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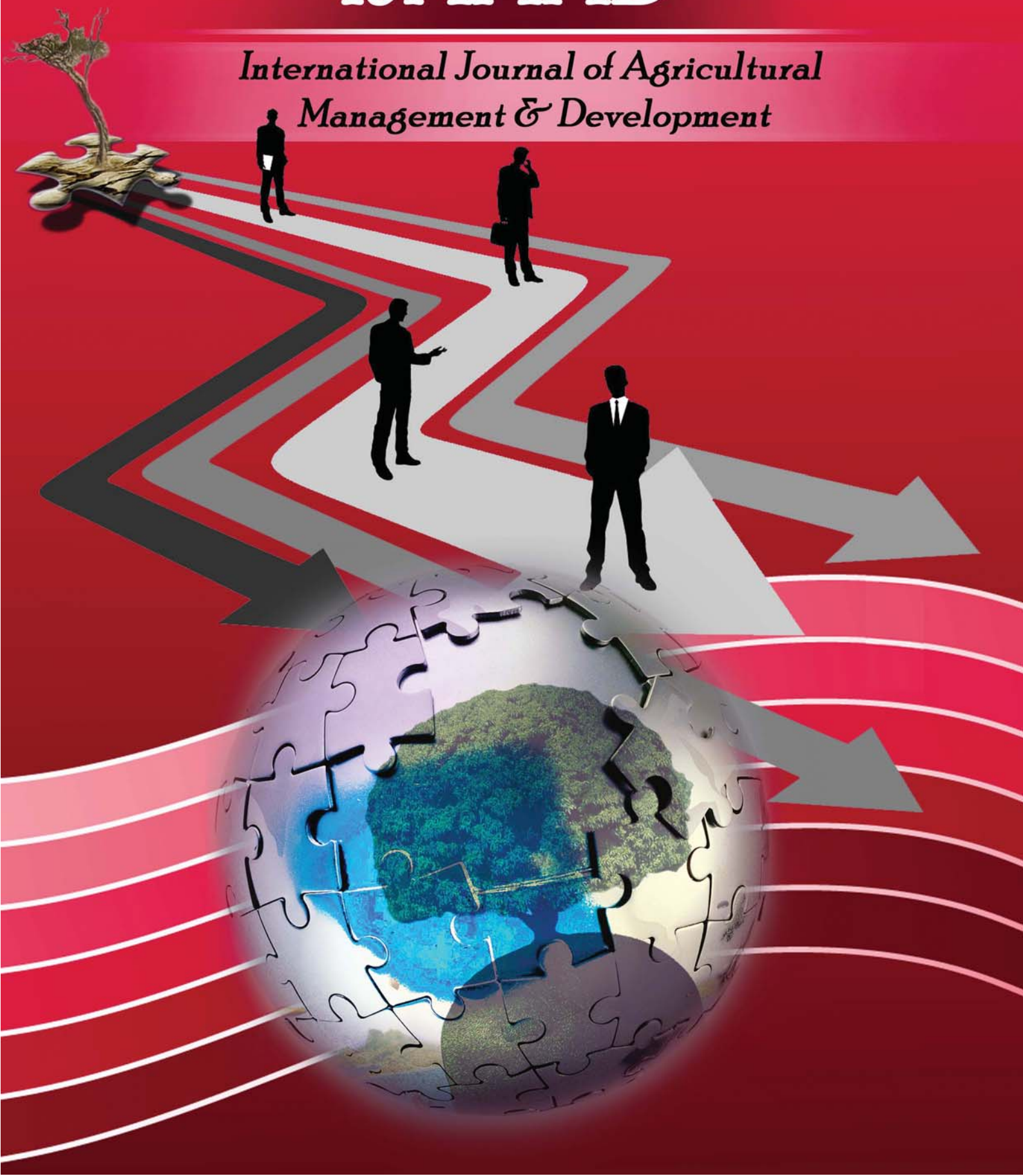

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Labour and Poverty: Empirical Relationship Using House Data from South Nigeria

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Abstract

In Nigeria, most farming activities rely on family labor. However, rural-urban drift and the movement of young people away from agriculture are making labor increasingly pause. Thus, labor has become a major constraint to expanding the scope of production by small-scale resource poor farmers. This paper provides an empirical relationship between labor and poverty using data from households. Through a multi stage sampling procedure, 150 farming households were selected using questionnaire. Results of Foster, Greer and Thorbecke decomposition show that poverty incidence, depth and severity increase with increase in labor employed in farm operations implying that poverty is directly related to labor. Finding further reveals that the difference in poverty incidence of one of the sub-group (1–50 Vs 50–100) pair is statistically significant at ($P< 0.05$). Results suggest that the mandays of labor employed significantly affect the poverty incidence of farm households.

