved the economy of participant enterprise through improving sales by an average amount of birr 2,248 (38%), employment level by a number of 1.02 (42%), capital asset by an amount of birr 11,091.68 (60%).

These program impacts were observed through the efforts so far performed for promoting and developing MSEs: establishment of legal framework and streamlining of regulatory conditions and the provision of direct enterprises support services (Financial and BDS). However, the qualitative analysis indicates that still there have been certain problems that impede the promotion and development of the sectors, particularly in terms of financial and business development services.

Generally, both qualitative and econometric analysis concretely justified that MSEs support service program intervention so far provided in Dira Dawa adminstration has brought positive impact on participant enterprises.

2. Recommendations

Close collaboration of financial service providers and business development service providers is extremely necessary for the MSEs to curb their working capital problems and expand their sales and employment levels. In addition, in order to have maximum impact of support services on MSEs, policy makers and the service provider institutions need to consider and revise the extent, intensity and quality of services and their linkages. Besides, Dire Dawa city administration and the service providers have to undertake aggressive promotion and awareness creation activities so as to bring the jobless youth to the business of MSEs. Furthermore, strengthening the available services to the participant enterprises and extending the services to non-participants will also help the MSEs absorb the extra jobless communities, build their capital assets, and enhance their sales volume.

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Agritourism Farms - Evaluation of Their Websites Quality and Web 2.0

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Anotace

Na základě porovnání výsledků z dotazníkových šetření z let 2009 a 2012 bylo zjištěno, že kvalita www prezentací agroturistických farem se téměř nemění. Kvalita stránek u stejných farem je statisticky vyšší pouze u kritéria "Obsah – struktura" www stránek. Lze usuzovat, že v roce 2012 farmáři věnovali větší pozornost struktuře informací, které prezentují na vlastních stránkách. Farmy, které mají vlastní doménové jméno, vykazují statisticky významně vyšší kvalitu www prezentací.

Obecně lze říci, že prezentace agroturistických farem málo využívají nové přístupy v internetových technologiích. Proto byl navržen postup jak inovovat méně kvalitní www prezentace pomocí WCMS WordPress. Je doporučováno více využívat technologie Web 2.0, například pomocí mashup technologií integrovat do webových prezentací související informační zdroje (odkazy na sociální sítě, propojení s počasím nebo zdrojem RSS v daném regionu).

Klíčová slova

Agroturistika, kvalita website, SEO, Web 2.0, WordPress.

Abstract

Based on surveys carried out in 2009 and 2012 it can be suggested that the web presentations of agritourism farms are virtually unchanged. The quality of the web pages for the same farms is statistically higher only for the criterion of "Content – structure" of websites. It can be assumed that in 2012 farmers devoted more attention to the structure of information that is presented on their own websites. Farms that have their own domain name show statistically significantly higher quality websites.

Generally, it can be said that the website presentations of agritourism farms do not use the new approaches to the internet technologies as much as they could. For this reason, an approach has been proposed for upgrading the www presentations of lesser quality by means of the WCMS WordPress. It is recommended to use the Web 2.0 technologies, e.g. integrate through the mashup technologies the associated information sources into the websites (links to social networks and weather forecasts or the RSS sources in a given region).

This paper was elaborated within the framework of the solution VZ MSM 6046070906 „Economics sources of Czech agriculture and their efficient use in the context of multifunctional agri-food systems".

Key words

Agritourism, website quality, SEO, Web 2.0, WordPress.

Introduction

The multiplication effects of tourism put it amongst the significant factors of economic growth. It is one of regional development tools in the form of rural tourism. Agritourism represents a specific category of regional tourism. Webster Dictionary defines agritourism as the practice of touring agricultural areas to see farms and often to participate in farm activities. [1]

Today`s tourists are increasingly more demanding. Ecology, healthcare and healthy life style, culture and active use of free time play a much more important role in their current "modern" life.

Potential agritourism farms visitors search for information mainly on the internet and it is, therefore, essential that the agritourism farms present their activities by means of suitable web pages. Morisson [10] analyses the impact of IT

on tourism in great detail. Law et al.[6] provide a comparison of different methods for the evaluation of tourism web sites. Havlicek et al. [4] explain the possibilities of using ICT in the Czech Republic`s agritourism in 2009.

Several years ago the web presentation of a company would have gained an advantage against competition. Today, having a website is an absolute necessity and the emphasis on the overall quality of the website is very strong. Even when a website is completed its regular update is necessary. The www technologies continue to develop and new applications, called Web 2.0, are created through the usage of the so-called "mashups". Furthermore, the great current phenomena are the online social networks of which the most typical representative is Facebook. It would therefore seem imperative to use these new technologies for the sustainable development of regional tourism.

Materials and methods

The main objective of this paper is to compare the results of two questionnaire surveys, which aimed at determining the quality of the websites of tourist facilities in rural regions. The results would then provide a basis for the proposed new approaches to the www presentations of agritourism farms.

In 2009 a questionnaire was compiled to evaluate the websites quality. The first results from this survey were published by Havlicek et al.[3] Table 1 outlines the comparison of the original 2009 questionnaire with an updated version of 2012.

Each criterion in Table 1 was evaluated on the scale from 0 to 4 points (where 4 is the best result). In the "Content – languages" criterion the scale ranged from 1 to 4.

Characteristics of the evaluated criteria

The basic attributes that most influence the quality of the website include:

Content and structure

A web presentation (e.g. of a farm, see Table 2) must be well-structured with easy to understand text. Presented information should always be up-to-date and, if possible, in several languages.

Design

Almost limitless graphics options in creating a web site give rise to a design that can be beautiful but, if one is not careful, can become unattractive. It is important that the visitor gets a pleasant feeling when viewing the page that interests him/her, and will be happy to return.

Number of advertisements

Pages without advertisements were awarded 4 points. Those with one advertisement received 3 points, with two adverts were given 2 points, with three only 1 point and with more adverts they had scored zero points.

Criteria	2009	2012	Comment
Content – structure	yes	yes	Statistically evaluated
Content – update	yes	yes	Statistically evaluated
Content – languages	yes	yes	Statistically evaluated
Design	yes	yes	Statistically evaluated
Number of advertisements	yes	yes	Statistically evaluated
Browsers support	yes	no	Too much variability in the use of browsers
Wayback– website age	yes	yes	Not evaluated
Complexity of the web address	yes	yes	Used as a criterion for sorting data from 2012
Age of the domain names	yes	yes	Not evaluated
Number of Google backlinks	yes	yes	Not evaluated
Number of Seznam backlinks	yes	yes	Not evaluated
Google Page Rank	yes	yes	Not evaluated
Seznam S-Rank	yes	yes	Not evaluated
Accessibility	yes	yes	Statistically evaluated
Version for printing	yes	no	Not used

Source: own processing

Table 1: The criteria of the 2009 and 2012 questionnaires.

Homepage	Introduction, logo, advertising motto, a typical photograph (picture), contact information
About us (about the farm)	Farm´s focus (animal husbandry, cultivation of special plants, organic products, etc.)
Activities on the farm and in the neighbourhood	Accommodation, places to visit, attractions in the neighbourhood
Price list	Prices for accommodation and meals (preferably in a table form)
Photo Gallery	Guide to farm, or a video focused on a particular event
Contacts	Owner's name, address, phone, email, GPS coordinates

Source: own processing

Table 2: Recommended structure for a farm´s presentation.

Errors in accessibility	Range of ratings points
Website contains no errors and warnings, is accessible and also includes some features that contribute to accessibility (green icon).	4
Web site contains no errors or warnings, is accessible.	3
Web site contains no errors in accessibility, but contain one or more warnings (yellow icons).	2
Web site contains only one or a combination of these three errors in web accessibility (lack of longdesc, blank form label, image maps on the server side).	1
Any error in the accessibility of sites (red icon) in addition to the three rules listed on the line above.	0

Source: wave.webaim.org and own processing

Table 3: Accessibility rating.

Accessibility for handicapped people

Accessibility of a homepage has been tested using web accessibility tool Wave (http://wave.webaim.org). The range of ratings is shown in Table 3.

A new approach has been developed for updating the websites with the lowest evaluation points with minimum costs. This study presents an example of a solution using the Web 2.0 technologies (see the results in Section e).

Results and discussion

The data obtained from the surveys in 2009 and 2012 have been analysed from several viewpoints. The results are presented in the following categories:

- Comparison of all agritourism farms in 2009 and 2012 (Section a)
- Comparison of the same farms in 2009 and 2012 (Section b)
- Comparison according to the complexity of the web address - only in 2012 (Section c)
- Search Engine Optimisation (SEO) evaluation (Section d)

a) Comparison of all agritourism farms in 2009 and 2012

In 2009, after excluding incorrectly filled-in forms only 219 questionnaires out of 421 were used for analysis and comparison.

In 2012, 449 correctly completed questionnaires out of 947 were statistically processed. This drop in the total analysed number is due to the inclusion of only the questionnaires concerning the farms involved in agritourism (or rural tourism in relation to agriculture). Items such as tourist cottages, guesthouses, B&B`s, hotels, etc. have been excluded.

Individual evaluated criteria were compared using the Two-sample Assuming Unequal Variances t-Test. The results obtained are shown in Table 4.

The average value of the “Content – structure” criterion is higher by 0.08, but the other criteria are lower. There is a statistically significant change in the“ Content – languages” criterion. The average value for this criterion has decreased by 0.13. This change can be explained by the increased use of tools for translating web content, which is implemented directly in the Google Chrome browser. For these

Criterion	Mean		Variance		T stat	Significant α=0.05
	2009	2012	2009	2012		
Content – structure	2.78	2.86	0.98	0.97	-0.96	No
Content – update	2.58	2.54	1.83	1.7	0.35	No
Content – languages	1.58	1.45	0.81	0.74	1.68	Yes
Design	2.51	2.48	1.29	1.38	0.3	No
Number of advertisements	3.12	3.1	2.02	1.95	0.23	No
Accessibility	1.18	1.07	1.89	1.64	0.98	No
Sum	13.71	13.5	11.58	13.7	0.72	No

Source: own processing

Table 4: The results for all the questionnaires.

Criterion	Mean		Variance		T stat	Significant α=0.05
	2009	2012	2009	2012		
Content – structure	2.75	3.05	0.94	0.86	-1.73	Yes
Content – update	2.68	2.65	1.71	1.72	0.14	No
Content – languages	1.58	1.75	1.03	1.14	-0.88	No
Design	2.55	2.6	1.03	1.29	-0.25	No
Number of advertisements	3.28	3.43	1.63	1.13	-0.7	No
Accessibility	1.3	1.17	1.91	1.73	0.54	No
Sum	14.15	14.65	12.27	14.6	-0.75	No

Source: own processing

Table 5: The results for the same farms.

reasons it is not a priority for the web designers to create new language versions.

In all other criteria the average values have decreased, but none of these changes are statistically significant.

Partial conclusion

The overall quality of the websites in 2012 compared with 2009 has remained virtually unchanged.

b) Comparison of the same farms in 2009 and 2012

In both surveys the same 60 farms websites were evaluated.

A statistically significant change was demonstrated only in the "Content – structure" criterion (see Table 5). The significantly higher value of 0.3 can be explained by the fact that farmers are paying more attention to the structure of information that is presented on their own websites. Statistically, the other criteria do not show significant differences. The overall rating is slightly higher by 0.5 points, but at the significance level of alpha = 0.05 it was insignificant.

Partial conclusion

The overall quality of the websites has not improved. Only the "Content – structure" criterion had a statistically significant higher value in 2012.

c) Comparison according to the complexity of the web address (only in 2012)

Completed questionnaires from 2012 were sorted according to the criteria of the „Complexity of www address" into two groups. Farms with the domain name of the second level such as www.agroturistika.cz were placed into one group (360 questionnaires). The second group consisted of farms with a complex web address, such as the domain name of the third level www.xxxx.wz.cz or address type www.xxxx.cz/cs/farma1 (89 questionnaires).

The technological background of each website is not known. Hypothetically, we assume that if the farm has its own domain name it is more likely that the website quality will also be better. This assumption is based on the fact that if a farmer registers his own domain name he pays greater attention to the website quality.

Criterion	Mean		Variance		T stat	Significant α=0.05
	level 2	level 3	level 2	level 3		
Content – structure	2.98	2.37	0.88	1.08	-5.01	Yes
Content – update	2.69	1.96	1.54	1.98	-4.51	Yes
Content – languages	1.53	1.15	0	1.53	-5.3	Yes
Design	2.66	1.74	1.22	1.35	-6.77	Yes
Number of advertisements	3.26	2.44	1.68	2.54	-4.5	Yes
Accessibility	1.09	0.97	1.69	1.46	-0.88	No
Sum	14.21	10.62	11.24	13.42	-8.42	Yes

Source: own processing

Table 6: Comparison according to the complexity of the web address.

All criteria (except for accessibility) have the higher values, which are statistically significant at the significance level alpha = 0.05 (see Table 6).

Partial conclusion

It can be argued that farms that have their own domain name have significantly better quality websites. This is probably due to their investing more money into creating and updating websites.

d) Search Engine Optimisation (SEO) evaluation

During the development of websites it is necessary to concentrate on achieving good rankings by search engines. This is important for obtaining higher traffic (i.e. number of visits to the website) from search engines. This traffic, in some cases, forms more than 95% share of the total number of website visits.

One of the important factors affecting link positions is the technology of backlinks.

Search engines positions are calculated on the basis of the so-called “ranks”. These are internal ratings used in the calculation methods of search engines. The best known rank is “PageRank”.

These criteria were used in the questionnaires (number of backlinks and toolbar PageRank value), but there are continuous changes in the methods of counting them (PageRank and S-Rank), so it is not convenient to use them for statistical research.

Partial conclusion

SEO is an inseparable part of any web site. It is carried out by using methods which are not documented and, for this reason, the raw data from the questionnaires had not been analysed.

e) Websites innovation

Some websites are already obsolete (see Figure 1) and unattractive for the current competitive environment.

The WCMS (Web Content Management Systems) are suitable for the websites improvement. The most popular systems that can be used for this purpose include Open Source software, particularly WordPress.

The high quality and modern style of a website produced by WordPress are due to the extension of a number of so-called plug-ins. These extensions enhance the usability and usefulness of the presentation. The following modern elements of Web 2.0 technologies, such as microformats [2] could be added to the website presentations:

- Event - hCalendar
- Contact - hCard
- Evaluation - hReview
- Geolocation - geo
- Product – hProduct

Modern presentations often utilize mashups technologies, which allow linkages to other servers and offer better and more sophisticated service to visitors. These technologies include:

- Mapping service (Google maps, Maps Seznam.cz)
- Online news via RSS (eg Yahoo! Pipes)
- Servers providing multimedia support (Flickr, Panoramio, YouTube)
- Online social networks (Facebook, Twitter, LinkedIn).

Links to other resources allow the user a comprehensive view of agritourism farms presentations. They also include discussions and comments from social networks. This can be a determining factor in increasing the conversion

Figure 1: Habřina Farm - the original website.

Figure 2: Habřina Farm – a new presentation created in WordPress.

of a visitor into a customer.

Figure 2 illustrates the possibilities of integrating Web 2.0 technologies into websites. The letters A, B and C in Figure 2 designate areas which utilize the Web 2.0 technologies. These elements have been added to the site in order to improve the presentation of its content in the form of additional information.

Area A includes the icon of the RSS syndication technology news from Web sites. This is called an RSS feed that is generated automatically – and is based on posted items, pages or received messages. The RSS technology emerged gradually and, therefore, there are several versions of this format today. But this is a factor that can benefit not only individual users but also syndication sites that are based on many sources that are automatically

informed about the different areas. RSS refers to the principles of facilitating information sharing described by Liburd [8].

Area B features links to social networks and services, such as Facebook, Google+, Twitter, YouTube, Skype and e-mail. The network with the largest number of users is Facebook. It has currently more than 3.8 million Czech users and offers a huge potential market for agritourism farms. We can increase the impact of social networking by inserting a variety of references. For example, a special software application called widget provides information inserted into social networks and allows customers to interact with the site. The widgets include small items such as the „like“ button, „+1“ or „tweet“. All of these bring to the web what Liburd [8] calls “social action”.

Area C is an example of value-added information, which is linked to the website through Web 2.0 technologies. The embedded supplement shows the current weather. It is technically possible to implement it in a number of ways - by using prepared supplements, using API or some services such as custom data from automatic weather stations (AWS). Other similar types of mashup implementation are described byWanget al. [13].

Partial conclusion

It is possible to state that the usage of Web 2.0 technologies has a potential in ranking of web sites in search engines. Most web sites, which can be found in better positions, use some of these technologies. A better position obviously generates economic and social benefits as described by Marjanovic et al. [9]

Discussion

An important factor in promoting agritourism is a good Internet connection. The status and development of the Internet infrastructure in rural regions of the Czech Republic has been described by Vaněk et al. [11] and compared with the official source – the Czech Statistical Office.

Byeong Cheol Lee [7] analyzes in detail the positive aspects of Web 2.0 technology and highlights its importance for tourism.

Vaněk et al. [12] present the results of information and communication technologies (ICT) in a research report on the Czech Republic regions. It is focused mainly on the problems of mapping the cultural heritage in the country together with activities in the area of tourism and business activities associated with it (accommodation, food etc). One possible approach to using the Internet in promoting tourism is demonstrated in the example of the web portal entitled “Get to know Posumavi – a tourist guide to Posumavi Region”.

In the tourism sector it is recommended to increase the use of rating services. These include TripAdvisor, which is a typical representative of the „electronic word of mouth“ with millions of visitors a day [5].

Conclusion

Based on the surveys carried out in 2009 and 2012 it can be suggested that the overall quality of the Czech agritourism farms websites as shown by the evaluation of respondents has dropped slightly since three years ago. The quality of the web pages for the same farms has statistically increased only for the criterion of “Content – structure”.

It can be assumed that in 2012 farmers devoted more attention to the structure of information that is presented on their own websites. Farms that have their own domain name show statistically significantly higher quality websites.

Generally, it can be said that the website presentations of agritourism farms do not use the new approaches to the Internet technologies as much as they could. SEO is an important part of any web site.

A new approach has been proposed for upgrading the www presentations of lesser quality by means of the WCMS WordPress. It is recommended to use the Web 2.0 technologies, e.g. integrate through the mashup technologies the associated information sources into the websites (add links to social networks, weather forecasts or the RSS sources in a given region).

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Economic Effects of Investment Support of Adding Value to Food Products

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Anotace

Důvodem pro zpracování tohoto příspěvku je potřeba analyzovat a vyhodnotit podporu přidávání hodnoty zemědělským a potravinářským podnikům v rámci Programu rozvoje venkova (podopatření I.1.3.1) v kontextu přípravy dokumentů pro programové období 2014 - 2020. Aplikace výsledků výzkumu je prvním krokem k modifikaci pravidel pro poskytování podpory z PRV na programové období 2014 - 2020 tak, aby byly účelně a cíleně poskytovány na podporu potravinářského průmyslu v nových podmínkách. Řešení je z metodologického hlediska založeno na kontrafaktuální analýze a identifikuje hlavní efekty pro potravinářské odvětví s použitím ekonomických indikátorů. Výsledky ukazují, že podpořené podniky si do určité míry upevnily svou ekonomickou pozici. Investiční podpora má pozitivní dopad na finanční stabilitu, protože podpořené podniky v období 2007 – 2010 vykázaly menší pokles rentability v porovnání s nepodpořenými podniky. Investiční podpora zvyšuje produktivitu práce. Efekt na celkové hospodářské výsledky podpořených podniků je tlumen vyššími odpisy, které jsou důsledkem investic do dlouhodobého majetku.

Klíčová slova

Potravinářský průmysl, přidávání hodnoty, strukturální, podpory, ekonomické ukazatele, efektivnost.

Abstract

The reason for this contribution is need for analysis and evaluation of the support of adding value to food products in framework of the Rural Development Programme (sub-measure I.1.3.1) in the context of the preparation of new documents for the new programming period 2014 - 2020. Application of research results is the first step to modification of rules for the RDP granting aid for the programming period 2014 - 2020 in order to be efficient and targeted at food industry in the new conditions. From a methodological point of view the solution is based on counterfactual analysis and identifies the main effects for the food industry using economic indicators. Results show that the supported businesses consolidated their economic position to a certain extent. The investment support has positive impact on financial stability because participants had smaller decrease of profitability than nonparticipants in the period 2007 - 2010. The investment support increases labour productivity. But due to the higher depreciation, as the consequence of investments in fixed assets, the overall effects on economic results are slightly reduced.

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Key words

Food industry, adding value, structural support, economic indicators, efficiency.

Introduction

The economic recession has affected many sectors including food industry. It has increased the level of risk not only for suppliers, especially for farmers, but for the whole agribusiness. The objective of the paper is to evaluate the effects of support of adding value to food products under the Rural Development Programme (sub-measure I.1.3.1, RDP) with regard to the need for creating new strategic documents for the programming period 2014 - 2020. The economic research has not

comprehensively recognized effects of the RDP support sub-measure I.1.3.1. With respect to the need for design the rules of the upcoming programming period of the Common Agricultural Policy, it is necessary to prepare this evaluation.

In the context of EU accession of the Czech Republic it has been pointed out that the food industry offers opportunities for the development of production especially for products with higher added value. It can also stimulate foreign investors to a greater extent (Lukas - Pöschl, 2004).

According to Pokorný et al. (2008), building contacts and cooperation are fundamental prerequisites for the transition to a knowledge-based economy. The potential for innovations attracts the foreign investors focusing on higher added value. Furthermore, it contributes to an increase competitiveness of the region.

Puticová and Mezera (2011) engage in the problems of competitiveness and the performance of the Czech food industry. Both these attributes are evaluated in the framework the domestic manufacturing sector and market, as well as from the point of view of the relations in foreign trade, that means in context with the European and world market. They conclude that the sector competitiveness is not in a critical situation. However, the sector competitiveness assessed by the RCA index and foreign trade is not going to be improved. The stagnation has come. As it follows from the SWOT analysis, the reason is that the opportunities of the sector are not fully utilised. Food producers are facing the basic problems in the output sphere mainly in the domestic market.

As Čechura (2009, 2012) states, the technical efficiency in the food processing industry did not change significantly within the period from 2000 to 2007. The common feature of all analysed branches (food processing industry total, slaughtering, dairy, milling, feedstuffs, beverages) of the food processing industry is that the technological change did not contribute significantly to the development of efficiency in the analysed period. However, the distribution of technical change suggests that the gap between the best and worst food processing companies increased within the analysed period. On the other hand, he concludes that TFP (Total Factor Productivity) in the food processing industry significantly increase within the analysed period. The technological change is an important factor determining the TFP increase. Nevertheless, the improvement in production possibilities has been due more to the diffusion of knowledge generated in another part of the economy, or imported from abroad, than to the sector's own research and development.

Mejstříková, Mezera and Plášil (2011) reported that financial analysis shows that taking into account inter-branch heterogeneity the total profitability of both manufactures (CZ-NACE 10 and CZ-NACE 11) improved in spite of worsened economic conditions, which was a positive trend. It implies certain adaptability of a significant part of enterprises included in this financial economic analysis and their mutual inter-branch comparison.

According to evaluation of the period 2008 – 2010 (Mezera - Mejstříková, 2012), the book value added (in current prices) in the food processing industry increased in the group of small and medium enterprises between 2009 and 2010. On the other hand it fell down in the group of large enterprises (with 250 and more employees) in the same period. Authors assume that support programs and legislative measures are among key instruments for strengthening market and economics position of the Czech food industry.

The paper focuses on the economic effect of investment support targeting at adding value to food products in the Czech Republic. It especially attempts to answer the question if there are any effects on financial performance of supported companies compared to companies without public investment support. The assessment of nonfinancial effects is the challenge for future research.

The paper is organised as follows. First part describes data and methods of counterfactual analysis. The methods of data matching as well as result indicators for assessing financial effects are included. The second part devotes to description of the results. The last part concludes new findings with respect to the needs of the Ministry of Agriculture as the managing authority of the RDP.

Material and methods

Data on investment projects within the RDP measure I.1.3.1 "Adding value to agricultural and food products" is obtained from the Ministry of Agriculture (MoA). The database provides information about applicants (including legal form, region), project name, project assessment process, total investment expenditures, eligible investment expenditures, absolute and relative amount

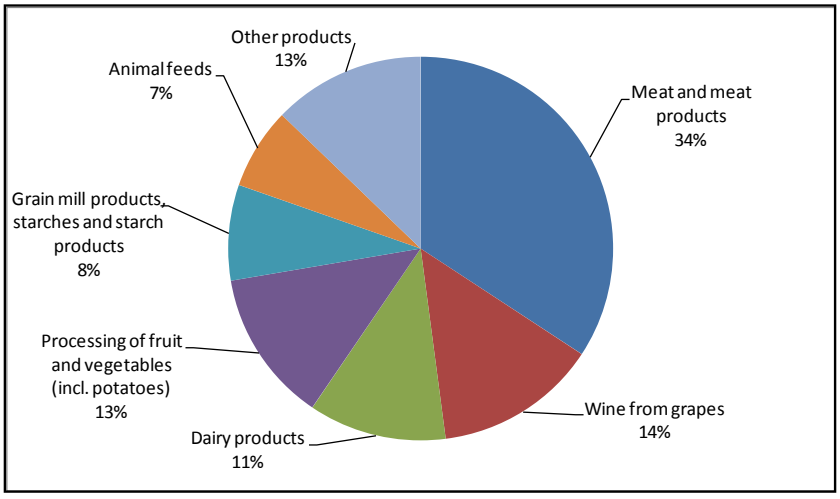
of the investment subsidy. We linked the MoA database with information from a database Soliditet - Albertina, which contains data from financial statements of companies in the CR as well as an overview of the company headquarters, industry, number of employees and total turnover. Thus we can obtain the basic information about companies whose applications were approved for investment between 2007 and 2011.

In the period 2007 – 2011, the MoA registered 1405 applications in measure I.1.3.1, of which 896 were applications by non-agricultural enterprises. Total 519 of 896 applications were approved, i.e. success rate was more than 50 %. Since the basic assumption for counterfactual analysis is that investment has to be in operation, only completed approved applications are taking into account. In the period 2007 - 2011, 336 applications were completed (settled), so it is possible to suppose that investment subject has really launched.

In the period 2007 – 2011, the total value of 336 completed investment projects was nearly 3.50 billion CZK of which about 1.16 billion CZK were investment subsidies from the RDP. The most completed applications were in the Southern Moravia Region (32 %). Figure 1 shows the distribution of completed projects by branch. The most capital-demanding projects were realized by manufacturers of grain mill products, starches and starch products (average investment expenditure per project was 18.0 million CZK) and in the dairy industry (average investment expenditure per project was 15.9 million CZK). On the other side, the least capital-demanding projects were set up by manufacturers of wine from grape (7.5 million CZK per project on average) and by the manufacture of prepared animal feeds (8.5 million CZK per project on average).

For the counterfactual analysis it is necessary to have one sample of supported enterprises and another sample of enterprises with similar structural characteristics that were not supported by RDP in the same period. Because accounting data are available with the lag of t-2, it is possible to use data only for the period 2007 - 2010. Total 245 of 336 applications were completed (settled) between 2007 and 2010, so they can be considered as supported and it is assumed that the investment was put into operation until 2010. The total number of 245 applications represented 178 applicants (individual enterprises) which can be labelled as "participants". Nevertheless, complete full accounting data in 2007 and 2010 are available only for 110 companies, so it is the final basic set of supported subjects for counterfactual analysis (labelled as "participants").

On the opposite side, 313 enterprises from food and beverage industry without investment support from RDP between 2007 and 2010 and with available full accounting data in both years are identified. From this group of nonparticipants it is necessary to select companies with similar characteristics as supported companies. The characteristics shall express company size, branch, capital endowment and capital structure in basic year 2007 (i.e. before public intervention). On the other hand, characteristics should not include covariates based on economic results (like EBIT, cash flow, value added etc.) because they serve as result indicators for subsequent counterfactual analysis. In addition,



Source: own calculation based on MoA database

Figure 1: The share of completed projects by branch (2007 – 2011).

selected variables do not correlate each other (Pearson correlation coefficients did not exceed ± 0.30). Following available indicators for matching participants and nonparticipants are selected:

- total assets (TA) as an indicator of company size,
- debt ratio (DR) as an indicator of capital structure,
- share of current assets to total assets (CA_TA) as an indicator of asset structure,
- share of bank loans to total liabilities (BL_TL) as an indicator of using structure of liabilities,
- current ratio (CR) as a measure of company liquidity,
- share of depreciation and amortization to total assets (DEP_TA).

Ratinger et al. (2012) highlight two serious problems of CMEF (Common Evaluation a Monitoring Framework) and the EU evaluation guidelines which eventually might lead to wrong conclusions on the success of the programme: i) it is impossible to associate the result and impact indicators (as GVA/GDP) only with policy intervention, since there are number of other factors and circumstances affecting the results; ii) usually, policy measures either target or are exploited by only some groups of producers/regions, etc., which makes simple comparisons between supported and non-supported groups methodologically problematic (Michalek, 2007). To deal with these shortcomings Ratinger et al. (2012) adopt the counterfactual approach.

Data matching procedure is used to create treatment-control matches based on propensity scores and/or observed covariate variables. Propensity score matching (PSM) constructs a statistical comparison group that is based on a model of the probability of participating in the treatment, using observed characteristics (Khandker et al., 2010). Ideally, one would match each treatment subject with a control subject (or subjects) that is an exact match on each of the observed covariates. As the number of covariates increases or the ratio of the number of control subjects to treatment subjects decreases, it becomes less and less likely that an exact match will be found for each treatment subject. Propensity scores can be used in this situation to simultaneously control for the presence of several covariate factors. The propensity score was introduced by Rosenbaum and Rubin for the first time (1983, 1985). The propensity score for subject i ($i = 1,\ldots, N$) is defined as the conditional probability of assignment to a treatment ($Z_i = 1$) versus the control ($Z_i = 0$), given a set (or vector) of observed covariates, x_i. Mathematically, the propensity score for subject i can be express as

$$e(X_i) = p\ (Z_i = 1 | X_i = x_i) \tag{1}$$

It is assumed that the Z_i's are independent, given the X's. The observed covariates, x_i, are not necessarily the same covariates used in the matching algorithm, y_i, although they could be. Rosenbaum and Rubin (1985) suggest using the logit of the estimated propensity score for matching because the distribution of transformed scores is often approximately normal. The logit of the propensity score is defined as

$$q(x) = \log\left(\frac{1 - e(x)}{e(x)}\right) \tag{2}$$

Different approaches can be used to match participants and nonparticipants on the basis of the propensity score. Greedy data matching is used for propensity score data matching procedure in this paper (like in Božík, 2011 a 2012). Several different distance calculation methods are available in the matching procedures. Gu and Rosenbaum (1993) compared the imbalance of Mahalanobis distance metrics versus the propensity score difference in optimal 1:1 matching for numbers of covariates (P) between 2 and 20 and control/ treatment subject ratios between 2 and 6. *Mahalanobis distance within propensity score calipers was always best or second best, so Mahalanobis distance within propensity score calipers (no matches outside calipers)* is chosen in this paper as distance calculation method. Mahalanobis distance was suggested by P. C. Mahalanobis (1936).

According to Khandker et al. (2010) the main advantage (and drawback) of PSM relies on the degree to which observed characteristics drive program participation. If selection bias from unobserved characteristics is likely to be negligible, then PSM may provide a good comparison with randomized estimates. To the degree participation variables are incomplete; the PSM results can be suspect. This condition is not a directly testable criteria; it requires careful examination of the factors driving program participation.

Table 1 shows results of data matching including mean and standardized differences. One subject of participants is excluded because of extreme values of characteristic variables. After matching it seems to have really similar control group. Figure 2 depicts effects of PSM on branch structure of the sample (by CZ-NACE codes).

After creating group of participants (110 supported companies) and nonparticipants (110 not supported companies) the next step is to make counterfactual analysis, i.e. to make impact evaluation of investment and investment support in biogas energy. First, the relevant indicators have to be selected. In order to make complex impact evaluation mainly based on financial statements, following indicators of profitability, liquidity, activity, capital structure, value added and productivity are identified as suitable for counterfactual analysis.

A) Indicators of profitability:

- Return on Assets (ROA) = EBIT/Total Assets
- Return on Capital Employed (ROCE) = EBIT/(Equity + Provisions + Long-term payables + Long-term bank loans)
- Return on Equity (ROE) = EAT/Equity
- Return on Sales (ROS) = EBIT/(Sales of Production + Sales of Goods)

B) Indicators of liquidity:

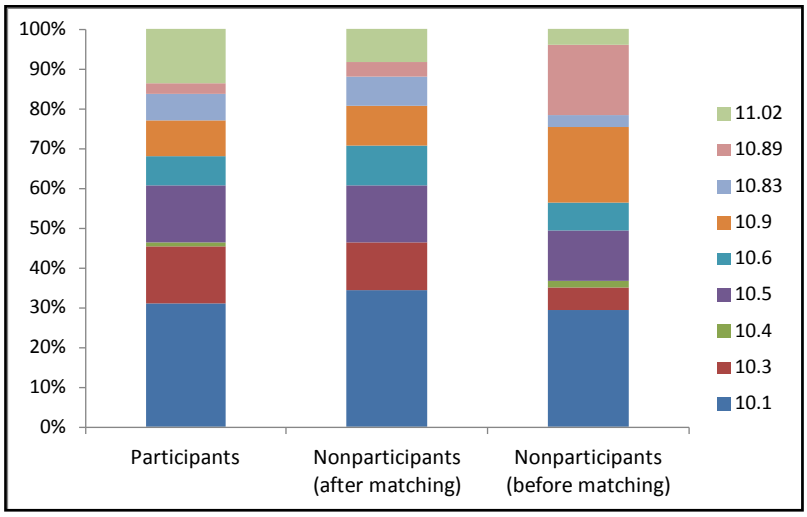
- Current Ratio = Current Assets/Current Liabilities
- Acid Test Ratio = (Current Assets – Inventory) / Current Liabilities
- Cash Ratio = Short-term Financial Assets/ Current Liabilities

Variable	Units	Group type	Participants	N	Mean	SD	Mean difference	Standardized difference (%)
Total assets	´000 CZK	Before matching	Yes	110	242,831	428,803		
			No	313	165,622	359,917	77,210	19.50%
		After matching	Yes	110	242,831	428,803		
			No	110	246,165	480,761	-3,334	-0.73%
Debt ratio		Before matching	Yes	110	0.580	0.21		
			No	313	0.679	0.56	-0.098	-23.29%
		After matching	Yes	110	0.580	0.21		
			No	110	0.591	0.22	-0.010	-4.77%
Share of current assets to total assets		Before matching	Yes	110	0.555	0.18		
			No	313	0.587	0.25	-0.033	-15.19%
		After matching	Yes	110	0.555	0.18		
			No	110	0.561	0.18	-0.006	-3.34%
Share of bank loans to total liabilities		Before matching	Yes	110	0.264	0.21		
			No	313	0.226	0.24	0.037	16.54%
		After matching	Yes	110	0.264	0.21		
			No	110	0.254	0.23	0.010	4.73%
Current ratio		Before matching	Yes	110	1.658	1.44		
			No	313	2.756	6.21	-1.098	-24.38%
		After matching	Yes	110	1.658	1.44		
			No	110	1.476	1.08	0.182	14.28%
Share of depreciation and amortization to total assets		Before matching	Yes	110	0.050	0.03		
			No	313	0.044	0.04	0.005	14.71%
		After matching	Yes	110	0.050	0.03		
			No	110	0.049	0.03	0.001	3.48%

Notes: N = number of enterprises, SD = standard deviation

Source: own calculation

Table 1: Results of PSM – data source for counterfactual analysis.



Source: own calculation

Figure 2: Effects of PSM on structure of the sample by branches (CZ-NACE codes).

C) Indicators of activity:

- Long-term Asset Turnover = (Sales of Production + Sales of Goods)/Fixed Assets
- Inventory Turnover = (Sales of Production + Sales of Goods)/Inventory

D) Debt ratios:

- Debt Ratio = Total Debt/Total Assets
- Credit Debt Ratio = Bank Loans & Overdrafts/ Total Assets
- Share of Bank Loans & Overdrafts to Debts
- Financial Leverage = Total Assets / Equity

E) Value added indicators[1]:

- Value Added per Total Assets
- Value Added per Firm
- Staff Costs per Firm
- Value Added per Staff Costs

F) Other indicators:

- Fixed Assets per Firm
- Share of Fixed Assets per Total Assets
- Depreciation per Firm
- Depreciation per Total Assets
- Sales of Production per Cost of Sales
- Total Revenues per Total Costs

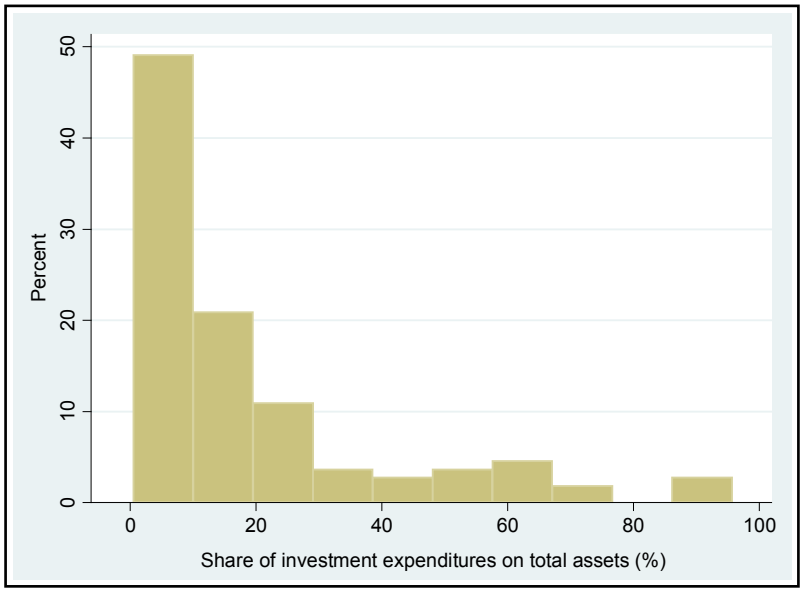
Results and discussion

The extent of economic effects of investment support depends on the relative importance of investments in supported enterprises. As figure 3 shows, about 50 % of the participants have total investment expenditures up to 10 % of total assets. The question is how significantly these relatively less important investments can affect economic results of companies in the food sector. Table 2 gives the information about effects of investment support on profitability, labour productivity and cost efficiency.

The effects of investment support also arise from the change of fixed assets and depreciation per firm (table 2). The participants increased the mean level of fixed assets by 31 % while nonparticipants did not substantially change the value of fixed assets from 2007 to 2010. This is also evident from the share of fixed assets in total assets. Moreover, the participants had significantly higher depreciation per firm as well as per total assets than nonparticipants in 2010.

Results in table 2 indicate higher profitability of supported companies. This finding can raise the question if the investment support by the RDP is targeted at generally more profitable companies or should help less profitable companies to improve their economic results. In the period 2007 – 2010 indicators of profitability dropped in both participants and nonparticipants. The general decline of profitability was caused by systematic global economic recession that affected most industries worldwide. The positive effect is that relatively slower decline in profitability is observable in the group of participants compared

[1] Value added = (Sales of goods – Cost on goods sold) + (Sales of production – Cost of sales)



Source: own calculation

Figure 3: Relative importance of investment expenditures in the supported enterprises.

Indicator	Units	Mean (participants) N = 110			Mean (nonparticipants) N = 110		
		2007	2010	Index	2007	2010	Index
ROA	%	6.79	5.23	0.77	4.56	2.98	0.65
ROCE	%	13.31	8.72	0.66	11.54	6.34	0.55
ROE	%	11.85	6.36	0.54	7.71	4.00	0.52
ROS	%	3.09	2.60	0.84	1.99	1.50	0.76
Value Added per Total Assets	%	31.80	30.03	0.94	30.29	27.74	0.92
Value Added per Firm	´000 CZK	28,835	36,285	1.26	18,460	18,788	1.02
Staff Costs per Firm	´000 CZK	16,592	19,131	1.15	13,061	13,622	1.04
Value Added per Staff Costs	CZK	1.74	1.90	1.09	1.41	1.38	0.98
Fixed Assets per Firm	´000 CZK	39,751	52,023	1.31	33,548	32,796	0.98
Share of Fixed Assets per Total Assets	%	42.56	47.37	1.11	43.16	42.74	0.99
Depreciation per Firm	´000 CZK	4,384	5,454	1.24	3,241	3,832	1.18
Depreciation per Total Assets	%	4.51	5.32	1.18	4.26	4.34	1.02
Sales of Production per Cost of Sales	CZK	1.19	1.22	1.02	1.16	1.18	1.01
Total Revenues per Total Costs	CZK	1.03	1.02	1.00	1.02	1.01	1.00

Source: own calculation

Table 2: Indicators of profitability, labour productivity and cost efficiency.

to the nonparticipants. It can be explained as effect of investment support. Nevertheless, the indicator ROE does not prove such obvious effect of support, so the investment support is not so beneficial for shareholders as for the whole company.

Investment support has important effect on productivity. The participants have higher value added than nonparticipants. Furthermore, they also increased mean value added by 26 % between 2007 and 2010. But in relation to the total assets, the value added slightly dropped in both groups of companies because the rise of value added was reduced by rise of total assets in the group of participants as a consequence of investment. Concerning labour productivity the parallel changes of value added and staff costs need to be compared that can be expressed by indicator value added per staff costs. Labour productivity of participants grew by

9 % while there was a slight decline in the group of nonparticipants in the reporting period. So, higher labour productivity can be considered as one of the positive effects of the investment support by the RDP.

Even if the effects of investment support on profitability and labour productivity are shown, the impact on cost efficiency is not obvious. There is some positive effect if cost efficiency of production is considered (sales of production per cost of sales). When total cost and total revenues are calculated, the effect is zero probably because of higher depreciation and staff costs in the group of participants. Depreciation and staff costs are not included in cost of sales and their growth eliminates the effect of higher total revenues.

The profitability is a result of other financial indicators. Table 3 refers to the indicators of liquidity, turnover and capital structure.

There is no big difference in change of liquidity ratios between participants and nonparticipants. All indicators of liquidity increased in the reporting period. One possible reason is that firms seek to reduce liabilities during crisis and prevent possible problems with their settlement. This statement can be supported by debt ratio that expresses the share of external capital to total capital employed. The participants used relatively higher debts in 2007 (more than 60 %) but they reduced it more sharply than nonparticipants. In 2010 both groups had similar debt ratio at the maximum recommended level of about 50 %. Looking at the difference between indexes of debt ratio and credit debt ratio the relative change of both ratios is similar in the group of participants but it differs in the sample of nonparticipants. That is because the participants reduced liabilities but they increased the share of bank loans and overdrafts (as results from table 3). On the contrary, nonparticipants also reduced liabilities but they did not noticeably increase the share of bank loans. So, the nonparticipants' drop of credit debt ratio is sharper.