Keywords:
Labour, Poverty, Household, Nigeria.

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INTRODUCTION

Nigeria's agricultural production is highly labor intensive. Over 90% of all tasks in non–mechanized production systems depend on human labor, and for mechanized production systems depend on human labor, and for mechanized production systems, between 50 and 60% of the tasks depend on human labor (Olayide, 1981; Shaib *et al.,* 1997). According to Olayeni (1980) and Sharb *et al.,* (1997), family labor constitutes over 76% of farm labor. Generally, males are responsible for land clearing, ridging and weeding, while women undertake the processing and marketing of farm produce and they may also help in weeding, harvesting, bird scaring and the tending of cattle, sheep and goats. Hired labor has become important in farm operations especially during the peak periods of the various farming activities.

The rapid rural-urban migration of the youths and the resultant dwindling of an active farm labor force has become a major constraint to expanding agricultural production (Shaib *et al.,* 1997). Historically, the movement of labor away from agriculture as a result of rural-urban drift was relatively gradual between 1960 and 1970. During this period, young school leavers went into public and industrial sector employment, which was concentrated in the urban centers. In the 1970s, the deployment of earnings from petroleum export in urban construction industries created employment for unskilled labor. The resulting massive rural–urban migration depleted rural areas of farm labor. In the 1980s and 1990s when there were reverses in petroleum and construction activities, urban employment dropped. While some of the migrants returned to rural areas, many of them did not, and as a result labor shortages in the village have remained endemic. Consequently, farming sector wage rates have been on the increase, rising from a mere N0.45 per man-day in the 1970–1975 period to nearly N65.00 per man-day in the 1991–1994 period, making hired labor increasingly unaffordable to the small-scale farmer. More recently, these wage rates have increased astronomically between N1, 500 – N2, 500 per manday depending on the location and size of the plot.

Farm labor productivity has become increasingly low because farm households largely comprised fairly old people and very young children coupled with crude implements which impedes their ability to raise yield and income with subsequent reduction in poverty. According to Borlang and Dowswell (2010), no nation has been able to substantially reduce poverty and bring about economic growth and development without first markedly increasing the productivity of its agricultural and food systems. Like in many developing countries, poverty in Nigeria is essentially a rural phenomenon as most of the impoverished people live in the rural areas, where they derive their livelihood from farming (Etim and Ukoha, 2010). Investing in agriculture is a key to reducing poverty and hunger in developing countries and is essential element in addressing the current food price crises (Fan & Rosegrant, 2008; Etim & Ukoha, 2010). But agricultural production in the Akwa Ibom State is highly labor intensive as majority of the farming activities rely both on family and hired labor. Most of poverty studies are linked to agriculture (Canagarajah *et al.,* 1995; FOS, 1999; Khan

Table 1: Mean Household Expenditure (Adult Equivalent)

Item	Amount (₦) per month	Percentage Expenditure
Energy	1677.34	20.30
Clothing	1201.30	14.54
Health care/ Medication	1134.34	13.73
Education	2107.00	25.50
Food	2144.11	25.93
Total	8264.09	100.00

Mean 1652.82
2/3 1,101.88 (Poverty line)

Table 2: Labour Employed in all farm Enterprises

Family Labour (Mandays)	Frequency	Percentage
1 - 50	52	34.67
51 - 100	78	52
101 - 150	20	13.33
Total	150	

Table 3: Comparison of Poverty by Labour

Labour Employed (Mandays)	P0	P1	P2	Contribution to		
				P0	P1	P2
1–50	0.38	0.25	0.24	0.17	0.31	0.34
	(1.00)	(-0.25)	(-0.27)			
50–100	0.46	0.42	0.43	0.57	0.56	0.55
	(-0.20)	(-0.04)	(-0.08)			
100–150	0.66	0.71	0.84	0.26	0.13	0.11
	(2.11)**	(2.45)**	(2.57)**			
All	0.57	0.48	0.44	1.00	1.00	1.00

Figures in parentheses are t – values of Pα. ** Significant at 5%.