Concerning long-term asset turnover and inventory turnover there are also some effects of investment support. The long-term asset turnover dropped more in the group of participants because new investments increased more the level of fixed assets compared to the sales growth. The level of inventories is not affected by investments. Thus the change (index) of inventory turnover has different trend than the long-term asset turnover.

Finally, some disadvantages of such counterfactual analysis can be identified. Firstly, the above processed analysis is based on financial indicators only. For better understanding of all potential effects of the investment support it is very useful to make case studies (like in Ratinger et al., 2012). Long-term organisational viability and competitiveness should not be evaluated solely in terms of financial measures. Investors, policy makers and other stakeholders increasingly seek to evaluate performance with respect to sustainability-the environmental, social and economic performance of an organisation (Yakovleva, Sarkis, Sloan, 2012). The case studies can also help to evaluate the nonfinancial effects on the use of particular inputs, effects on market share, quality of production, staff number and qualification and on the work environment, to indicate past and future investment strategy, problems and barriers in applying for investment support etc. It is a great challenge for future research. Secondly, it is problem

Indicator	Units	Mean (participants) N = 110			Mean (nonparticipants) N = 110		
		2007	2010	Index	2007	2010	Index
Current Ratio	x	1.27	1.44	1.13	1.16	1.31	1.13
Acid Test Ratio	x	0.76	0.82	1.08	0.80	0.85	1.07
Cash Ratio	x	0.07	0.09	1.24	0.05	0.08	1.60
Long-term Asset Turnover	x	2.18	1.80	0.82	2.27	2.10	0.93
Inventory Turnover	x	4.89	4.25	0.87	5.70	4.76	0.83
Debt Ratio	%	60.60	52.52	0.87	57.91	53.05	0.92
Credit Debt Ratio	%	12.44	10.93	0.88	14.70	11.68	0.79
Share of Bank Loans to Total Debts	%	24.98	29.06	1.16	22.86	23.33	1.02
Financial Leverage	x	2.58	2.05	0.80	2.33	2.07	0.89

Source: own calculation

Table 3: Indicators of liquidity, turnover and capital structure.

to find really similar group of nonparticipants because it is not possible to find the same companies (Michalek, 2009). So, the results of counterfactual analysis based on propensity score matching can be biased to a certain extent. Nevertheless, the above described propensity score matching is a good basis for quantitative impact evaluation.

Last but not least, the question of competitiveness of the Czech food industry should be perceived in the European context. For example Wijnands et al. (2008) conclude that the EU food industry's competitiveness is weak. The legal system was positively evaluated compared to the U.S. system, but major improvements are possible. The recommendations are to improve economies of scale, economies of scope, ICT-based supply chain management, and exploit cultural differences through innovation, within a more flexible and streamlined legal framework.

Conclusion

The paper focuses on the economic effect of investment support targeting at adding value to food products in the Czech Republic (measure I.1.3.1). It especially attempts to answer the question if there are any effects on financial performance of supported companies compared to companies without public investment support. About 50 % of the participants have total investment expenditures up to 10 % of total assets. The question is how significantly these relatively less important investments can affect economic results of companies in the food sector.

According to the MoA, the measure I.1.3.1 responds to the strategic objective to improve the competitiveness of agri-food industry by focusing especially on the improvement of the performance of processing enterprises and on the development of new outlets for agricultural products, support for marketing of agricultural products, and the development of innovations within the agri-food production. The analysis shows that the investment support has positive impact on financial stability because participants have smaller decrease of profitability than nonparticipants. The investment support increases labour productivity measured using value added. But due to the higher depreciation, as the consequence of investments in fixed assets, the overall effects on economic results are slightly reduced. The investment support and new investments to adding value to the food products change the structure of debt to the benefit of bank loans and overdrafts. On the other hand, both supported companies and nonparticipants focus on debt reduction in response to global economic crisis. Finally, it can be concluded that some positive effect of investment support are obvious.

The investment support of the adding value to food products should continue in upcoming period 2014-2020. Only the targeted support can be the incentive for enhancing economic „viability" of enterprises as well as the tool for improving competitiveness of the food industry. This plan corresponds with the vision of forming the European food sector as a world "leader" being competitive in the long term.

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Technical Efficiency of Cassava - Based Cropping in Oyo State of Nigeria

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Abstract

This study examined the technical efficiency of cassava-based cropping in Oyo State of Nigeria. The population for the study consisted of all cassava-based farmers in Oyo State. Well structured questionnaire was used in collecting information from 253 cassava-based farmers in the study area. Multistage random sampling technique was employed. The study was analyzed, using descriptive statistics, stochastic frontier production and multiple regression analysis. The result of the Cobb-Douglas stochastic frontier production function revealed that cassava cutting material was statistically significant and positive in all the zones. This implies that cuttings are positive factors that influence output in the study area. The coefficient of farm size was also found to be significant and positive in all the zones except in zone 4 where it was insignificant and negative. This implies that farm size was a significant and positive determinant of cassava output in these zones The estimated gamma parameter (γ) of 0.814 indicates that 81.4% of the total variation in cassava output was due to technical inefficiencies in the study area. The return to scale (RTS) was 0.54 in the study area. This indicates a positive decreasing return to scale and that cassava production was in stage II of the production region where resources and production were believed to be efficient. The mean technical efficiency for the study area was 0.542. The analyses of technical efficiency revealed that cassava-based farmers were not operating on the production frontier. Productivity improvements can be achieved by implementing policies, such as, improved farmers' access to extension services and technical assistance, to ensure farmers used the existing technology more efficiently. This would make farmers operate more closely to the existing frontier.

Key words

Technical efficiency, cassava, stochastic frontier.

Introduction

The agricultural sector is an important sector in the Nigerian economy. Agriculture production remains the mainstay of the Nigerian economy. It is the main source of food for the population. The sector accounts for about 30.8 percent of GDP and employs about two-thirds of the labour force (CBN, 1994).

Cassava is the most widely cultivated crop in the southern part of the country in terms of area devoted to its production and the number of people employed. Indeed, almost every household grows it. The consumption of cassava cuts across all parts of the country. Its adaptability to climatic and soil conditions even in marginal soils has endeared cassava to most people that have to do continuous cultivation on limited available land. The general acceptance of cassava and its products to all classes of Nigerians on its own draws close attention to the producers of cassava (Olanrewaju et al., 2009).

In recent years, cassava has also been transformed from being a subsistent crop to an industrial cash crop. Cassava is one of the most actively marketed food crops and is the most promising in terms of growth and new market opportunities. There is also a regular surplus of cassava in most producing countries and several governments in Africa have taken positive steps to promote cassava production for industrial use since many of these countries have large capacities for cassava production. Cassava is cultivated for its tuberous roots, from which cassava flour, breads and tapioca are derived. It is in demand for several reasons (Oloyede, 2004). In Nigeria, International Institute of Tropical Agriculture (IITA) is committed to the introduction of cassava bread. To this end, the institute, in collaboration with the office of Special Assistant on food security in the Presidency, has mapped out series of training workshops for cassava processors

in the country to facilitate prompt implementation of the Federal Government policy. The Federal Government of Nigeria promulgated a policy on the use of cassava. The government directed that composite flour be made which comprises of 10% cassava and 90% wheat. The government further directed that manufacturers should start using this composite flour with effect from 1st January 2005.

According to Njeru (2004), technical efficiency is the ability of a firm to maximize output for a given set of resource inputs while allocative (factor price) efficiency reflects the ability of the firm to use the inputs in optimal proportions given their respective prices, and production technology. Technical efficiency is considered to be an important determinant of productivity growth and international competitiveness in any economy. It is also considered to be an important factor which contributes to stability of production. The role of efficiency in increasing agricultural output has been widely recognized in both developed and the developing countries of the world (Tran et al., 1993; Giroh and Adebayo, 2009).

A number of empirical studies have identified the sources of technical inefficiency, in addition to predicting the technical efficiencies for the firms. One of the earliest empirical studies in stochastic frontier production function was an analysis of the sources of technical inefficiency in the Indonesian Weaving Industry by Pitt and Lee (1983). The study estimated a stochastic frontier production function by the method of maximum likelihood and the predicted technical efficiencies were then regressed upon some variables, including size, age and ownership structure of each firm, and were shown to have significant effect on the degree of technical inefficiency of the firms. Many subsequent empirical studies have investigated the sources of technical inefficiency in different firms using the same two stage analytical methods. However, studies by Huang and Liu (1994) and Battese et al., (1996) have questioned the theoretical consistency of this two stage analytical technique and have proposed the use of stochastic frontier specifications which incorporate models for the technical inefficiency effects and simultaneously estimate all the parameters involved. Seyoum et al., (1998) using a one stage technical inefficiency model investigated the technical inefficiency and productivity of maize producers in Ethiopia and found technical inefficiency to be a decreasing function of the education of farmers and the number of hours of extension services but education was not significant for those farmers practicing traditional farming.

A study on efficiency in cassava production is important for many reasons. One, measuring efficiency of cassava producers and identifying the factors impacting on it will provide indications for the formulation of economic policies likely to improve producer efficiency and output in general. Two, at the micro-level, improved efficiency helps to increase the levels of income through increased profit and hence reduce poverty. Three, given the high costs of cassava production and the low productivity, knowledge on technical efficiency levels will provide guidelines to government on how to improve output by farmers. Finally, whereas a number of studies have been undertaken on efficiency measurement in Nigeria, very few use the stochastic frontier approach on cassava-based cropping.

This study therefore examines the level of technical efficiency of cassava- based cropping in Oyo State. There appears to be little previous application of stochastic frontier models in the analysis of the efficiency of cassava-based cropping system in Nigeria. Given the amount of work and available information on previous studies it is believed that this model is very relevant to the Nigerian situation.

Materials and methods

The study was carried out in Oyo States of Nigeria. Oyo State is located between latitudes 2^0 38^1 and 4^0 35^1 east of the Greenwich meridian. Oyo State covers an area of 28,454 square kilometer [2,845,400 H]. According to NPC, Oyo state had a population of 5,591,585 people. The state has two distinct ecological zones – the western moist forest to the south and the intermediate savannah to the north.

The target population of the study was cassava – based farmers in Oyo State. A multi-stage random sampling technique was employed in selecting the sample. The four agricultural zones were taken as the sampling units as a first stage of sampling. At the second stage, two local government areas were randomly selected to represent the zone making a total of eight LGAs. The last stage involved random selection of 253 cassava – based farmers relative to the number of local government area in the zone (Ibadan/Ibarapa-79 – zone 1, Oyo-56 – zone 2, Ogbomoso-45- zone 3, and Saki-73- zone 4). Primary data were collected using well-structured questionnaire and interview schedule. Descriptive statistics, stochastic frontier production function and multiple regression analysis were used to analyze the data collected.

For the purpose of this study, the specific models that were estimated are:

1. A Cobb-Douglas production frontier function in its log transformation

$$LnY_i = Ln\ A + \sum_{I=1}^{6} \beta_i Ln\ X_i + V - U \quad (1)$$

Where

Y = Total farm output (kg)

X_1 = The area devoted to cassava production (ha);

X_2 = Quantity of cassava cuttings used (bundle/ha)

X_3 = Family and hired labour used in cassava production (man-days/ha)

X_4 = Quantity of fertilizer used (kg/ha)

X_5 = Quantity of herbicide and pesticide used (litre/ha)

X_6 = Total expenditures on farm tools used for the year.

A and β_i = are parameters to be estimated (i = 1, 2...6)

V_i = is a two-sided, normally distributed random error

U_i = is a one-sided efficiency component with a half-normal distribution where U_i is defined by

$$U_i = \delta_0 + \sum \delta_i Z_i \quad (2)$$

Where

Z_1 = The number of years of formal schooling completed by the farmer

Z_2 = Farming experience in cassava production in years

Z_3 = Age of the cassava farmer in years

Z_4 = Availability of extension service measured by the number of contact with extension agents

Z_5 = Types of cassava cuttings used; equal 1 if improved varieties is used and zero otherwise.

δ_0 and δ_i are parameters to be estimated

(i = 1,2,.....5) together with the variance parameter.

$$\sigma^2_s = \sigma^2 + \sigma^2_v$$

$$\sigma^2 = \sigma^2_v + \sigma^2_u$$

$$\lambda = \sigma_u / \sigma_v$$

The parameters of the stochastic frontier functions were estimated by the method of maximum likelihood, using the computer program FRONTIER version 4.1.

From the stochastic production function specified in equation (2) above, the technical efficiency of farm can be written as

$$TE = Y/Y^* = f(x_i;\beta)\ exp(V_i - U_i)/f(x_i;\beta)\ exp\ (V_i)$$

$$TE = exp\ (-U_i) \quad (3)$$

TE was measured on a scale of 0 to 1. A value of 1 indicates that farm i displays complete TE while a value of zero indicates level of inefficiency. TE is in effect an expression of the farmer's ability to achieve results comparable to those indicated by the production frontier.

Results and Discussions

1. Summary Statistics

The average farm size was 1.6 ha for cassava based farmers in Oyo State. This study is in consonance with that of Awoyemi and Kehinde (2005) who reported an average of 0.52 ha in the study carried out on cassava production in Southwestern Nigeria and that of Ogundari and Ojo (2006) that reported an average of 0.89ha in a study carried out on cassava production in Osun State. The quantity and type of cassava cuttings planted by the cassava – based farmers depend on the production system, size of the farm, availability of varieties, price per bundle, ability of the farmers to take risk and the suitability of the variety to a particular environment and the purchasing power of the farmer. The mean quantity of cassava cuttings planted was 29.52 bundles per hectare for the pooled data. This quantity was below the recommended amount of cuttings per hectare (35 – 50 bundles per hectare). This implies that the plant population may not be optimum and their output would be less than the expected output. This may result in inefficiency on the part of cassava farmers in their production activities.

The mean age of the respondents were 49.4 years, 48.4 years, 49.4 years and 42.8 years in zone 1, zone 2, zone 3 and zone 4 respectively. This indicates that cassava – based farming in Oyo State was in the hands of elderly people who may not have the required labour by themselves to engage in large scale production of cassava. In the entire zone, the average age was tending towards the declining productivity class of greater than 50 years (Ogundele and Okoruwa, 2006). The implication

Variable	Zone 1	Zone 2	Zone 3	Zone 4	Pooled
Output (Kg/ha)	12.7 (11.8)	11.4 (10.7)	10.5 (11.9)	9.5 (7.0)	13.7 (16.7)
Farm Size (ha)	1.6 (1.4)	2.1 (1.4)	1.5 (1.4)	1.3 (1.1)	1.6 (1.3)
Cuttings (bundle/ha)	28.7 (27.0)	26.8 (16.7)	24.4 (19.5)	33.1 (34.0)	29.5 (118.9)
Labour (mandays/ha)	346.5 (300.8)	264.1 (292.5)	465.1 (554.2)	326.4 (404.4)	456.6 (797.7)
Fertilizer (Kg/ha)	396(203.1)	72.5 (26.1)	300 (310.3)	162.5 (93.0)	265 (217.9)
Pesticide and Herbicide (Litre/ha)	11.3 (5.5)	10.0 (9.3)	4.3 (5.3)	3.9 (2.0)	5.2 (5.1)
Equipment (N/ha)	2394.9 (4522.0)	632.8 (594.8)	4106.3 (6331.0)	1867.7 (1337.0)	2843.3 (5202.8)
Age (years)	49.3 (12.2)	48.4 (12.1)	49.4 (10.6)	42.8 (11.3)	47.3 (11.2)
Education (years)	5.7 (5.6)	9.9 (3.9)	5.6 (4.6)	8.0 (6.5)	7.2 (5.4)
Experience (years)	27.1 (16.0)	28.3 (11.8)	17.5 (16.1)	17.0 (12.7)	21.3 (15.4)
Family size (Number)	9.6 (4.8)	7.3 (2.2)	9.7 (2.2)	9.0 (2.4)	9.1 (3.6)
Extension visit (Number)	18.5 (6.7)	16.8 (7.9)	9.7 (9.5)	5.2 (4.0)	13.8 (8.8)

Figure in Parentheses are standard deviation
Source: Field Survey, 2008

Table 1: Summary Statistics.

of this is that except the occupation witnessed the injection of young able men, in the next one decade, many of these farmers would have reached the declining productivity level and cassava-based farming will suffer a set back.

The means of years of farming experience were 27.1 years, 28.3 years, 17.5 years and 17 years in zone 1, zone 2, zone 3 and zone 4 respectively. In essence, majority of the farmers have had long number of years in the production of cassava and could be said to be well experienced in the business. This finding agrees with those of Alabi et al., (2006a) and Alabi et al., (2006b).

2. Estimated Production Functions

The Ordinary Least Squares (OLS) and the Maximum Likelihood Estimates (MLE) of the production parameters for cassava-based farming in Oyo State are presented in Tables 2 and 3 respectively.

The adjusted R^2 of the OLS estimate of the parameters for the production function was 0.255in zone 1, 0.381 in zone 2, 0.495 in zone 3, 0.929 in zone 4 and 0.486 in the pooled data. This implies that the inputs used in the model were able to explain about 26 percent in zone 1, 38 percent in zone 2, 50 percent in zone 3, 93 percent in zone 4 and 49% in the pooled data of the variation in the cassava production in the study area. The coefficient of farm size was found to be significant in all the zones except in 4 where it was insignificant and negative. This implies that farm size was a significant and positive determinant of cassava output in these zones. The coefficient of cassava cuttings was significant and a positive determinant of output in all the zones. Use of pesticide and herbicide was found to be statistically significant in zone 2 and 3, however, it is negative in zone 2 at 10% level of significance. The coefficient of equipment was statistically significant and positively related to output in zone 1 while it was negatively related to output in zone 3.

With an upward shift in the constant term, the coefficient of cassava cuttings remained significant in the Cobb-Douglas stochastic frontier production function in zone 1, 2, 3 and pooled data implying that the farmers could be advised to use more of cuttings to increase cassava output. In zone 4, there is need to reduce the use of cuttings. The coefficient of farm size was also found to be significant and positive in all the zones except in zone 4 where it was insignificant and negative. This implies that as the farm size increases, the output also increases. This finding is in line with the study by Ogundari and Ojo (2006) where farm size had a positive relationship with output. The coefficient of labour was found to be significant and negative in zone 2. This implies that output of cassava reduces with increase in the use of labour. Moreover, it was also observed that the coefficient of pesticide and herbicide had a statistical significant and positive relationship with output in zone 3 at 1% significant level. This implies that cassava output tends to increase with increase in the use of pesticide and herbicide. In zone 2 and 4, there is a statistical and negative influence of pesticide and herbicide on cassava output at 5% and 10% significance level respectively. This could be due to overuse or inappropriate use of pesticide and herbicide in these zones. Fertilizer had a significant but negative relationship with output in zone 3. The coefficient of equipment had a significant and positive

Variable	Zone 1	Zone 2	Zone 3	Zone 4	Pooled
Contant	0.054 (0.053)	26.636 (1.312)	3.64 (4.152)	9.013 (8.125)	8.501 (3.165)
Farm size (X1)	0.206 (1.801)	0.953 (3.052)***	0.256 (2.223)**	0.095 (-0.065)	0.406 (5.086)*
Cuttings (X2)	0.212 (2.260)**	0.557 (3.822)***	0.213 (2.104)**	0.347 (3.714)*	0.160 (3.333)*
Labour (X3)	0.011 (-0.129)	0.233 (-0.729)	0.024 (-0.369)	0.055 (0.574)	0.002 (0.036)
Fertiliser (X4)	0.111 (-1.023)	0.158 (0.236)	0.111 (-1.545)	0.056 (0.453)	0.018 (-0.189)
Pesticide and herbicide (X5)	0.055 (0.356)	0.562 (-1.937)*	0.331 (2.874)***	0.178 (-0.874)	0.028 (0.330)
Equipment (X6)	0.217 (2.583)***	0.202 (-1.278)	0.247 (-2.390)**	0.199 (-1.634)	0.027 (-0.466)
Log likelihood function	-79.336	-207.905	-22.666	-64.061	-890.983
R^2	0.255	0.381	0.495	0.929	0.486

Note that when the figures in parentheses are negatives, the coefficient s are also negative
Figure in Parentheses are t-ratios.
* - estimate is significant at 10 % level
**- estimate is significant at 5 % level
***- estimate is significant at 1 % level
Source: Data Analysis, 2008

Table 2: Ordinary Least Squares estimate for cassava-based farmers in Oyo State.

Variable	Zone 1	Zone 2	Zone 3	Zone 4	Pooled
Contant	0.068 (0.066)	52.084 (111.863)***	3.577 (4.214)***	9.142 (11.108)***	24.387 (5.451)***
Farm size (X1)	0.206 (1.876)*	1.188 (4.870)***	0.237 (2.244)**	0.032 (-0.246)	0.388 (5.339)***
Cuttings (X2)	0.212 (2.358)**	0.531 (5.480)***	0.299 (2.664)***	0.362 (-5.049)***	0.177 (4.151)***
Labour (X3)	0.011 (0.138)	0.251 (-2.030)**	0.008 (0.116)	0.007 (-0.09)	0.011 (0.240)
Fertiliser (X4)	0.011 (-1.049)	0.312 (1.167)	0.133 (-1.996)*	0.090 (0.948)	0.031 (-0.333)
Pesticide and herbicide (X5)	0.055 (0.371)	0.663 (-2.480)**	0.340 (3.262)***	0.129 (-1.787)*	0.049 (0.617)
Equipment (X6)	0.217 (2.689)***	0307 (4.070)***	0.270 (-2.615)***	0.129 (-1.573)	0.058 (-1.309)
Sigma Square	0.438 (4.892)***	241.277 (241.588)***	1.806 (4.319)***	4.388 (2.896)***	235.4 (3.429)***
Gamma	0.448 (2.560)***	0.999 (193.481)***	0.345 (1.668)*	0.979 (71.942)***	0.814 (11.956)***
Log likelihood function	-79.335	-201.516	-19.705	-53.41	-888.64
Return to scale	0.59	0.81	0.481	0.129	0.54

Figure in Parentheses are t-ratios.
* - estimate is significant at 10 % level
**- estimate is significant at 5 % level
***- estimate is significant at 1 % level
Source: Data Analysis, 2008

Table 3: Stochastic production frontier for cassava-based farmers in Oyo State.

relationship with output in zone 1 while it had a negative relationship with output in zones 2 and 3.

The estimate of sigma squares of 0.438 in zone 1, 241.277 in zone 2, 1.806 in zone 3, 4.388 in zone 4 and 235.498 in the pooled data were significantly different from zero at different levels. This indicates a good fit and correctness of the specified distributional assumption of the composite error term. This suggests that the conventional production function was not an adequate representation of the data.

The estimated gamma parameter (γ) of 0.448 in zone 1, 0.999 in zone 2, 0.345 in zone 3, 0.979 in zone 4 and 0.814 in the pooled data indicates that 44.8 % in zone 1, 99.9 % in zone 2, 34.5 % in zone 3, 97.9% in zone 4 and 81.4% in the pooled data of the total variation in cassava output was due to differences in their technical efficiencies.

The estimated elasticities of the explanatory variables of the stochastic frontier shows that cassava cutting was a positive decreasing function to output in zones 1, 2, 3 and pooled data indicating the variables allocation and use were in the stage of economic relevance of the production function (Stage II). In zone 4, there is over-utilization of use of cassava cuttings and hereby in Stage III of the production surface. The elasticities of farm size were a positive decreasing function to the output in zone 1, zone 3 and for the pooled data indicating optimum use and in stage II in these zones. The elasticity of farm size was a positive increasing function in zone 2 (Stage I) while it

was a negative decreasing function to the output in zone 4 (Stage III). The elasticity of labour was a positive decreasing function to the output in zone 1, zone 3 and the pooled data (Stage II) while it had a negative decreasing function with output in zone 2 and zone 4 (Stage III).

The elasticity of fertilizer was positive decreasing function in output in zone 2 and zone 4 (Stage II) while it had a negative decreasing function with output in zone 1, zone 3 and the pooled data (Stage III). The elasticity of agrochemicals was a positive decreasing function to output in zone 1, zone 3 and the pooled data (Stage II) while it had a negative decreasing function with output in zone 2 and zone 4 (Stage III). The elasticities of equipment was a positive decreasing function to output in zone 1 (Stage II) while it had a negative decreasing function to output in zone 2, zone 3, zone 4 and the pooled data (Stage III).

The return to scale (RTS) was 0.59 in zone 1, 0.81 in zone 2, 0.48 in zone 3, 0.13 in zone 4 and 0.54 in the pooled data. This indicates a positive decreasing return to scale in all the zones and that cassava production was in stage II of the production region in these zones where resources and production were believed to be efficient. Hence it is advisable that the production units should maintain the level of input utilization at these stages as this will ensure maximum output from a given level of input *ceteris paribus.*

3. Technical efficiency indexes

The results derived from the ML estimates indicate that technical efficiency (TE) indices range from 0.0467 to 0.987 for the farms in zone 1 with a mean of 0.735 (Table 4). This means that for an average efficient farmer to achieve the technical efficiency level of its most efficient counterpart, he could realize about (1 – 0.735/0.987) savings in cost or increase in production. This gives about 26.8 percent increase in production or cost savings. The least efficient farmer can now save a cost or increase in production of 96.6 percent (1 – 0.0467/0.987) to achieve the required technical efficiency of the most efficient farmer in the zone.

The TE indices range from 0.056 to 0.995 for the farms in zone 2 with a mean of 0.395. This means that for an average efficient farmer to achieve the TE level of it most efficient counterpart, he could realize about 60.3 percent (1 – 0.395/0.995) savings in cost or increase in production in the zone. The least efficient farmer can now save a cost or increase in production of 94.9 percent (1 – 0.056/0.995) to achieve the required technical efficiency of the most efficient farmer in zone 2.

The TE indices range from 0.419 to 0.972 for the farms in zone 3 with a mean of 0.848. This means that for an average efficient farmer to achieve the technical efficiency level of its most efficient counterpart, he could realize about 12.8 percent (1 – 0.848/0.972) savings in cost or increase in production. The least efficient farmer can now save a cost or increase in production of 59.8 percent (1-0.419/0.972) to achieve the required TE of the most efficient farmer in zone 3.

The TE indices range from 0.09 to 0.9 is with a mean of 0.696 in zone 4. This means that for an average efficient farmer to achieve the TE level of its most efficient counterpart he could realized about 23.5 percent (1 – 0.699/0.910) cost savings or increase in production. The least efficient farmer in the zone can now save a cost or increase in production of 90.1 percent (1 – 0.09/0.910) to achieve the required TE of the most efficient farmer in the zone.

In the pooled data, the TE indices range from 0.000432 to 1 with a mean of 0.542. This means that for an average efficient farmer to achieve the TE level of its most efficient counterpart, he could realize about 45.8 percent cost savings or increase in production. The least efficient farmer in the state can now save a cost or increase production by 99.9 percent to achieve the required TE level of the most efficient farmer in the state. From table 30, it can be seen that farmers in zone 3 are more technically efficient than farmers in other zones. The mean TE of 73.5 %, 39.5 %, 84.8 % and 69.6 % were achieved by cassava – based farmers in zone 1, zone 2, zone 3 and zone 4 respectively. This shows that there is scope for increasing cassava production by 26.5 %, 60.5 %, 15.2 % and 30.4 % with the present technology in zone 1, zone 2, zone 3 and zone 4 respectively.

The mean TE found in this study is in line with the findings reported by others. Ajibefun et al., (2002) estimated technical efficiency of Japanese rice farmers to be 74.5 %. Awoyemi and Kehinde (2005) computed TE of cassava-based Small farm holdings in South-Western Nigeria to be 82.7 %. Awoyemi et al., (2003) estimated TE of aquaculture production in Nigeria to be 24 %.

4. Relationship between Technical Efficiency and Some Socio-economic Variables

To investigate the relationship between technical efficiency and socio economic variables, regression analysis was carried out.

Levels (%)	Zone 1	Zone 2	Zone 3	Zone 4	Pooled
<10	4 (5.1)	9 (16.1)	0	1 (1.4)	34 (13.4)
100-20	8 (10.1)	9 (16.1)	0	3 (4.1)	37 (14.6)
21-30	5 (6.3)	7 (12.5)	0	1 (1.4)	33 (13)
31-40	4 (5.1)	8 (14.3)	0	1 (1.4)	14 (5.6)
41-50	1 (1.3)	4 (7.1)	2 (4.4)	6 (8.2)	7 (2.8)
51-60	2 (2.5)	5 (8.9)	0	5 (6.8)	7 (2.8)
61-70	2 (2.5)	4 (7.1)	3 (6.7)	8 (11)	9 (3.6)
71-80	2 (2.5)	2 (3.6)	5 (11.1)	23 (31.5)	9 (3.6)
81-90	3 (3.8)	3 (5.4)	17 (37.8)	21 (21.8)	24 (9.6)
>90	48 (60.8)	5 (8.9)	18 (40)	4(5.5)	79 (31.2)
Means (%)	73.5	39.5	84.8	69.6	54.2
Minimum (%)	4.7	5.6	41.9	9	0.04
Maximum (%)	98.7	99.5	97.2	91	1
Average (save in cost)	26.80 %	60.80 %	15.60 %	23.50 %	45.80 %
Least (save in cost)	96.60 %	94.90 %	59.80 %	90.10 %	99.90 %

Figure in parentheses are the percentages
Source: Data Analysis, 2008

Table 4: Frequency distribution of technical efficiency for cassava-based farmers in Oyo State.

The results presented in Table 5 revealed a negative and non significant relationship between education and technical efficiency in zone 1 and zone 3. In zone 2, there was a positive and significant relationship between education and TE indicating that TE increases with increase in the years of schooling. The coefficient in pooled data was negative and statistically significant at 1% level of significance. This implies that TE tends to decrease with increase in education. Various studies have found a positive correlation between TE and education (Belbase and Grabowki, 1985), while several others have reported no significant relationship between these variables (Bravo-ureta and Evenson, 1994).

Experience was found to have a negative and significant relationship with TE in zone 3 and pooled data while it was not significant in zone 1, 2 and 4. This implies that TE tends to decrease with increase in years of experience. While some of these results were consistent with that of Ogundele and Okoruwa (2006) whose results had a negative relationship between experience and TE, some differed from those of Alabi et al., (2006b) and Kalirajan and Flinn (1983) whose results had a positive relationship between experience and TE.

In zone 3, the coefficient of age variable with TE was positive and statistically significant at 1% level of significance. This implies that older farmers are more technically efficient than younger farmers. This result was consistent with the findings of Bravo-ureta and Evenson, (1994) and Ogundele and Okoruwa, (2006).

In zone 4, there was a negative and significant relationship between extension visit and TE. This implies that farmers with more frequency of extension visits tend to be less technically efficient in cassava production. One will expect that increase in number of extension visits to farmers would increase efficiency in cassava – based cropping, but this was not so in this study rather increase in number of extension visits leads to a decrease in the TE in zone 4. It was either that the quality of extension service is poor in this zone (for example, may be wrong information is being passed to the farmers from extension quarters) or the farmers do not follow extension advice. This finding differs from those of Alabi et al., (2006a) and Ogundele and Okoruwa (2006). In the pooled data, there is a positive and significant relationship between frequency of extension visit and TE. This implies that technical efficiency increases with increase in frequency of extension visit. This finding was consistent with those of Alabi et al., (2006a) and Ogundele and Okoruwa (2006). Frequency of extension visit was insignificant in determining technical efficiency of cassava farmers in three zones.

The positive coefficient of varieties of cassava used and TE in zone 2 implies that farmers that used improved varieties of cassava tend to be more technically efficient than farmers that planted local varieties. However, variety was not significant in determining TE in three zones and pooled data.

The F – statistics in zone 1 was not

Variable	Zone 1	Zone 2	Zone 3	Zone 4	Pooled
Constant	1.064 (3.772)	0.207 (0.059)	0.623 (6.007)	1.174 (2.002)	0.760 (3.864)
Education	0.112 (-0.101)	0.265 (1.920)*	0.005 (-1.196)	0.011 (1.434)	0.179 (-2.724)***
Experience	0.013 (0.345)	0.006 (0.1)	0.007 (-4.511)***	0.005 (-0.214)	0.052 (-1.934)*
Age	0.029 (-0.708)	0.070 (-1.512)	0.008 (3.556)***	0.006 (-1.589)	0.001 (-0.045)
Extension	0.008 (0.108)	0.081 (1.066)	0.004 (-0.012)	0.014 (-2.495)**	0.084 (2.144)**
Variety	0.157 (-1.339)	0.224 (2.104)**	0.013 (0.160)	0.006 (0.011)	0.342 (-0.481)
F-test	0.909	2.523**	5.132**	3.75**	2.543**
R^2	0.068	0.387	0.397	0.273	0.08

Figure in Parentheses are t-ratio.
* - estimate is significant at 10 % level
**- estimate is significant at 5 % level
***- estimate is significant at 1 % level
Source: Data Analysis, 2008

Table 5: Regression Result of Relationship between technical efficiency and some selected socio-economic variable.

statistically significant, the hypothesis that technical efficiency of cassava- based farmers was not affected by their socio-economic characteristics was accepted in zone 1 and rejected in all other zones and pooled data.

Therefore, technical efficiency level of farmers is affected by their socio- economic characteristics in Oyo State that is, the pooled data.

Conclusion

The following conclusion could be drawn based on the findings of this study.

1. The factors affecting cassava production in Oyo State was farm size and stem cuttings.

2. There is scope for increasing cassava production by 45.8% for technical efficiency, with the present technology in Oyo State.

3. There is a negative relationship between the extension contact and efficiency in zone 4 while it is positive in pool data.

In view of the above conclusion, there is a need to strengthen the extension agencies and the agents trained to increase their efficiency at training and providing information to farmers.

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Development of Visegrad Countries' Agricultural Trade in Relation to Agricultural Production Development

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Anotace

Článek se věnuje problematice vztahů mezi agrární produkcí a obchodem zemí Visegradské skupiny. Cílem článku je analyzovat agrární produkci ve vztahu k agrárnímu obchodu a identifikovat nejvýznamnější změny v oblasti vývoje agrární produkce, agrárního obchodu a jeho konkurenceschopnosti v případě jednotlivých zemí Visegradské skupiny. Během let 1993 – 2010 země Visegradské skupiny výrazně změnily charakter vlastní agrární produkce a obchodu. Objem agrární produkce byl zredukován zejména v případě Slovenska, České republiky a Maďarska. Redukce agrární a potravinářské produkce zapříčinily výrazný nárůst hodnoty importů zejména v Čechách a na Slovensku. Stagnace v oblasti agrární a potravinářské produkce rovněž negativně ovlivnila i maďarský obchod. Pouze Polsko bylo schopné během sledovaného období výrazně zlepšit situaci v oblasti produkce a obchodu. Agrární obchod České republiky, Slovenska a Maďarska nedisponuje komparativními výhodami jak ve vztahu k zemím EU, tak ani ve vztahu ke třetím zemím. Pouze polský agrární obchod disponuje komparativními výhodami ve vztahu k oběma trhům.

Klíčová slova

Visegradská skupina, zemědělství, produkce, obchod, vývoj, trend, konkurenceschopnost.

Abstract

The paper is devoted to the analysis of Visegrad coutries' agricultural production and trade relationship. The objective is to analyze changes in agricultural production in relation to individual countries' agricultural foreign trade performance and to identify the most important changes in area of Visegrad members' agrarian production and trade performance and competitiveness. During the period 1993 – 2010, Visegrad countries' agricultural production and trade were significantly affected. The volume of agricultural production was reduced especially in Slovakia, the Czech Republic and Hungary. The reduction of agricultural and foodstuff production volume in the Czech Republic and Slovakia resulted in the significant growth of imports. Hungarian trade was also negatively affected by its agricultural sector and foodstuff industry stagnation. Only Poland was able during the analyzed time period significantly improve its production and trade performance. Agricultural trade of the Czech Republic, Slovakia and Hungary does not have comparative advantages in relation to the EU and third countries market. Only Poland does have comparative advantages in the field of agricultural trade, both in relation to the EU market, as well as in relation to the global market.

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Key words

Visegrad groups, agriculture, production, trade, development, trend, competitiveness.

Introduction

The global production and trade in agricultural products have been constantly growing. There are several reasons explaining the general growth of global agricultural production and trade. Among the most important factors boosting both trade and production we can include in particular the growth of human population, the growth of individual incomes, the growth of bio fuels production, liberalisation of global trade, intensification of global production, changes in consumption patterns, the growth of animal products consumption etc. (Jeníček, 2010a; Jeníček, 2010b; Potter, Tilzey, 2007; Kuna,

2010; Horska et al., 2011; Beneš, 2004; Hromadko at al., 2009 and 2010). It is very interesting to see that global food and agricultural production has been growing in all regions around the world with only one exception. The only region, where the global agricultural production stagnates, is Europe – especially the European Union (FAOstat, 2012). In the period 1993 – 2010, the global food production increased its volume by more than 20%, and the volume of crops and animal production also increased by more than 20%. The global production is growing much faster in developing countries in comparison with developed countries (FAO, 2011). While the global animal and crops production in developing countries recorded during the monitored time period increased by about 20%, the developed regions recorded the growth of production volume of only about 4% (FAOstat, 2012). A very specific situation can be seen especially in the case of EU members. The European Union – one of the most important global food producers and traders – is the only region, where the volume of food production stagnates. In general we can see that the volume of livestock production has been the same for the last two decades, and in the case of crops production we can even see a decrease of production volume. The reason for this development is peculiar to the European market. While the majority of countries around the world have been boosting agricultural production to satisfy the growing demand, the policy of the EU countries is the opposite. The aim of the current EU Common agricultural policy is the reduction of production volume, instead of intensifying agricultural production (Svatoš, 2008). The current goal of the agricultural policy is the reinforcement of the non-production function of agriculture (Vošta, 2012). This quite specific attitude towards agriculture has a direct impact on individual EU members' agricultural production and trade (Antimiani, 2012).

However, the paper does not have an ambition to analyse the EU agricultural production and trade development. The paper is focused on agricultural production and trade performance in selected EU members. The analyzed group of countries is Visegrad group (Czech Republic, Hungary, Poland and Slovakia). The reason why those countries are analyzed is the following. During the last twenty years Visegrad members significantly changed their economy structure. The agricultural sector was one of the most affected parts of their economy. Agricultural production and trade were affected twice. First time they were affected in 90ties during the transformation from central planned economy to market economy. Another moment was represented by individual countries' EU accession in 2004.

Material and methods

The main objective of this paper is to analyze individual Visegrad members' agricultural production development and to identify the most significant changes in agricultural sector and its volume and structure which appeared during the period 1993 – 2010. Another objective is to analyze changes in agricultural production in relation to individual countries' agricultural foreign trade performance and to identify the most important changes in the area of Visegrad members' agrarian export and import and especially in area of individual countries' agricultural trade competitiveness.

It is important to mention that in analytical terms, the entire text is compiled from the viewpoint of the development of agricultural production and trade within the scope of time including the period of the years 1993 - 2010. Paper is analyzing the basic characteristic related to agricultural production performance: animal and crops production volume, volume of foodstuff production, changes in commodity structure of agricultural production etc. Except for agricultural production development, paper is analyzing also agricultural trade performance both in relation to the EU27 and third countries (export, import and trade balance).

In terms of the uniformity of the data source, the UN COMTRADE database was selected as the central source of data for the analysis of agrarian trade, FAOSTAT database and WDI database were chosen for the analysis of agricultural production volume and value development.

The analysis of trade and production performance development is conducted by way of the utilization of basic statistical characteristics, such as the basic index, chain index and geometric mean. A part of the analysis is also conducted by way of indices, the objective of which is the characterization of the comparative advantages (modified Ballasa index RCA1 – Ballasa, 1965). The Ballasa index provides a simple overview of the comparative advantage distribution (e.g., Proudman and Redding, 2000; Hinloopen and Marrewijk, 2001).

Revealed comparative advantage index (RCA1 – global/regional level)

$$RCA1 = (Xij/Xnj)/(Xit/Xnt)$$

where:

- X represents exports
- i represents the analyzed country
- j represents the analyzed sector of the economy (sector of industry or commodity)
- n represents the group of countries or world
- t represents the sum of all sectors of the economy or the sum of all commodities or the sum of all branches

The RCA1 index analyzes the exporting of commodity "j" in the case of country "i" in proportion to the total exports of the given country and the corresponding total exports of the analyzed group of countries or of the whole world (Hinloopen, Marrewijk, 2001 and Utkulu, Seymen, 2004). A comparative advantage is then proven if the RCA1 index value is greater than 1. If, however, the result of the calculated index is less than 1, it may be asserted that the given country has a competitive disadvantage in the case of the given commodity or group of commodities (Qineti, Rajcaniova, Matejkova, 2009).

Results and discussion

Visegrad countries agricultural production

The main subjects of the following analysis are agricultural production and trade in the Czech Republic, Slovakia, Hungary and Poland. Each country became a member of the EU in 2004, and each can be considered as a developed country. If we analyze the structure of individual Visegrad countries' economy, we can see that agriculture plays a minor role. The share of agriculture in individual countries' economy is steadily decreasing (for details see Table 1).

Agricultural land represents a large proportion of total land in these countries. The share of agricultural land is the highest in Hungary (63%), and the lowest in Slovakia (40%). The share of agricultural land in total land is quite stable in the Czech Republic and in Hungary, however in Poland and Slovakia it has been declining over the last two decades (for details see Tables 2). It can be seen that during the analyzed time period the size of agricultural land decreased in all countries except for the Czech Republic.

Employment in agriculture is very low in the analyzed countries. The share of people working in agricultural sector has been steadily decreasing in each of the analyzed countries. The lowest share of people working in agriculture is in the Czech Republic and Slovakia. The highest share is in Poland (Table 3). All analyzed countries can be characterized by the significant reduction of number of people working in agriculture. The effect of this development was the significant growth of countries' agricultural sector effectiveness.

The value added generated by the agricultural sector has been constantly growing – the only exception is the Czech Republic. The average value of inter annual growth rate of agricultural value

Country Name	1993	1995	1997	1999	2001	2003	2005	2007	2008	2009	2010
Hungary	7.5	8.0	7.1	5.9	5.3	4.3	4.2	4.0	4.3	3.4	3.5
Slovak Republic	6.1	5.9	5.3	4.7	4.7	4.5	3.7	4.1	4.2	3.9	3.9
Czech Republic	5.3	4.5	3.8	3.6	3.5	2.7	2.6	2.4	2.3	1.9	1.7
Poland	8.4	8.0	6.6	5.2	5.1	4.4	4.5	4.3	3.7	3.7	3.5

Source: WDI, 2012

Table 1: Visegrad countries – the share of agriculture in GDP value in %.

Country Name	1993	1995	1997	1999	2001	2003	2004	2005	2007	2010
Czech Republic	42 820	42 800	42 800	42 820	42 780	42 690	42 650	42 600	42 490	42 390
Hungary	61 300	61 790	61 950	61 860	58 650	58 650	58 640	58 630	58 070	57 830
Poland	187 150	186 220	184 570	184 350	177 880	161 690	163 270	159 060	161 770	161 190
Slovak Republic	24 460	24 460	24 450	24 430	22 550	22 360	19 340	19 410	19 300	19 300

Source: WDI, 2012

Table 2: Agricultural land (sq. km).

Country Name	1993	1995	1997	1999	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Czech Republic	7.7	6.6	5.8	5.2	4.8	4.8	4.5	4.3	4	3.8	3.6	3.2	3.1	3.1
Hungary	9.1	8	7.9	7.1	6.2	6.2	5.5	5.3	5	4.9	4.7	4.3	4.6	4.5
Poland	24	22.6	20.5	18.1	19.1	19.3	18.4	18	17.4	15.8	14.7	14	13.3	12.8
Slovak Republic	10.2	9.2	9.2	7.4	6.1	6.2	5.8	5.1	4.7	4.4	4.2	4	3.6	3.2

Source: WDI, 2012

Table 3: Employment in agriculture (% of total employment).

Country Name	1993	1997	2001	2005	2010	Inter annual growth rate - GEOMEAN
Czech Republic	2 601 256 550	1 718 645 956	1 943 983 107	2 496 690 029	2 100 452 125	0.9875
Hungary	2 069 593 467	2 196 051 563	2 541 385 349	3 387 836 924	2 744 022 562	1.016731
Poland	7 994 303 202	7 643 310 115	8 051 872 151	8 833 573 449	8 863 696 021	1.006091
Slovak Republic	1 100 419 889	1 250 230 330	1 307 352 128	1 549 659 112	1 955 039 617	1.034385

Source: WDI, 2012

Table 4: Agriculture, value added (constant 2000 US$).

Country Name	1993	1995	1997	1999	2001	2003	2005	2007	2008	2010	Inter annual growth rate - GEOMEAN
Czech Republic	4 945	4 078	3 634	4 298	4 662	5 324	6 712	5 262	5 674	6 423	1.015501
Hungary	3 449	3 935	4 482	4 848	5 856	5 595	8 822	6 882	11 029	8 522	1.054644
Poland	1 759	1 767	1 896	2 072	2 182	2 397	2 626	2 616	2 643	2 994	1.031807
Slovak Republic	3 916	4 343	4 942	4 607	5 493	7 209	7 141	9 779	11 279	9 924	1.056222

Source: WDI, 2012

Table 5: Agriculture value added per worker (constant 2000 US$).

added is positive in the case of Hungary, Poland and Slovakia, and negative in the case of the Czech Republic (for details see the Table 4).

The productivity of agriculture per worker is increasing in each of the Visegrad countries studied. The average growth rate of real agricultural added value in individual Visegrad countries is the following: Slovakia (5.6% a year), Hungary (5.4% a year), Poland (3.1% a year) and the Czech Republic (1.55% a year). (See Table 5).

The volume of food production in individual Visegrad countries decreased during the period 1993 – 2010, the only exception being Poland. Table 6 provides detailed information about the volume of food production in individual Visegrad countries. In the case of the Czech Republic the volume of production decreased by more than 28%. In Hungary the current volume of food production is at the same level as in 1993, but if we take into consideration the peak level of food production in 2001, we can see that the current production volume is lower by 20-21%. Slovakian volume of food production declined during the analyzed time period by more than 27%, and only one Visegrad country (Poland) was able to keep the level of food production stable during the last twenty years.

If we examine the individual countries food and agricultural production in more detail, we can see that both segments – animal and crops production – of agricultural production were heavily affected during the last nearly twenty years development (for more details – see Tables 7 and 8). The volume of crops production decreased in each of the analyzed countries. It was not only the volume of crops production which declined during the last twenty years in the individual analyzed countries, the volume of animal production also declined. Especially the Czech Republic and Slovakia recorded the significant decline of animal production. The Hungarian volume of production was also reduced, but the level of reduction was not as high as it was in the other two cases. The only exception among the Visegrad countries is Poland (during the last two decades its production volume increased by more than 12%).

From the detailed analysis of above mentioned

Country Name	1993	1997	2001	2003	2005	2007	2008	2009	2010
Czech Republic	126.15	100.22	101.14	88.32	98.30	95.67	101.84	98.20	91.86
Hungary	86.60	94.83	103.84	83.26	95.15	79.30	103.79	94.81	82.83
Poland	99.80	92.64	95.59	96.03	98.17	100.33	102.13	106.25	100.16
Slovak Republic	115.80	113.36	93.89	91.95	102.87	89.29	104.04	93.03	83.99

Source: WDI, 2012

Table 6: Food production index (2004-2006 = 100).

Country Name	1993	1997	2001	2003	2005	2007	2008	2009	2010
Czech Republic	133.11	108.34	105.92	99.33	99.66	96.71	98.34	94.90	93.11
Hungary	116.07	106.91	113.57	111.77	97.56	96.77	97.96	96.39	89.61
Poland	92.43	92.65	92.09	98.82	98.79	105.99	100.29	102.22	104.39
Slovak Republic	139.09	123.25	97.34	106.55	100.82	95.56	94.79	86.39	86.63

Source: WDI, 2012

Table 7: Livestock production index (2004-2006 = 100).

Country Name	1993	1997	2001	2003	2005	2007	2008	2009	2010
Czech Republic	105.25	97.37	102.25	77.86	100.12	92.43	102.78	99.65	86.47
Hungary	111.94	115.15	99.8	80.69	102.47	81.84	108.55	94.22	76.88
Poland	131.4	106.31	112.19	95.83	98.26	99.04	106.3	110.06	96.85
Slovak Republic	110.7	91.83	98.24	72.43	95.38	71.28	103.55	89.68	76.32

Source: WDI, 2012

Table 8: Crop production index (2004-2006 = 100).

countries we can see that the crops production is facing a much higher level of fluctuation in comparison with the animal production. During the analyzed time period not all commodities recorded a significant production slowdown. In the case of the Czech Republic the most significant reduction of production can be seen in the case of: fruits, pulses, starchy roots, sugar crops, vegetables, bovine meat, eggs, pig meat, milk, offals and animal fats (especially the whole animal production was heavily affected). On the other hand the significant production growth was recorded for: cereals, oil crops and poultry meat. Hungarian agricultural production volume during the same time period was particularly affected in the case of: fruits, pulses, spices, starchy roots, sugar crops, tree nuts, bovine meat, eggs, pig meat, animal fats and milk. The growth of production was recorded only in the case of cereals, oil crops, vegetables and poultry meat. Slovakian agricultural production recorded a huge decrease in the case of fruits, pulses, starchy roots, sugar crops, tree nuts, vegetables, bovine meat, eggs, pig meat, animal fats, offals and milk. The production growth was recorded only in the case of the following commodity groups: cereals, oil crops and poultry meat. On the basis of these findings, it can be seen that the reduction affected the same groups of commodities in each of the above mentioned countries, whilst production of cereals, oil crops and poultry meat was boosted in each case. The general growth of cereals production can be explained by the reduction of animal production in individual countries. It can also be explained by the fact that corn is only commodity which is purchased by individual countries' state authorities. The growth of oil crops production volume is influenced by the bio-fuels policy applied in the European Union, and the growth of poultry production is driven by the changes in consumption patterns and also through the growth of demand – because of much lower unit price level of poultry meat in comparison with bovine and pig meat. While Hungary, the Czech Republic and Slovakia recorded a significant production slowdown, the Polish agricultural sector recorded a different development in the monitored time period. Polish agricultural production is characterised by significant oscillations, however if we compare the level of production at the beginning of the nineties, with the level of production in 2010, we can see a significant production growth in the case of many

commodities (cereals, fruits, oil crops, tree nuts, eggs, poultry meat and animal fats). The production of pig meat and milk was only slightly affected. The only commodities which recorded a significant production slowdown were: pulses, starchy roots, sugar crops, vegetables and bovine meat.

While the level of production in individual analyzed countries was reduced significantly (the only exception being Poland), the level of domestic consumption changed only a little during the whole monitored time period (FAOstat, 2012). A significant decrease of production volume in comparison with domestic consumption volume development affected the level of agricultural market self-sufficiency level in individual analyzed countries (see Table 9).

The changes in agricultural production volume, apparent in the monitored time period, had a direct impact on agricultural trade value and volume development. The following subchapter analyzes the value and volume of individual Visegrad members' agricultural trade development. Trade development is analyzed in relation to the EU market and third countries.

Visegrad countries trade development and trade competitiveness

If we analyze agricultural trade performance of individual Visegrad members we should understand, that agricultural trade must be

Self sufficiency	item	1993	2009	item	1993	2009
Czech Republic	Bovine Meat	101.30%	77.15%	Cereals	152.38%	150.54%
Czech Republic	Pigmeat	101.95%	64.33%	Fruits	66.92%	31.40%
Czech Republic	Poultry Meat	106.78%	76.82%	Oilcrops	95.82%	141.03%
Czech Republic	Animal Fats	109.67%	78.34%	Pulses	286.87%	101.02%
Czech Republic	Eggs	109.24%	80.55%	Starchy Roots	115.93%	85.07%
Czech Republic	Milk	126.25%	119.53%	Sugarcrops	100.96%	93.99%
Czech Republic	Offals	98.26%	57.28%	Vegetables	74.85%	28.48%
Hungary	Bovine Meat	134.99%	65.31%	Cereals	100.78%	175.80%
Hungary	Pigmeat	111.55%	103.32%	Fruits	133.95%	102.90%
Hungary	Poultry Meat	131.57%	129.59%	Oilcrops	115.42%	200.78%
Hungary	Animal Fats	112.17%	88.93%	Pulses	185.81%	105.53%
Hungary	Eggs	102.79%	97.24%	Starchy Roots	102.48%	77.26%
Hungary	Milk – Exc. Butter	102.88%	94.90%	Sugarcrops	100.43%	98.82%
Hungary	Offals	98.04%	138.60%	Vegetables	124.15%	119.62%
Poland	Bovine Meat	96.20%	207.30%	Cereals	98.85%	107.01%
Poland	Pigmeat	98.31%	85.97%	Fruits	115.24%	136.07%
Poland	Poultry Meat	80.92%	145.16%	Oilcrops	93.82%	102.91%
Poland	Animal Fats	100.11%	115.05%	Pulses	121.17%	92.66%
Poland	Eggs	86.44%	125.90%	Starchy Roots	102.36%	105.69%
Poland	Milk – Exc. Butter	96.08%	110.34%	Sugarcrops	132.40%	102.56%
Poland	Offals	116.48%	122.20%	Vegetables	100.00%	99.99%
Poland	Bovine Meat	94.42%	126.38%	Cereals	105.82%	108.03%
Slovakia	Pigmeat	102.25%	65.22%	Fruits	94.40%	128.80%
Slovakia	Poultry Meat	96.84%	44.81%	Oilcrops	79.61%	33.57%
Slovakia	Animal Fats	93.88%	78.22%	Pulses	103.19%	157.42%
Slovakia	Eggs	103.82%	62.68%	Starchy Roots	136.44%	57.50%
Slovakia	Milk – Exc. Butter	99.32%	86.73%	Sugarcrops	107.94%	262.58%
Slovakia	Offals	113.19%	111.50%	Vegetables	97.27%	100.06%
Slovakia	Bovine Meat	99.44%	87.87%	Cereals	111.45%	54.77%

Source: FAO, 2012

Table 9: Visegrad countries – level of animal and crops production self sufficiency development in 1993 - 2009.

analyzed in two different dimensions. The first dimension is represented by the period of economy transformation (1993 – 1999) and second dimension is represented by the period 2000 – 2010 (This period can be characterized as period of preparation for the EU accession and the EU membership.). The period 1993 – 1999 can be characterized by low inter-annual growth rate of export values (the only exception is Poland) and significant growth rate of import value. Except for Poland, all Visegrad members recorded a significant worsening of their trade balance (see Table 10).

On the other hand the time period 2000 – 2010 can be characterized by the significant inter-annual growth rate of both export and import value in the case of all analyzed countries (The inter annual growth rate of export was usually higher in comparison with the inter annual growth rate of imports. The result was the stabilization of agrarian trade balance). The reason of significant agricultural trade value growth was the agricultural market liberalization process between EU and individual Visegrad members (for details see Tables 11 and 12).

Because of limited space, this paper analyses agricultural trade development in period 2000 – 2010. It is important to state that the actual territorial structure of agricultural trade of the Visegrad countries is distinctly oriented toward the EU27 countries. In relation to the position of agricultural trade of the Visegrad members within the overall merchandise trade, it may be stated that likewise as in the case of the global and European market, agricultural trade represents only a supplement to merchandise trade. In the case of goods exports and imports, agricultural products have approximately a 7% or 6.2 % share in the total value (data for the year 2010). In this regard, it is important to state that the value of both agricultural exports as well as imports of the Visegrad countries is dynamically increasing. Just in the years 2000 – 2010, the value

In mld. USD	Czech R.	Hungary	Poland	Slovakia	Czech R.	Hungary	Poland	Slovakia
	Export Agriculture:				Import Agriculture			
1993	1.03	1.69	1.54	0.4	0.98	0.69	2.08	0.43
1994	0.96	2.01	1.99	0.37	1.28	0.92	2.21	0.56
1995	1.25	2.57	2.29	0.51	1.68	0.84	2.73	0.71
1996	1.14	2.43	2.62	0.38	1.91	0.83	3.6	0.76
1997	1.16	2.59	3.17	0.41	1.76	0.98	3.43	0.8
1998	1.25	2.51	2.96	0.42	1.8	1.05	3.54	0.83
1999	1.01	2.06	2.39	0.37	1.63	0.88	3.03	0.72
2000	1.11	1.96	2.43	0.37	1.56	0.92	2.86	0.71
Inter annual growth rate – average value	1.01	1.02	1.07	0.99	1.07	1.04	1.05	1.07

Source: Comtrade, own processing, 2012

Table 10: Agrarian export and import value development in period 1993 – 2000.

Export	bil. USD	2000	2002	2004	2005	2006	2007	2008	2009	2010	Inter annual growth rate – average value
CR	Agriculture	1.11	1.4	2.18	2.99	3.25	4.37	5.53	4.84	4.94	1.161
	Total trade	29.05	44.26	65.77	78.21	95.14	120.9	146.09	112.88	132.14	1.164
SR	Agriculture	0.37	0.49	0.98	1.41	1.69	2.15	2.37	2.39	2.49	1.21
	Total trade	11.88	14.48	27.86	31.85	41.69	58.04	70.19	55.55	64	1.183
Hungary	Agriculture	1.96	2.35	3.41	3.63	4.02	5.72	7.12	5.89	6.5	1.127
	Total trade	28.09	34.34	55.47	62.27	74.06	94.59	108.21	82.57	94.69	1.129
Poland	Agriculture	2.43	3.03	6.11	8.36	10.12	12.95	16.13	14.96	16.79	1.213
	Total trade	30.96	40.25	73.78	89.38	109.58	138.78	171.86	136.64	157.06	1.176

Source: Comtrade, own processing, 2012

Table 11: Development of value and structure of foreign trade (export) of Visegrad group countries in the years 2000 – 2010.

Import	bil. USD	2000	2002	2004	2005	2006	2007	2008	2009	2010	Inter annual growth rate – average value
CR	Agriculture	1.56	2.02	3.27	3.99	4.65	5.99	7.1	6.55	6.65	1.156
	Total trade	32.24	48.23	66.71	76.53	93.43	116.82	141.83	104.85	125.69	1.146
SR	Agriculture	0.71	0.89	1.47	2.05	2.24	3.13	3.97	3.76	3.97	1.188
	Total trade	12.77	16.63	29.46	34.23	44.76	59.21	72.61	55.16	64.38	1.176
Hungary	Agriculture	0.92	1.17	2.29	2.67	2.97	3.79	4.7	4	4.12	1.162
	Total trade	32.08	37.61	60.25	65.92	76.98	94.66	108.78	77.27	87.36	1.105
Poland	Agriculture	2.86	3.21	4.95	6.13	7.27	10.07	13.6	11.58	13.08	1.164
	Total trade	48.13	54.27	88.15	101.54	125.65	164.17	210.48	149.57	174.13	1.137

Source: Comtrade, own processing, 2012

Table 12: Development of value and structure of foreign trade (import) of Visegrad group countries in the years 2000 – 2010.

Export		RCA1	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CR	EU27	Agriculture	0.41	0.37	0.35	0.35	0.38	0.44	0.43	0.45	0.45	0.44	0.42
SR	EU27	Agriculture	0.36	0.37	0.37	0.33	0.42	0.53	0.52	0.47	0.41	0.45	0.44
Hungary	EU27	Agriculture	0.68	0.72	0.62	0.63	0.63	0.63	0.61	0.79	0.79	0.75	0.77
Poland	EU27	Agriculture	0.75	0.72	0.69	0.72	0.88	1.06	1.12	1.12	1.08	1.05	1.06
CR	Others	Agriculture	1.04	0.79	0.5	0.7	0.57	0.65	0.46	0.38	0.31	0.3	0.28
SR	Others	Agriculture	0.69	0.65	0.61	0.46	0.42	0.53	0.44	0.23	0.21	0.17	0.16
Hungary	Others	Agriculture	2.2	2.08	2.08	1.83	1.62	1.26	1.28	0.72	0.8	0.69	0.76
Poland	Others	Agriculture	2.49	2.24	2.1	2.26	1.87	1.74	1.68	1.44	1.29	1.46	1.72

Source: Comtrade, own processing, 2012

Table 13: Competitiveness of commodity structure of goods trade of Visegrad countries in relation to the EU market and to the global market.

of agricultural export of the Visegrad countries increased from USD 6 billion to more than USD 30 billion, and in the case of agricultural import, there was an increase in the traded value from USD 6 billion to 28 billion. In terms of their own development of agricultural trade, the Visegrad countries as a group achieve a positive balance of agricultural trade. Nevertheless, it is appropriate to state that currently, such positive balance is fully to the debit of the agricultural trade of Poland and Hungary, while the agricultural trade of the Czech Republic and Slovakia regularly finishes in negative values.

A specific characteristic of merchandise trade of the Visegrad countries is the competitiveness of individual trade transactions, both in relation to the market of the EU27 countries, as well as in relation to the market of third countries. In this regard, it is appropriate to emphasize that currently, in terms of the development of the value of effected trade flows, the important thing is primarily the ability to retain comparative advantages in relation to the EU27 market, which represents the main outlet for exports originating from Visegrad countries. The following Table 13 provides information on the development of values of the RCA1 trade competitiveness index. As regards agricultural trade, there we can state that agricultural trade of the Visegrad countries is currently uncompetitive, both in relation to the EU market, as well as in relation to the market of third countries. Nevertheless, in the case of Poland, the situation is the opposite. Only Polish agricultural trade is capable of achieving comparative advantages, and, importantly – it is also capable of amplifying them.

On the base of above mentioned data we can see that during the last two decades agricultural trade completely changed its character. Agricultural trade becomes more concentrated both from territorial and commodity point of view. The size of agricultural production in individual countries was significantly reduced and they become more dependent on agrarian imports and their agrarian exports lost their shares in total merchandise trade performance. The only country which did not lost

Period	Reporter	Commodity Description	Import	Export	Balance	Period	Import	Export	Balance
1994	Czech Rep.	LIVE ANIMALS; ANIMAL PRODUCTS	145	306	160	2010	1 774	1 320	-455
1994	Czech Rep.	VEGETABLE PRODUCTS	499	238	-261	2010	1 963	1 288	-675
1994	Czech Rep.	ANIMAL OR VEGETABLE FATS , etc.	60	51	-9	2010	283	242	-42
1994	Czech Rep.	PREPARED FOODSTUFFS, etc.	666	451	-216	2010	3 356	2 766	-590
1994	Hungary	LIVE ANIMALS; ANIMAL PRODUCTS	188	759	570	2010	1 188	1 887	700
1994	Hungary	VEGETABLE PRODUCTS	307	585	279	2010	958	2 795	1 837
1994	Hungary	ANIMAL OR VEGETABLE FATS , etc.	27	89	63	2010	308	303	-5
1994	Hungary	PREPARED FOODSTUFFS, etc.	503	809	306	2010	2 470	2 773	303
1994	Poland	LIVE ANIMALS; ANIMAL PRODUCTS	524	609	85	2010	3 864	5 854	1 989
1994	Poland	VEGETABLE PRODUCTS	762	553	-209	2010	3 717	3 088	-629
1994	Poland	ANIMAL OR VEGETABLE FATS , etc.	176	19	-157	2010	655	425	-230
1994	Poland	PREPARED FOODSTUFFS, etc.	940	894	-46	2010	5 900	8 132	2 232
1994	Slovakia	LIVE ANIMALS; ANIMAL PRODUCTS	74	87	13	2010	988	698	-290
1994	Slovakia	VEGETABLE PRODUCTS	194	136	-58	2010	1 037	888	-149
1994	Slovakia	ANIMAL OR VEGETABLE FATS , etc.	31	8	-24	2010	222	103	-119
1994	Slovakia	PREPARED FOODSTUFFS, etc.	316	168	-149	2010	1 933	1 177	-756

Source: Comtrade, own processing, 2012

Table 14: Changes in Visegrad members' agrarian trade value and commodity structure – comparison of years 1994 and 2010.

its production capacity and which was able to significantly improve its trade performance and competitiveness is Poland. The following Table 14 provides us brief information about the changes in individual Visegrad members' agrarian foreign trade which appeared in period 1994 – 2010 (the year 1993 was excluded because of specific trade development in the Czech Republic and Slovakia after the breakup of Czechoslovakia).

Conclusion

During the period 1993 – 2010, Visegrad countries' agricultural production and trade were significantly affected. The volume of agricultural production was reduced in Slovakia, the Czech Republic and Hungary. The only country which agricultural production performance was almost not affected is Poland. Czech, Slovakian and Hungarian agricultural production reduced its size both in relation to animal and crops production. On the other hand – during the same time period – Poland was able to increase the volume of animal production and the volume of crops production almost did not change. In relation to foodstuff production it can be said, that the Czech Republic and Slovakia significantly reduced their production performance, Hungary was able to keep plus minus the same level of production for the whole analyzed time period and the same can be said about Poland. In relation to agrarian trade activities, individual Visegrad countries recorded the significant changes. The reduction of agricultural and foodstuff production volume in the Czech Republic and Slovakia resulted in the significant growth of imports, which is closely related with the growth of their negative agrarian trade balance. Hungarian trade was also negatively affected by its agricultural sector and foodstuff industry stagnation. Hungary was able to keep the positive trade balance, but it lost its position as a significant regional exporter of meat and meat products and prepared foodstuffs. Only Poland was able during the analyzed time period significantly improve its production performance both in relation to agricultural sector and foodstuff industry. Poland was able to increase its export performance – especially in relation to processed foodstuff products and it becomes a regional trade tiger. Polish inter annual growth of exports value exceeded the value of imports and country recorded the significant positive balance in trade in live animals, animal products and prepared foodstuffs.

If we focus on the actual objective of the article, which was to identify the comparative advantages of agricultural trade of the Visegrad countries in relation to the global market, as well as in relation to the EU27 countries, the following may be stated. Agricultural trade of the Czech Republic, Slovakia and Hungary as a whole does not have comparative advantages either on the global market or on the internal market of the EU countries. However, Poland as the only representative of the Visegrad

countries does have comparative advantages in the field of agricultural trade, both in relation to the internal market of the EU countries, as well as in relation to the global market (to the market of third countries). If we focus on the territory of the EU27 countries, which represents the main trade partner of all of the analyzed countries, both in terms of exports, as well as in terms of imports, it may be stated that although the Czech Republic, Slovakia and Hungary do not have comparative advantages in the area of agricultural trade in regard to the EU as a whole, they are capable of achieving comparative advantages at the level of bilateral relations with individual EU member countries. In terms of bilateral business competition, Poland and Hungary are of course in the best position. On the other hand, the Czech Republic and Slovakia are in the worst positions.

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Farm Management Analysis in Paddy Granary Areas in Enhancing On-Farm Income

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Abstract

Income inequality between rural and urban areas is a persistent issue that has been frequently studied and discussed with the hope of introducing or improving schemes that would lead to closing the gap between these two areas. Traditionally, paddy farmers have been mired in poverty and their livelihood has largely relied on on-farm income. In rice granary areas, on-farm income has played an important role in providing rural livelihood among paddy farmer households. Since on-farm income has played an important role in the rural livelihood, it is important to comprehend the influential factors determining on-farm income of the paddy farmers and find solutions to improve their income level and enhance future agricultural developments on the main granaries. We attempt to find out confronting problems in relation to on-farm income in the paddy sector by concentrating on paddy granary areas in Kedah, Selangor and Terengganu. This paper tries to grasp the characteristics of farm management and reveal influential determinants of gross return per hectare in value term in the three paddy granary areas while computing the benefit-cost ratio. The sample farmers were interviewed to gather information on the individual farm management practices in each area and farm management analysis was employed to analyze the obtained information. The Cobb-Douglas production function was used to indicate the significant factors influencing the farmers' income. The result shows that there are different characteristics of gross return from paddy in each studied granary area. The usage of pesticide, fertilizer and seedling method directly influence the gross return per hectare from paddy farming.

Key words

Rice granary, farm management, Cobb-Douglas, gross return, on farm income.

Introduction

Traditionally, paddy production has played an important role in sustaining paddy farmers' livelihood in Malaysia and on-farm income has been the source of earnings among rural paddy households in Malay villages (Purcal, 1971; Terano and Fujimoto 2010). Apart from plantation crops such as rubber and palm oil, areas under paddy cultivation cover larger areas of land compared to other food crops such as vegetables, fruits or cash crops (Year Book of Statistics, 2010). However in the late 70's, a drastic technological innovation called the Green Revolution took place and raised productivity in many countries including Malaysia. Although the green revolution has evolved farm households around the world, but a typical paddy farm household in Malaysia is still small in size and on-farm activities are individually managed at that level. Nevertheless with the economic development in progress, paddy farm management has begun to change and is now influenced by external changes related to economy, government policy, technological progress and the advancement of the manufacturing sector in the rural areas that forces change upon the mapping of regional society and nature. While farm households in paddy growing areas were affected to a large degree by the external environment, an internal environment such as changing farm management, using farming technology and farm input may have also impacted on-farm household income as a whole.

Paddy sector development in Malaysia

In the 60's many newly independent nations like Malaysia, considered the improvement of agricultural systems a priority in their planning for the rural development (Gomes, 2007). One of the early developments in the green revolution was the improvement of paddy farming technologies in Peninsular Malaysia. By the 70's Malaysia was comparatively advanced in paddy sector among the Southeast Asian countries through the introduction of modern technologies. High Yield

Varieties (HYV) and corresponding modern rice technologies have increased paddy productivity over the years. However, the introduction of the HYV required a proper farm management especially in the application of fertilizer, water, weedicide and pesticide to ensure that a potential yield from the HYV could be achieved.

In 1970's the Malaysian government introduced a newly initiated irrigation scheme that permitted double-cropping in a controlled environment (Drakakis-Smith, 1992). During 1970's, there were 131,700 hectares of paddy land in Peninsular Malaysia which were improved through irrigation facilities, of which 110,563 were provided in double-cropping areas (Tenth Malaysia Plan p. 286).

As can be seen in Table 1 the area under paddy plantation has been steadily increasing from 581,904 ha in 1965 to 673,745 ha in 2010. Hence with the increase in the productivity leading to higher yields the production of paddy is also showing an increasing trend over that period. Through the green revolution, paddy yield has increased from 2.4 tons per hectare in 1965 to 4.2 ton per hectare in 2010. According to statistics for rice production presented on the web database of the International Rice Research Institute (IRRI), there was a drastic increase in yield among Southeast Asian countries from 1963 to 2007 such as from 2.14 ton/ha to 4.87 ton/ha in Vietnam, 1.87 ton/ha to 2.69 ton/ha in Thailand, from 1.24 ton/ha to 3.76 in the Philippine and from 1.72 ton/ha to 4.69 ton/ha in Indonesia. Thus it was inevitable for the Malaysian paddy production to increase alongside the surrounding countries and for the green revolution to have positively impacted the paddy sector and paddy farming systems in Malaysia.

Protective measures for paddy and rice sectors

The government has to put in a great effort to deal with the issues surrounding paddy farmers. The paddy/rice policy came out with support measures through the various Malaysian Plans and National Agricultural Policies. The provision and improvement of irrigation facilities is inevitable for raising productivity. Moreover, the Guaranteed Minimum Price (GMP) for paddy and the support price for rice and the input subsidy to support farm income in the uncompetitive paddy/rice sector have all been the backbone of sustainability in the paddy/rice sector.

Under the input subsidy scheme, the Malaysian government has provided free fertilizers equivalent to 80 kg of nitrogen, 35 kg of phosphate and 20 kg of potash per hectare up to a value of RM 200 per hectare (Dano, 2005). The fertilizer subsidy was first introduced in the early 1950's with the objective of encouraging farmers to use fertilizer, hence demonstrating the higher pay-off from using adequate fertilizer, in terms of both paddy output and income (Tawang and Kamil, 1999).

The Guaranteed Minimum Price (GMP) on the other hand was introduced in1949. Currently Padiberas National Berhad (BERNAS), a privatized enterprise involved in paddy and rice trading, has undertaken to buy paddy from farmers at no less than the guaranteed minimum price of RM750 per ton since 2009. A cash subsidy for every ton of paddy sold was introduced in 1980 and the amount was increased in 1984 and 1990. Under the paddy subsidy scheme, the government made fixed payments to farmers (RM 2.48 per kilogram) for the paddy sold by them to any commercial rice mills (Fulford, 1996; Anderson, et.al., 2009).

	Planted area (ha)	Yield (ton/ha)	Production (tons)
1965	581,904	2.4	1,255,610
1970	704,767	2.6	1,681,420
1975	750,339	2.9	1,997,000
1980	716,800	3.1	2,044,600
1985	654,974	2.9	1,745,370
1990	680,647	3.1	1,884,980
1995	672,787	3.5	2,127,270
2000	698,700	3.4	2,140,800
2005	676,200	3.8	2,314,000
2010	673,745	4.2	2,548,000

Source: FAOSTAT, FAO statistics division 2012

Table 1: Paddy total planted area, average yield and total production in Malaysia, 1965-2010.

Thus far the Malaysian government has been implementing a protective policy for the rice sector through fertilizer and output price subsidies. Price support scheme was able to increase output by 65.8 percent and contribute to a 38.6 percent change in income while subsidy components such as GMP, subsidized fertilizer, price subsidy as a whole, constituted about 58 percent of total farm income (Dano and Samonte, 2005). Given the above scenario the objective of this paper is to analyze the paddy farm management in enhancing the on-farm income given the intervention and innovativeness of the paddy farmers in managing their paddy field.

Materials and methods

Productivity in rice farming has played an important role in increasing on-farm income in rice granary areas. The level of productivity directly influences on-farm income and farmer's living standards. In order to reveal influential determinant factors on rice productivity and profitability for this developing subsidized sector, we focused on rice production in the main season. The main season is a period when paddy planting is highly suitable based on the local climate (rainy season) and does not depend wholly on the irrigation system. For administrative purposes, the main season is defined as the period when paddy is planted with the commence date for planting generally falling between August to February (Year Book of Statistics, 2009).

This study used data collected in 2011 from paddy farmers living in three granary areas. These areas are; 1) Muda Agricultural Development Authority (MADA); 2) Barat Laut Selangor Integrated Agriculture Development Area (BLS); and 3) North Terengganu Integrated Agriculture Development (KETARA). A survey was conducted using structured questionnaire among paddy farmers and data was collected through face to face interviews. The total number of farmers interviewed was 117 in the three areas; 40 farmers in MADA, 42 farmers in BLS, and 35 farmers in KETARA, Terengganu. Table 2 shows characteristics of farm households in the three areas. The descriptive analysis was used to describe the farm characteristics and the Cobb-Douglas production function model was employed. The analysis is in value term to determine influential factors linked to on-farm income. In order to see the difference in expenses, t-test was applied to compare every two areas and also the benefit-cost ratio was computed in each area to roughly measure the efficiency of the farm.

Data Analysis

Based on the characteristics of cost and return analysis in farm management, there were different

Items	MADA, Kedah (n=40)			BLS, Selangor (n=42)			KETARA, Terengganu (n=35)		
	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
Average of family size (persons)	5	10	2	5	8	1	6	11	2
Age of household head (years)	51	77	30	46	72	27	48	73	29
Education of household head (years)	9	16	0	9	15	2	8	14	0
Farming experience (years)	23	50	3	20	46	1	17	50	2
Average farm size (ha)	3.3	11.5	0.3	2.5	14.6	0.4	3.1	16.2	0.4
Job of household head									
Full-time (paddy only)	13		17	10					
Part-time	27		25	25					
Characteristics of household									
Full-time farm household	10		14	3					
Part-time farm household	30		28	32					
Number of farmers by tenual status									
Owner farmer	4		11	5					
Owner-tenant farmer	17		8	12					
Tenant-farmer	19		23	18					

Source: Own survey 2011

Table 2: The demographic profile of farm household in the three areas.

ways in gross return generated from sales of paddy for rice and paddy for seeds among the three areas.

Gross return = Yield in Kg/ha×rice price per kg (Spoor, 2010).

Firstly, focus was put on gross return per hectare in order to reveal the determinant factor on per hectare basis throughout three areas. The Cobb-Douglas production function for paddy was estimated to determine the factors that influenced the value of paddy being harvested. The value of output and input was used as the dependent and independent variables respectively. All the values were converted into per hectares basis to estimate the parameters related to the dependent variables (Nandhini, 2006; Chapke, 2011; Adhikari, 2011).

In general the Cobb-Douglas production function can be specified as follows:

$$Y = Ax_1^{b1} x_2^{b2} x_3^{b3} x_4^{b4} U$$

The non-linear Cobb-Douglas is then transformed into natural log. The model can be specified as the following linear function:

$$ln\ Y = ln\ a + lnX_1 + ln\ X_2 + X_3 + lnX_4 + U$$

Where:

lnY is gross return, measured in ringgit/ha,

a = Constant

lnX_1 is total expense of fertilizer, measured in ringgit/ha,

lnX_2 is total expense of pesticide, measured in ringgit/ha,

X_3 is a dummy variable for seedling method (transplanting = 1, direst-seeding = 0),

lnX_4 is total expense of hired labour input in ringgit/ha, and

U = error term

Benefit and cost ratio

Benefit cost ratio is the ratio between the gross return and the total cost per hectares (Adhikali, 2011). In this study, benefit cost ratio was computed by using the formula:

B/C ratio = Gross return/Total cost

Results and Discussion

Characteristics of farm household

Table 2 shows the demographic profile and characteristics of farm households in the three areas. Regarding the characteristics of the farm households, family size in the three areas was almost of the same size ranging from 5 to 6 members in each family. Farmers' age in BLS was on average 46 years old, it was below51 in MADA and 48 in KETARA areas. In the three areas, the number of school years attended was around 8 to 9 on average. The characteristics of farm households in all the three areas showed that most farmers operated their farm as part-time. The years of farming experience was from one year to 50 years. The largest farm size was 16.2 hectares in KETARA followed by 14.6 hectares in BLS, and 11.5 hectares in MADA. The number of part-time farmers was less than half of the total number of farmers in the three areas. The paddy farmers with a secondary job were the major stream in the granaries. Here, a full-time farm household indicated that any residential family members were not self-employed or employed in off-farm sectors. Throughout the three areas, more than half of the paddy farmers were also employed as part-time workers either on other paddy farms or in off-farm sectors. In addition the number of full time farm households was fewer especially in KETARA. In terms of tenant status, owner-tenant farmers and tenant farmers constituted the largest majority of farmers in the three areas.

As shown in Table 3, the average range of farm size was 2.5 hectare to 3.3 hectares which included 2.0 to 2.5 hectares of rented land. This meant that more than half of total operated farm consisted of land rented from other land owners in the three areas. For the average yield per hectare, BLS has the highest rate at 6.8 tons followed by 6.4 tons in MADA and 4.4 tons in KETARA. The characteristics of the three farming areas are also shown in Table 3 particularly in terms of farming system practices. First, there are different farming systems in the method of seedling in the three areas. While MADA did not begin the transplanting method among its interviewed farmers, the practice was already introduced and in use in BLS and KETARA at 37% and 46% levels. In the case of BLS, several private enterprises existed around paddy farms, and farmers were able to decide for themselves whether they needed either transplanting or direct-seeding practices. In KETARA, farmers were given a choice of applying direct seeding which is the traditional method of seeding or transplanting. For those farmers who choose transplanting, the farmers were given access to opportunities backed by technical support by the local office of KETARA. For fertilizer expenses, the majority of farmers in BLS used additional fertilizers which they purchase with their own

	MADA, Kedah	BLS, Selangor	KETARA, Terengganu
	n=40	n=42	n=35
Average farm size	3.3ha	2.5 ha	3.1ha
Average size of rented land in	2.5ha	2.0 ha	2.0ha
Average yield	6.4tons/ha	6.8 tons/ha	4.4 tons/ha
Method of seedling			
Direct seeding	100%	63%	54%
Transplanting	0%	37%	46%
Fertilizer			
Only subsidies	77%	20%	60%
Additional fertilizers	23%	80%	40%
Percentage of hired labour usage			
Seedling and transplanting	45%	80%	25%
Land preparation	55%	93%	62%
Fertilizer, pesticide and weedicide	38%	63%	24%
Harvesting	100%	100%	100%
Transportation	100%	100%	100%

Source: Field Survey 2011

Table 3: Characteristic of faming systems and farm management of paddy farming household.

funds and not as a part of subsidized fertilizers. In MADA and KETARA areas, 77% and 60% of farmers applied only subsidized fertilizers. In terms of the percentage use of hired labour, farmers in BLS especially used hired labour for the farming process in seedling/transplanting, land preparation, fertilizer/pesticide/weedicide by 80%, 93% and 63% respectively which are notably the highest percentages among the three areas. On the other hand, in KETARA regarding the usage of hired labour, farmers preferred to work by themselves because their secondary job such as rubber tapping was highly seasonal thus they could spare more time on their farm. Thus the amount of hired used in seeding and fertilizing the farm were less. And in all three areas, harvest and transportation were fully contracted.

Table 4 shows the cost-return analysis of rice production in the three areas. Gross return consisted of two types that was gross return including paddy and paddy seed sold to BERNAS and others and also from government subsidy for every ton sold by the farmers. While paddy farmers obtained subsidy of RM248.1 per ton for paddy sold but the income from selling of paddy and paddy as seed was determined by the price per ton which was usually different in each area. In BLS, gross return obtained from rice production sold as paddy and seed was the highest among the three areas at RM8,399 per hectare. While the average rejection rate of paddy at collection center was 16%, ranging from 14% to 17%, and average rice price was RM1,230 ranging from RM1,150 to RM1,400 per ton. The majority of the paddy farmers sold their paddy to local private factories in BLS itself.

In case of KETARA area, paddy was shipped to BERNAS, private factories and local Farmers' Association which set the percentage discarded for spoilage at an average of 21%, ranging from 18% to 23%. The average price was at RM1040 per ton, ranging from RM980 to RM1,150 per ton. On the other hand in MADA, the average rejection rate was 17% of shipped paddy in the area. Although BERNAS and private companies were the main places for paddy farmers to sell their produce the average prices were the same at RM750 per ton for both BERNAS and private companies.

Expenses included seeds, packaged price for transplanting, purchasing fertilizer/pesticide/ weedicide, hired labour, harvester/tractor, land rent and fuel. Transplanting is fully contracted to private enterprises or semi-private enterprises as a package in BSL. The package price in BLS was RM659 per hectare. However in KETARA the transplanting package which is partly supported by the local government was priced at RM469.3 per hectare.

In MADA, 100% of paddy farmers used direct seeding for their paddy production, thus there was no transplanting package [see Table 4]. In BLS and

Items	MADA, Kedah	BLS, Selangor	KETARA, Terengganu
Gross return			
Sold as paddy & seed (A)	4,818.9	8,399.3	4,789.9
Paddy subsidy (B)	1,589.9	1,687.4	1,046.6
Total C (=A+B)	6,408.8	10,086.7	5,836.5
Expenses			
Seeds	259.7	120.3	221.6
Transplanting package	0.0	658.8	469.3
Fertilizer/pesticide/weedicide	351.1	984.2	556.4
Hired labour	500.1	377.9	88.2
Harvesting/transportation	830.1	447.5	224.7
Rent	1,123.4	1,714.5	1,374.7
Fuel	81.5	82.4	27.3
Total expense (D)	3,145.9	4,385.6	2,962.2
Net income (=D-C)	3,262.9	4,013.7	2,874.3

Source: Own Survey 2011

Table 4: Cost-return analysis of rice production per hectar. (Unit:Ringgit/ha)

KETARA only 63% and 54% used direct seeding respectively. As can be seen in Table 4, among the three areas, the expenses of fertilizer/pesticide/ weedicide were the highest in BSL followed by KETARA. Farmers in BSL were innovative and used extra fertilizer, pesticide and weedicide in addition to the subsidized products they received to maximize efficiency in production and provide better management and systematic system for their farms. In KETARA on the other hand the use of additional fertilizer, pesticide and weedicide was quite substantive compared to MADA areas at RM556.4 and RM351.10 respectively [refer to Table 4]. For the harvesting process, required harvesters were also provided as a packaged deal which included hired labour, machine and fuel. However, in case of KETARA the Department of Agriculture (DOA) provided the means for transportation but a fee was not charged when farmers shipped harvested paddy to sell as seed. However, since most farmers occasionally tapped rubber as a part-time job, they worked on the paddy field during most of the farming process as well and they themselves will do the transplanting, pesticide spraying and fertilizing, thus making the expense on fuel and hired labour comparatively lower in KETARA.

The production function

The Cobb-Douglas production function for the gross return function of the three areas was assessed collectively for the efficient use of resources on paddy farming. Variables taken into consideration were purchased fertilizer (ringgit), purchased pesticide (ringgit), seedling method and hired labour (ringgit). Table 5 presents the result of the estimated model and as can be seen the coefficient of multiple determinations (R2) of the function was 0.394, which indicated that 39.4% of variation in gross return from paddy production was explained by the four independent variables. Seedling method and purchased pesticide were found to be significant at 1% level, while purchased fertilizer was found to be significant at 5%. Hired labour input was found to be non-significant. The elasticity coefficient for the cost of purchased fertilizer and pesticide indicated that by increasing the expenses on fertilizer and pesticide by 1%, there would be an increase in gross return by 0.080% and 0.099% respectively. It could then be concluded that expenses on purchased fertilizer and pesticide are inelastic and their impact on gross return is very small. However, seedling method was the largest magnitude of the regression coefficient for gross return. It indicated that switching to transplanting would increase the gross return by 0.318%. It proved that seedling method was the most influential factor in increasing the gross return per hectare.

Comparison of expenses for input per hectare among the three areas

The elasticity of input such as purchased fertilizer and pesticide was really small. The amount which was spent on fertilizer/pesticide occupied on average 35% in KETARA, 43% in BSL and 17% in MADA out of the total expenses excluding rental

Variables	Regression coefficient		T-values
Constant	7.986	***	51.953
Purchased fertilizer (ringgit per hectare)	0.080	**	2.346
Purchased pesticide (ringgit per hectare)	0.099	***	3.497
Seedling method (Transplanting = 1, Broad-casting = 0)	0.318	***	4.203
Hired labour input (ringgit per hectare)	-0.011		-0.999
R^2	0.394		
F-value	17.067		
N	117		

Note: *** denotes significant at the 1 % probability level.
** denotes significant at the 5 % probability level.
* denotes significant at the 10 % probability level.
Source: Field Survey 2011

Table 5: Estimates of Cobb-Douglas production function in three areas, main granaries.

	Purchased fertilizer (ringgit/ha)				Purchased pesticide (ringgit/ha)			
	No.	Mean	t-value		No.	Mean	t-value	
MADA-KETARA								
MADA	40	60.85	1.133		40	290.25	-2.543	**
KETARA	35	101.31			35	155.45		
KETARA-BLS								
BLS	42	362.29	4.653	***	42	621.82	5.503	***
KETARA	35	101.31			35	155.45		
BLS-MADA								
BLS	42	362.29	5.232	***	42	621.82	3.462	***
MADA	40	60.85			40	290.25		

Note: *** denotes 1 % significant level
** denotes 5 % significant level
Source: Own Survey 2011

Table 6: Comparison of input expense per hectare among the three paddy areas.

	Minimum	Maximum	Mean
MADA, Kedah			
Total cost (Ringgit/ha)	1,118	4,984	3,146
Gross return (Ringgit/ha)	3,891	8,203	4,819
B:C ratio	0.9	4.7	1.5
BSL, Selangor			
Total cost (Ringgit/ha)	1,325	11,638	4,386
Gross return (Ringgit/ha)	1,958	7,336	8,399
B:C ratio	0.30	2.8	1.9
KETARA, Terengganu			
Total cost (Ringgit/ha)	1,050	6,303	2,985
Gross return (Ringgit/ha)	1,767	8,472	4,790
B:C ratio	0.6	4.7	1.6

Source: Own Survey 2011

Table 7: Benefit and cost ratio per hectare in three areas.

fee for the land. The expenses were compared by applying the student's t-test. Table 6 shows the comparisons of input in each of the two areas; or between 1) MADA-KETARA, 2) KETARA-BLS, and 3) BLS-MADA states. Between (1) MADA and KETARA, there was no difference between input in purchased fertilizer, but MADA spent more on pesticide. Between (2) KETARA and BLS, there were small differences in major inputs of purchased fertilizer and pesticide. Both inputs in BLS were on average higher than in KETARA. Between (3) BLS and MADA, inputs in BLS were higher than in MADA for the purchased fertilizer and pesticide.

Benefit-Cost Ratio

As shown in Table 7, benefit-cost ratio for each of the three areas was calculated. In the B:C ratio, gross return did not include price subsidy (RM2.41per ton). The average B:C ratio was found to be 1.5 in MADA, 1.9 in BSL and 1.6 in KETARA which indicated that rice farming is still profitable and farmers are getting a net income from gross return even without subsidies. However, based on varied B:C ratio which is quite wide between the maximum and minimum ratios, it was assumed that gaps existed among farmers in management ability and farming technology levels.

Conclusion

This paper attempted to recognize the influential factors which determine agricultural productivity by analyzing farm management schemes for further developments in the agricultural sector in the main granaries. Data were gathered from three farming areas in Kedah, Selangor and Terengganu states in 2011. The quantification of input and output of rice farming and influential determinants on rice productivity and profitability were then analyzed. This paper discovered certain characteristics of paddy farming pertaining to individual management in typical rice farming areas in Kedah, Selangor and Terengganu states as well as some confronting problems which caused low gross return and net income for some of the states. It seems that traditional transplanting method could yield higher gross return due to higher yields.

The Cobb-Douglas production function was used to estimate the value term of major determinants of gross return on a per unit area basis. This clarified that the total expenses of purchased fertilizer and pesticide influenced the gross return with positive signs in the three areas. However, gross return was inelastic on expenses of fertilizer and pesticide, and those inputs only had a small impact on the gross return even though farmers still purchased much fertilizer and pesticide. In the production function model, only seedling method had a large impact on the gross return. Diffusion of transplanting among farmers is the key factor in increasing gross return from rice farming. Certain levels of farming experience and technical support system are required in rice farming which have been missing over the last few decades. These factors could be of importance in determining gross return to farmers. Since there were widely varied B:C ratios among the three areas, it is important to improve farmer's managerial capabilities and abilities for the use of a proper amount of fertilizer and pesticide.

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Spam as a Problem for Small Agriculture Business

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Anotace

Příspěvek se zaměřuje na problematiku elektronické komunikace mezi firmou a zákazníkem. V této komunikaci je kromě jiných nástrojů využívána elektronická pošta. Problémem elektronické pošty je její snadné zneužití třetí stranou. Proto je nutné zabývat se možnostmi obrany proti nevyžádaným elektronickým zprávám. Ty s sebou nenesou pouze časovou ztrátu, ale také nebezpečí malware a phishingových útoků.

Uvedená problematika je velmi důležitá i z pohledu podnikatelských subjektů a jednotlivců také v regionech, kde se význam ICT přes existenci digitální propasti stále průběžně zvyšuje.

Klíčová slova

Email, spam, blacklist, fitrování zpráv, analýza emailových zpráv.

Abstract

The article deals with the problematic aspect of electronic communication between businesses and customesr. In this kind of communication the main tool which is used is email – electronic mail. The main problem connected with electronic email is the possibility of misuse by a third person. Because of this it's very important to understand ways to prevent email abuse. Spam is not only about time losses, but also about risks of malware infection or phishing messages.

This topic is very important for small businesses and single agriculture subjects in rural areas. The influence of information technologies rises every year, despite the digital divide between rural areas and large cities/ industrial areas.

Key words

Email, spam, blacklist, message filtering, email analysis.

Introduction

According to Mail Anti-Abuse Working Group, about 80% of all email traveling through the internet is spam. This is a very large number, and it corresponds with end user daily problems – the mailbox contains tens of spam messages but only units of ham – real emails from real persons, customers and friends.

Basics term explanations:

- Ham – wanted emails from real persons
- Spam – unsolicited emails with „very profitable" offers, hoax messages, malware and similar unwanted things
- Spamvertized web site or product – site or product in spam
- False positive – wanted email marked as spam – very undesirable, because the potential customer can be lost
- False negative – spam which wasn't marked as spam, it is a problem, but not a big deal, this message must be deleted manually (José, 2012)

This is a big issue for small business, when email service is the main communication tool. Clear email boxes without spam are important for agriculture businesses. Farm markets are very popular in big cities and farms can order food through the internet. They have websites with email and customers can communicate with them (Vaněk, 2008). When these email boxes are full of spam, communication is very difficult and there is a big chance of overlooking important emails (Šimek, 2008).

Currently we have many tools that can be used as

an appropriate counter measure. But the question is, are they sufficient? All of these tools stand alone. Of course, we can buy or create software which uses many of them together, but there we must be very careful, because only a blind combination might not be correct and can turn possible customers to competitor bussineses.

Material and methods

Research in this article was done at four domains which are in common usage on the internet. Within the domains all antispam software was shutdown. Every unsolicited email was moved to a special folder by the user. All messages in this folder were copied out by cron script at 01:00AM.

- Vasilenko.cz
- Jablickov.cz
- Malestranky.cz
- Nespamu.cz

There is one domain name with a similar purpose as a web site preseting agriculture business. This domain is jablickov.cz. The key task is to propagate main benefit offers to other people. Jablickov.cz offers courses for kids or mothers with kids. Agriculture businesses offer products from ecological farming (Vaněk, 2010). Spam is a special form of internet threat. There is no difference between agriculture businesses and other economical subjects.

Email header analysis

Email header contains relevant information about a message. All rows are specified in RFC for SMTP procotol. The following are important for spam analysis:

- received – there is an IP address of the sender's computer and date and time when the message was received
- subject
- body

Other rows aren't as important. Group analysis doesn't contain relevant data. Yes, there is a possibility to make a thorough analysis, but in this case, we can ignore them.

Content analysis

Spammers are sending millions and millions of emails with similar content (Alexander, 2009), (Xinyuan, 2009), (Compuoter Fraud & Securityi, 2011). When all of those messages will be the same, it would be easy to detect and delete them – ideal tools are for example the md5 hash function. Hash is an imprint of text string, when only one character in a long document has changed, the hash print is different – the principle of an electronical signature.

To defeat possible filtering based on hash, spammers put some random texts in messages. For example:

Dear **449e3d6**,:

*0.67$--Vigara

*1.71$--Levtira

*1.51$--Cilais

*1.56$--Female-Vigara

*2.12$--Family-Pack

*3.25$--Professional-Pack

http://NaK.medicclot.ru/ (random string parts are highlighted by author)

Thank you!

(Author original research, 2012)

This is one of 4972 similar emails captured between February 2011 and December 2012. All messages are different. Random parts are in the first row and at the link address. In those 4972 emails links are overall 524 domains with unique third level domain. Average cost of russian tld domain .ru is 7USD per year (Author original research, 2012), so the cost of all domains per year is 3668USD. Hosting for this domain cannot be detected, because according to who is IP tools are server in Germany or Antarctic – base MacMunro.

If we calculate an average hosting, for example VPS (virtual private server), we can assume that the cost can be about 500USD per year – the sum of costs for this spamvertized site is about 4000USD per year – based on the available date there is a relevant possibility that many more domains are registred from spamvertizing. This is the weak point of the spam rate between cost and income. All links are pointed to the same website which offers pills marked as a Canadian pharmacy. The prices and some additional texts are also different. This site is placed on 4 servers. When the IP address from this server is placed on the web browser the output is only a text string - „abab". This spam infrastructure is hosted by cb3rob.net – known for example in the spamhaus.com project as one of top 10 spamming subjects (Alexander, 2009).

Characteristics of this spam set

As is show in this message, there are mispelled name of well know drugs:

- Vigara x Viagra
- Levtira x Levitra
- Cialis x Cilais

(Author‘s original research, 2012)

These mispelled words aren‘t mistakes. This is the countermeasure against bayesian filtering. Because bayesian filtering divides emails into single words and analyzes each word based on the share of this word in ham and spam. Common tactics include also putting some „good“ words into a spam email. All of those countermeasures are named as Bayesian poisoning (Xinyuan, 2009). Spammers are sending spam in sets – certain quantity of the same messages.

One of many similar texts:

Dear 1fad723,

** Vigara - $0.62

Levtira - $1.63

** Cilais - $1.35

Famyli Pakc - 1.90$

** Femela Vigara - 1.35

Professional Pack - 2.89$

Follow this link: http://csGkR.medicappea.ru/

Thank you, 1fad723!

In this group of messages the linked domain was the same – medicappea.ru. What is different is the 3rd domain – the only randomly generated string (Alexander, 2009).

- http://mqYz.medicappea.ru/
- http://gJsGzlj.medicappea.ru/

Other groups from this advertised web are similar – prices are randomly generated in a predefined interval. For example for Vigara (purposely mispelled Viagra) it is between 0.52 and 0.87USD (on the pages the prices are higher – for example Viagra 0.88USD).

Text patterns for these groups are mainly the same – mispelled names of pills and prices with randomly added string:

** Vigara - $0.62

++ Vigara – 0.70$

All of this is countermeasure against bayesian filtering – spammers try to make as many changes with minimal hardware consumption. Spamming is about sending a great amount of unsolicited emails with the hardware demand as low as possible.

Very dangerous for an unexperienced user are spams targeting the technology aspects of internet communication and maintaining websites. For example this message:

==

Last Call For Domain jablickov.com:

We will be offering jablickov.com for sale today. We see that you previously respond to an email about this domain, but did not submit an offer. This is your last chance to submit an offer on excelfunction. com, or we will make other arrangements.

To submit an offer of at least $97 now, click http://OCCUPYCINEMA.COM/7b82fb7d4e414868.34

But I don‘t know how much to offer!

Often people do not submit offers, because they don‘t know how much to offer. Our minimum offer price is $97. If you submit an offer of at least $97, then you will reserve your position for this domain. In almost all cases, this is enough to win the domain.

To submit an offer of at least $97 now, click here

How do I know that this is a safe transaction?

This is **a ONE-TIME** payment, after which the domain becomes your exclusive property. You never have to pay us anything for the domain ever again.

I don‘t want to rebrand everything with the new domain name

You do not have to rebrand at all. Our service includes FREE domain and email forwarding! You simply redirect the traffic from jablickov.com to doozerbrewingco.org and gain the benefit of having the preferred excelfunction.com without having to change hosting or rebranding at all.

How will I know that I own the domain?

To summarize - you can bid as low as $97, you do not pay until you receive delivery and you never have to reveal your personal payment details to anyone. This your best possible opportunity to get the preferred excelfunction.com to complement your doozerbrewingco.org domain.

Act now and get a free SEO analysis of your website (a $250 value!).

If you would rather not receive notice of these business proposals again, please click

the following link, and your address will be removed immediately -http://OCCUPYCINEMA.COM/1/7b82fb7d4e414868.34

It is possible to store the mind with a million facts and still be entirely uneducated.

We are kept keen on the grindstone of pain and necessity.

== (this is shortened version of spam message – cut is made by author)

This message is based on an attempt to make the user fearful about his domain with international suffix .com. When users have no experience in IT they can be easily convinced that it is necessary to pay.

Bayesian filtering

Common tool for email analysis is Bayesian filtering, this tool is used to determine a score for each email. When the score reaches a preset level, the email is marked as „suspicious spam“ or spam. For suspicious emails the user reaction is mandatory – the user alone decides about this message. When an email is marked as spam with high probability, than the message is dropped to trash.

The key term is spamicity – the probability that this word or email is a spam. Spamicity is a number from the interval between zero and one. There are many different ways how to calculate it. But we can detect spam by patterns based on the content of spam messages. Bayesian filtering analyzes spamicity of words or small parts of a text. So this can be manipulated by adding positive words to a spam text.

Bayesian filtering for this case is not the best tool. Sets of spam messages are different and only one part of the message is similar – the link. But bayesian filtering checks only the text in the link – and the domain is very variable, so this tool is not as good as it should be. Next problem is the hardware cost. Bayesian filtering needs some cpu capacity to analyze emails and compute the final score for a message. There is some research about pre-classification spam messages to relieve some load. One future possibity can be packet analysis on middle communication node.(Muhammad, 2009)

Another way can be established by using collaborative antispam leaning system, where the cpu load is divided by the number of collaboration MTA servers. All users of this antispam network participate to make the most successful antispam collection of rules. But again – it is only about making rules and every email was analyzed as a single one.(Gu-Hsin, 2009)

Blacklisting

The effectivity of IP blacklist is low in this case. About 12% of spam messages can be filtered by this tool, but also 26 hams were blocked by an IP filter. This is the result of botnets (Alexander, 2009).When one zombie computer is in a large local net behind NAT (all computers on network communicate through one IP), all computers from this local net are affected – they are sending email from same IP, which is blocked. When big botnets have hundreds of thousands of computers under control, blacklisting is no longer an effective and reliable tool. It can be used only as auxiliary metrics.

The same situation occurs in the case of domain blocking by DNSBL. When a spam message is send, the header contains a false sender address. Therefore it cannot be considered as a reliable tool. Spam messages contain 4218 spams with the domain name jablickov.cz or vasilenko.cz. If DNSBL is applied, users from those domains cannot simply communicate between each other.

Opportunity

All antispam tools act as a single instrument. Blacklists evaluate the IP address or domain, bayesian filtering calculates the score for the entire message, DKIM or other authentification tools check the sender‘s identity. Commercial antispam solutions try to make a group out of these tools. What if there can be a compact solution to recognize spam based on identify the message as part of a single spam set? It can be easier to decide – this message is similar to several groups of spam.(Zhenhai, 2011)

Results and discussion

After 20 months of monitoring four domains, 71 572 emails were received at all of four domains in research. 95,239% of emails were spam and only 3 407 ham. This is a huge number of messages if we need to analyze and sort them manually.

When an antispam solution is applied, many of the spam messages will be at least marked as spam. But there is a big issue - can those antispam tools be trusted? How many false positive and false negative results are there and how difficult is it to

set those tools to operate? And of course, can those tools help with electronic communication?

For businesses is very important to read every message from a potentional customer. So even when 68,88% (46 954) of spam are randomly generated email addresses pointing at our domain, we cannot simply say that all messeges are junk. (Author‘s original research, 2012)

In the domain the trash bin contained 98 real emails from live persons after 20 months. So it is a small amount – 0,209%, but even such small amount cannot be forgotten. (Author‘s original research, 2012)

A sample of 5000 recognized spam messages was translated with google translator to the Czech language. After translation, all messages were put again into bayesian filtering. 617 messages weren‘t recognized as spam. The big effectivity of Bayesian filtering for English written spam in Czech (or other local) language environment can be seen here. (Author‘s original research, 2012).

Advanced spam scoring

Bayesian filtering is a great tool when we received spam in a different language, fortunately for the Czech language environment. For small businesses in the Czech Republic it is one of many great tools.

More efficient filtering is using content history analysis. When we can decide based on history that a group of messages is like another, we can then efficiently defend our mailboxes against spam.

Amoeba effect and unsolicited email vector

When a spammer takes orders to spamvertize a specific product or website he gets a text with a proposal. This is the core text for a spam message. This core must be protected from bayesian analysis and the blacklist of spam words. So, several variants of this message must be ready. Changes are based on adding random strings, changing prices and adding words with a predicted positive bayesian score. This we can call an Amoeba effect – the core of this small protozoan inucellular organism is still the same, but the shape is different. For a human being it is simple to be recognized, but for a computer it is very hard.

The Amoeba effect can be mathematicaly described as a multidimensional vector. Each characteristic of a spam email have their own vector variable, lets call it UEV (Unsolicited Email Vector). The final score of the message is a composit of the sums of all vector values. Composition od UEF is based on spam characteristics – IP map address score v1, bayesian score v2, clean subject score v3 (clean – with the random string removed), link analysis v4, time characteristics v5, amount of near-like messages v6. So UEV in this simple form can be described by the equation, Where variable x is mark for single email analyzed by UEV:

$$UEV_x = v_{1x} + v_{2x} + v_{3x} + v_{4x} + v_{5x} + v_{6x}$$

For a decision to which group of spam sets belongs a single message, we must compute the vector of this message. Database for this solution can be established by the multidimensional OLAP database. (Author’s original research, 2012) (Tyrychtr, 2012).

V1

V1 vector is based on a map of IP addresses misused for sending unsolicited emails. When botnet is used for spread spam messages once, it is not at last time and there is a possibility to capture a large amount of spam messages.

V2

Differencies between sets of spam messages must be reduced by near-like message detection. This NLMD procedure eliminates some artifically added strings and signs. NLMD can be likened to database normalization - Boyce-Codd Normal Form. After NLMD body of analysed emails is clear from disturbing strings and characters, such as „*, +, /, …“, multiple spaces and aditional rows. Now v2 can be processed by bayesian filtering.

V3

The subject is an inseparable part of an email. For confusing antispam tools, spammers add random parts to the subject. The captured spam stated for example this:

- New discount <1>
- New discount <2>
- New discount <3>
- …
- New discount <10>

So for vector v3 the subjects from captured spam messages were compared with subjects in the actual message and v3 distance is calculated.

V4

The link or email for vector v4 in the text is the only way to make order of a spamvertized product, so it is a significant pointer. If we compare

the link in the email with saved links from spam messages, we can decide if the link is clear or else the link is pointing to spamvertized sites. We only need to use methods for comparing web sites. Spammers cannot make infinite number of web pages – it costs money and time. The key attributes in this are the IP addresses, domains and comparing web sites with known spamvertizing sites in the database.

V5

The time and date in vector v5 can be very useful in special cases. When, for example, we have the date of January 2nd 2013 and in the email the date is January 5th 2014 or December 5th 2002, the spam is identified. Also when many near-like messages are captured with almost same date – it is very probable that it becomes one set of messages. When only one is spam, it is highly probable that all other messages are spam too.

V6

Last vector shows how many similar emails we have received. Often it is usual that we have the same messages in the mailbox for one user – it is caused by a mistake or a technical anomaly. This is not the reason to say that 3 messages with same text are spam. But 15 messages have more chance to be spam. So quantity is a last vector – it must be evaluated relatively with all 5 remaining vectors.

Conclusion

As in different computer security topics the antispam tools are one or more steps behind the spammers. At this time we only defend our mailboxes. Filtration and blocking is like pills against a headache. They cure symptoms not the cause. And we cannot cure the cause because of freedom of the internet. And we cannot restrict free access to the internet in accordance with Network neutrality. So spammers can hide behind botnets.

The only reasonable solution is based on the user. If you nobly click on a link in spam or make an order, the spam died alone. But when little fiction of internet population spends money through the spam messages, spam will be with us. As was written in this article, the main oportunity is in near-like detection. Spammers are sending very large quantity of spam, but only slightly modified by small random strings. There can be strong methods to drop them out.

When we look at received spam messages in this project, we can say that a large number is from a few sources sent by few orders. Almost the same texts, same websites at different domains. This is a way to really make spammers work hard to defeat this. When spam must have more modifications to not be recognized as similar, there is a big need of resources – generating every message as a single text is very resource consuming. Large work i salso about offensive solution to prevent spammer to send milions of emails. But this is another story.

Disadvantage of this proposal is need for large amount of spam messages. For this system is very important to build database with as much spam as possible. Second issue is need for computation power. When mail server must serve to 100 messages per hour, it can handle more deeply analysis then if have 100 messages per minute. For this, next research will be focused to benchmark UEV in real condition.

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Varietal Preferences and Adoption Pattern of Economically Viable Medicinal and Aromatic Crops by the Indian Farmers

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Abstract

Central Institute of Medicinal and Aromatic Plants (CIMAP) is the knowledge gateway of medicinal and aromatic plants related services and technologies. It organizes kisan mela (Farmers Fair) every year and display new varieties/technologies and innovative cultivation practices on commercially viable MAPs for its end users. Analyzed data reveals that 75.85% farmer preferring aromatic crops and only 24.15% farmers in favor of medicinal crops. In the year 2010-2012, aromatic crops are quite popular among the farmers and increment pattern of aromatic crops were 40% & 71.90 in Mint; 48% & 78.37% in Rose, Menthol mint still dominates the choice, while in case of medicinal plants, the adoption pattern increments were 75% & 38.09% in Stevia; 35.71% & 21.05% in Withania; 37.5% & 77.27% in Tulsi respectively. It leads to improved socio-economic condition of farmers in the area using cultivable land but also in rural sector under stress and unsustainable land.

Key words

Cropping pattern, agro-technology, socio-economic growth, MAPs cultivation.

Introduction

Agricultural practices are the major mean for the survival and living for over 58.4% of Indian population, near about 1/5th of the total gross domestic product contribution is from these agricultural sectors, in our export earning agriculture shares about 10% growth and side by side it plays major role in providing the major raw material to industries on large scale [1]. In majority people depends on medicinal plant products for curing human and livestock ailments, while aromatic plants reported with their importance either in domestic or commercial uses, on an average 12.5% of the reported plant species have medicinal values. The medicinal and aromatic plants (MAPs) cultivation need to be conserve in any type of agro-ecosystems approaches along with good marketing strategy would also results in promoting the cultivation of medicinal plants [17]. Cultivation of economically viable MAPs can improve the socio-economy of farmers, fast growing MAPs with high economic potential were given priority, traditional cereal crops production is uneconomic and diversification in cropping system is necessary [4]. Farmers have to make their income and growth mainly through these agricultural practices but the real fact is that their economic growth is not substantial to leave the agriculture. Farmer are migrating to urban area in search of job, it is necessary to overcome these situations and diversify their agricultural practices and along with the cultivation of medicinal and aromatic plant. It is an alternative way to bring good economic and production rate, and also protects the MAPs by the implementation of sustainable wild harvesting methodology [2] and also along with this intensive and continuous harvesting of wild medicinal plants could results with over exploitation and tragic development in biodiversity [22].

Medicinal and aromatic plants (MAPs) are the diversified crops they could be easily cultivated in some of the rare areas of wastelands, saline and alkaline soils. On an average 2700 and 2500 MAPs species were collected from India and Africa with wide application in medicinal and another usage [10, 18]. Practices with MAPs like collection, simple processing and trading contributes towards the cash income of poor small holder farmers and especially well socio-economic status of women in developing countries [9] MAPs constitute a large segment of the flora which produce raw material for the pharmaceuticals, cosmetics, perfumery, fragrance and flavor industries. On an average 95%

of MAPs were much more diversified from wild region and this also has been reported with health promising and other economic aspects [8]. More than 20% of over the counter prescription drugs (OTC) are presently derived from plants. Most of the essential oil bearing crops is mainly unaffected from pest and disease. Therefore no further use of pesticide were admitted, in these crops, because of their perennial in nature they have good root system and helps in preventing soil erosion, hence these crops are environment friendly . Global market value of these essential oils, aroma, chemical, natural flavors and fragrances is about US$15 billion and India ranks second with 21% sharing of US$922 million estimated oils(excluding turpentine oil) in 1999. World production of essential oil is estimated about 1,10,000 tones and India with sharing of 16% ranks third in this order. Out of these oils produced, 55-60% use for food flavours and 15-20% of fragrances and the remaining were used for the isolation of aroma chemicals [20],While globally Kenya were being reported in fulfilling the 70% demand of Pyrethrum [21] and Morocco stands with second largest exporter of medicinal and aromatic plants material from Africa [12]. The medicinal and aromatic plants (MAPs) as an alternative way in securing livelihoods and upliftment of farmers of developing world with their settled traditional and conventional agriculture system [7].

CIMAP plays a pioneer role in the widespread production and cultivation of MAPs crop in the different agro-climatic zones of the country. Number of commercially viable medicinal and aromatic plants verities has been produced by CIMAP made available quality planting material for industries. These varieties are CIM-Ayu, CIM-Somya (Tulsi), Poshita and NIMITLI-118 (Ashwagandha), CIM-Biridhi, KS-1 (Khus), Krishna (Lemongrass) CIM-Pawan (Geranium) etc. In order to make these crops and varieties popular among the growers number of programme like awareness meet, survey based technology intervention and training activities have been routinely conducted by CIMAP. With these efforts, MAPs crops could be increased in area and quality production of MAPs different part of the country. The present study was aimed to assess the preferences of varieties and adoption pattern of crop among the farmer/stockholder in present agriculture scenario.

Methodology

To disseminate the knowledge base of MAPs varieties, agro-technologies, process technologies, marketing linkage and encouraging farmers for wider adoption, the CIMAP organizes kisan mela every year on 31st January. Farmers from different part of Uttar Pradesh (U.P) and other states like Bihar, Jharkhand, Madhya Pradesh (M.P), Chhattisgarh, Maharashtra participated in the kisan mela to know about latest varieties, agro-technologies and process technologies in MAPs cultivation. Farmers purchased planting material of MAPs to their choice of adoptability and suitability in the area. A list of farmers visiting the kisan mela in 2010, 2011 and 2012 was prepared. The data on the various MAPs planting material that have been purchased by the farmers were collected from the CIMAP Research Farm and analyzed to work out the choice of different planting material either crops/varieties. The total one thousands four hundred twenty nine farmers were shown interest to collect the planting materials and propagules to their choice, suitability and economics of the crops during the years.

Results and Discussion

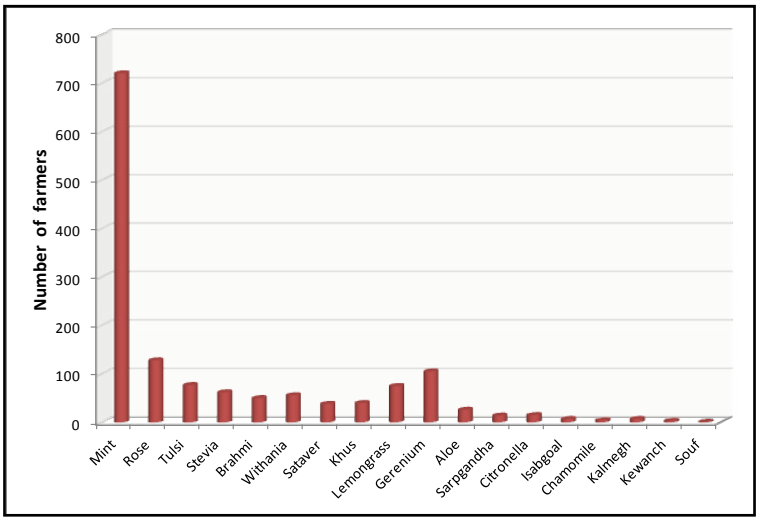
It is evident from figure 1a, 1b and table 1 in respective years (2010-2012), majority of farmers preferred to cultivate Menthol mint (50.45%) followed by Rose (8.96%), Geranium (7.35%), Tulsi (5.39%) and lemongrass (5.25%). Among the varieties most preferred indicating number of farmers in descending order were Saryu (349), Kosi (280), Saksham(32) in Mint; Noorjahan (85) and Ranisaheb (45) in Rose; CIM-Pawan (61) and Borbon (44) in Geranium; CIM-Somya (49), CIM-Ayu (23), CIM-Shyama (4) and Vikarsudha (1) in Tulsi and Krishna (57), Nima (10), Pragati (5), and Parman (3) in Lemongrass respectively. Number of Farmers have also got interested in few other crops like Stevia (4.34%) with var. CIM- Meethi and CIM-Madhu; Withania (3.92%) with var. Poshita; Brahmi (3.50 %) with var. CIM-Jagriti; Khus (2.80%) with var. CIM-Biridhi, KS-1, Gulabi. and Dharni; Satavar (2.66%) with var. CIM-Shakti; Aloe (1.82%) with var. Sheetal; Citronella (1.05%) with var. Bio-13, Krishak, Manjari and Manjusa; Sarpgandha (0.98%) with var. CIM-Sheel; Isabgoal (0.49%) with var. Niharika; Kalmegh (0.49%) with var. CIM-Megha; Chamomile (0.28%) with var. Smohak; Kewanch (0.21%) with var. CIM-Ajar; Souf (0.07%) with var. Sujal. The farmers of Uttar Pradesh, Bihar and Jharkhand are mainly preferred Mint, Stevia and Khus, while Rose, Withania, Geranium are preferred by Uttar Pradesh, Maharashtra, Bihar and Jharkhand

Crops	Varities and total no. of farmers (in parenthesis)	Total No. of farmers	% share
Mint	Saryu (349)	721	50.47
	Kosi (280)		
	Kushal (41)		
	Himalaya (20)		
	Saksam (32)		
Rose	Noorjahan (85)	128	8.95
	Ranisaheb (43)		
Tulsi	CIM-Ayu (23)	77	5.39
	CIM-Somya (49)		
	CIM-Shyama (4)		
	Vikar Sudha (1)		
Stevia	CIM-Madhu (62)	62	4.34
Brahmi	CIM-Jagriti (50)	50	3.5
Withania	Poshita (56)	56	3.92
Sataver	CIM-Shakti (38)	38	2.66
Khus	CIM-Bridhi (19)	40	2.8
	KS-1(18)		
	Gulabi (2)		
	Dharni (1)		
Lemongrass	Krishna (57)	75	5.25
	Nima (10)		
	Pragati (5)		
	Praman (3)		
Gerenium	Borbon (44)	105	7.35
	CIM-Pawan (61)		
Aloe	Sheetal (26)	26	1.82
Sarpgandha	CIM-Sheel (14)	14	0.98
Citronella	Bio-13 (10)	15	1.05
	Krishak (3)		
	Manjari (1)		
	Manjusa (1)		
Isabgoal	Niharika (7)	7	0.49
Chamomile	Smohak (4)	4	0.28
Kalmegh	CIM-Megha (7)	7	0.49
Kewanch	CIM-Ajar (3)	3	0.21
Souf	Sujal (1)	1	0.07
Total		**1429**	**100**

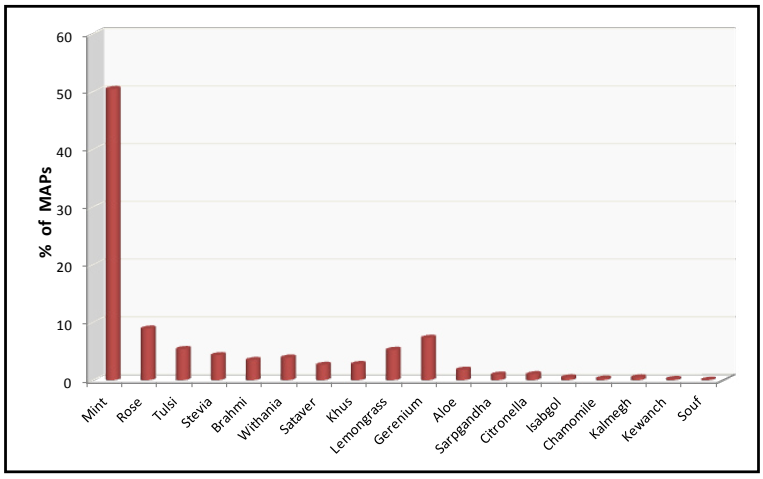
Source: CSIR-CIMAP Research Farm, Lucknow, India

Table 1: Different Varieties of MAPs preferred by the farmers and their no. during Kisan mela 2010,2011 and 2012.

farmers respectively. Herbs like Tulsi, Brahmi are preferred by the farmers of Uttar Pradesh, Bihar and Madhya Pradesh, while Aloe, Sarpgandha, Citronella, Kewanch are preferred by the farmers of Uttar Pradesh and Bihar (Table 2). Chamomile preferred by the farmers of Chhattisgarh and Maharashtra. Chhattisgarh is the only state where Saunf has been preferred by the farmers. It is also interesting to note that crop like Khus, Ocimum and Withania were not popular crop in north India taken up by the farmers as annual and short term crop but due to profitability and easy marketability (Table 2). It is due to CIMAP efforts to popularize these crops through survey awareness gosthi,



Graph 1a: Pattern of adoption of MAPs crops by growers over the period of three years (2010, 2011 and 2013) during CIMAP Kisan mela (Farmers fair)



Graph 1b: % pattern of MAPS adopted by the farmers in 2010, 2011 and 2012

demonstration and field visit where farmers have acquired knowledge to raise these crops under non-traditional belt. Although some farmers have also preferred plant material of Kewanch, Withania and Brahmi as medicinal crops due to assured returns in local market. It is observed that farmers are still prefers aromatic crop due to assured and defined market then medicinal crops in the country. Menthol mint is now dominating and widely accepted crop over most of district of Bihar and Uttar Pradesh also in the states like Jharkhand, Maharastra, Madhya .Pradesh, Tamilnadu, and Andhra Pradesh (A.P.) [3].

Cultivation of menthol mint more profitable in Deccan plateau [16]. Some of the MAPs crops like Ocimum, Satavar and Khus are popularizing in Uttar Pradesh extensively in various training and intervention programmes organized by CSIR-CIMAP [14]. It has been found that Ocimum crops can be grown region of low rainfall and region having inadequate irrigation. Some of MAPS are also grown through agro forestry system [16]. Earlier studies have also demonstrated that menthol mint grows well under poplar based agroforestry system in foot hills of Uttarakhand [11]. Improved agro-technology in cultivation of Geranium in comparatively short period definitely leads to large scale cultivation in North Indian Plaines [15]. Citronella, Lemongrass, Palmarosa and scented geranium are mostly preferred by north and West Indian farmers. These crops could also be grown in few areas like red soil region of south India and also in arid region of Bundelkhand [13]. It is also observed that farmers of U.P and Bihar are adopting Vetiver and Ocimum as well fitted crop due to

Crop	2010		2011		2012		Total
	States	No(s)	States	No(s)	States	No(s)	
Mint	UP,Bihar	150	UP,Bihar,MS	210	UP,Bihar,Jharkhand	361	721
Rose	UP,Bihar	25	UP,Bihar,Jharkhand	37	UP,Bihar,Jharkhand,MS	66	128
Tulsi	UP,Bihar,MS,Jharkhand	16	UP,Bihar,MP,MS	22	UP,Bihar,MP	39	77
Stevia	UP	12	UP,Bihar	21	UP,Bihar,Jharkhand	29	62
Brahmi	UP,Bihar	13	UP,Bihar,Jharkhand	11	UP,Bihar,MP	26	50
Withania	UP,Bihar,Jharkhand	14	UP,Bihar,Jharkhand	19	UP,Bihar,Jharkhand,MS	23	56
Satawar	UP,Bihar	5	UP,Bihar	13	UP,Bihar,MS	20	38
Khus	UP,Bihar	6	UP,Bihar,Jharkhand	16	UP,Bihar,Jharkhand	18	40
Lemongrass	UP,UT,Bihar,Jharkhand	40	UP,Bihar,Jharkhand	18	UP,Bihar,Jharkhand	17	75
Gerenium	UP,Bihar,Haryana	54	UP,Bihar,Jharkhand,MP	36	UP,Bihar,Jharkhand,MS	15	105
Aloe	UP	5	UP	8	UP,Bihar	13	36
Sarpgandha	UP	3	UP,Bihar	2	UP,Bihar	9	14
Citronella	UP,Bihar	6	UP	5	UP,Bihar	4	15
Isabgoal	UP	1	UP,Jharkhand	3	UP,Jharkhand,MS	3	7
Chamomile	….	0	MP	1	Chhattisgarh,MS	3	4
Kalmegh	UP	1	UP	4	UP,MS	2	7
Kewanch	….	0	UP	1	UP,Bihar	2	3
Souf	….	0	….	0	Chhattisgarh	1	1
Total		**351**		**427**		**651**	**1429**

Source: CSIR-CIMAP Research Farm, Lucknow, India

Table.2: Trends of prefrences of MAPs crops by the Indian farmers.

annual and short term crop with good profitability. MAPs are being adopted by the farmers of Bundelkhand region of Uttar Pradesh as rain fed crop especially Lemongrass in Aonla based agro-forestry system and also sole crop of Palmarosa. There were immense possibilities to grow aromatic grasses like Lemongrass, Palmarosa and Tulsi as rainfed crops. Kalmegh/Tulsi and Bajra/Maize can be suitable for co-cultivation to raise the income of small and marginal farmers of this region [6]. Recent science and technology interventions done by CIMAP in Bundelkhand region indicates that Palmarosa crop is emerging alternate crop in place of Mint in Bundelkhand region especially Jalaun and Jhansi district due to low water requirement and low inputs [6].

Conclusion

Agricultural practices are the medium for the farmers to maintain good socio-economic growth, along with the traditional practices of crops, introduction and inventorisation of MAPs could provide a good return value to the farmers. Globalization of MAPs quite familiar with the concept of standardization of plant material that were grown organically and meet the demand of market with higher efficacy [5]. ex-situ and in-situ conservation are the objectives in maintenance of MAPs status with their occurrence, general distribution and abundance[19], which also include Continuous S&T inputs in terms of awareness gosthi, training programmes and demonstration leads to wider adoption of these rainfed crops in the dry part of U.P especially in Bundelkhand region. An agro-technology based practice makes many areas either rainfed or irrigated for commercial cultivation of MAPs. Introduction of new varieties of MAPs by CSIR-CIMAP leads to quality production of raw materials and essential oils for commercial exploitation by the essential oil processing industries.

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Information: Compete

an EU research project to strengthen competitiveness of the European agri-food sector

The European Commission entrusts a consortium of sixteen European partners with the research collaborative project *"International comparisons of product supply chains in the agri-food sectors: determinants of their competitiveness and performance on EU and international markets"* (COMPETE).

The European agri-food sector faces global challenges through changes in product demand and supply of resources as well as a higher number and level of integration of market actors. This puts pressure on efficiency and innovation in today's food production and distribution. COMPETE will gain a more comprehensive view on the different elements which contribute to the competitiveness of the European agri-food supply chain in order to provide better targeted and evidence based policies on the EU as well as on the domestic level.

The COMPETE project will address three main questions:

- How should competitiveness be conceptualized and measured?
- What are the main determinants of competitiveness?
- How can policy-makers best strengthen competitiveness and promote the Knowledge Based Bio-Economy in Europe?

The project is innovative in that it takes a value chain perspective rather than looking at the performance of farms or food manufacturers in isolation. The funding from the European Commission accounts for 2.42 million Euros for a period of three years.

On November 19-20, 2012 the consortium launched the project's kick-off meeting at IAMO in Halle (Saale), Germany. On the agenda was the discussion of important milestones of the project. Further partners developed a strategy for a constant and dynamic dialogue with stakeholders to ensure a broad dissemination of the project results and the success of COMPETE.

The Consortium of COMPETE is coordinated by Leibniz Institut für Agrarentwicklung in Mittel- und Osteuropa (IAMO) and brings together academics, trade bodies, NGOs, agricultural co-operative, industry representative advisory services. In addition, the project will be supported by the group of societal actors, incorporating farmer, food processing and consumer associations, providing in-depth knowledge on the agri-food sector and speeding up the achievement of the project goals. The COMPETE project partnership consist of the following organizations:

- Leibniz Institut fur Agrarentwicklung in Mittel- und Osteuropa (IAMO), Germany – the project coordinator
- Institute of Agricultural Economics (IAE), Romania
- Wageningen Universiteit (WU), The Netherlands
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- Bundesvereinigung der Deutschen Ernährungsindustrie eV (BVE), Germany
- Federazione Italiana dell'Industria Alimentare Associazione (FED), Italy

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