2001; Okunmadewa, 2001). This implies that a large proportion of the rural poor are engaged in one form of farming or the other. According to Mijindadi (1995), over 90% of the foods consumed in Nigeria are produced by these farm households. This study investigates the empirical relationship between family labor and poverty using data from farming households.

The concept of poverty dates back to 1899, when one of the earliest and most famous studies of poverty was conducted by Seebohm Rowntree in York. He used a concept of subsistence poverty and drew a poverty line in terms of a minimum weekly of sum of money, which was necessary to enable families secure the necessaries of a healthy life. According to Okunmadewa (2001), poverty is more easily recognized than defined. Hence, a universally acceptable definition of the term has remained elusive. Poverty is defined as total poverty as the expectation overtime of the poverty measured at each point in time. Poverty can be chronic (structural) or transitory, depending on how long poverty is expressed by an individual or a community. Chronic poverty is long term, persistent, the causes of which are largely structural and endemic, while transitory poverty is temporary, transient and short term in nature. Transitory poverty is defined as total poverty minus chronics poverty. Since the nineteenth century when rigorous studies in poverty began researchers have tried to establish fixed yardsticks against, which to measure poverty ideally, such a yardstick would be applicable to all societies and should establish a fixed level, usually known as the poverty line below; which poverty begins and above which it ends. A traditional measure of poverty stipulates that the number of people living on less than US$I per day. Although this traditional measure of poverty is commonly used, many in the development community have supported measures such as Millennium Development Goals (MDGs) that use a complex set of conditions as yardsticks in assessing the entire living situation of poor people (Rosegrant *et al*., 2005). Absolute poverty is a situation of lack of access to resources required to obtain the minimum necessities required to maintain physical efficiency. Relative poverty, on the other hand, is the inability to attain a given minimum contemporary standard of living. Poverty can also be subjective. This refers to whether or not individuals or groups feel they are poor. Subjective poverty is closely related to relative poverty since those who are defined as poor in terms of standard of the day will probably see and feel themselves to be poor. The concept of subjective poverty is important since to degree, people act in terms of the way they perceive and define themselves. Poverty line is the threshold income below, which one is considered to be poor (Kakwani, 1993). It is the value of income or consumption expenditure necessary for a minimum standard of nutrition and other necessities. According to

Thorbecke (2004) there are currently two main methods of setting the poverty live i.e. Cost of Basic Needs (CBN) and the Food–Energy-Intake (FEI) methods.

The literature on aggregate measures of poverty and wellbeing is quite enormous. Many indices have been designed and developed to measure poverty and well-being. These comprise Sen index (1979); Foster-Greer-Thorbecke (FGT) poverty Index (1984); UNDP (1990), Integrated Poverty Index (IPI), Basic needs on balanced diet index, the Physical Quality of Life (PQLI) (Morris, 1994), Relative Welfare Index (IFAD, 1993), Index of Social Progress (Estes' 1984); Index of "Quality of Life" in nations (Slottje's 1991); Index of Quality of Life in metropolitan areas (Lui's 1977) This study however employs the Foster, Greer, Thorbecke weighted poverty measure for quantitative poverty assessment. This class of additively decomposable poverty measure is based on income/expenditure approach.

MATERIALS AND METHODS

Study area, sampling and data collection:
The study was conducted in Akwa Ibom State, Nigeria. The state is located at latitude 4º33' and 5º53' North and longitude 7º25' and 8º25' East and occupies a total land area of 7,246 km^2. With an estimated population of about 3.9 million (NPC 2006), the state is bounded to the North by Abia State, to the East by Cross River State, to the West by Rivers State and to the South by the Atlantic Ocean. Administratively, the state is divided into 31 Local Government Areas and has 6 Agricultural Development Project (ADP) Zones viz: Oron, Abak, Ikot Ekpene, Etinan, Eket and Uyo.

The study area is in the rainforest zone and has two distinct seasons viz: the rainy and the short dry season. The annual precipitation ranges from 2000-3000 mm per annum. Most of the inhabitants of rural communities in the study area are farmers and the crops commonly cultivated include cassava, oil palm, yam, cocoyam, flitted pumpkin, okra, water-leaf, bitter-leaf, etc. In addition, some micro livestock are usually raised at backyards of most homesteads.

Primary data were used for this study. Farm-level intensive itinerary survey provided the basic cross-sectional data from 150 rural farming households in the study area. Data were collected from farm households using well structured questionnaire. Primary data included data on household income and expenditure, socio-economic characteristics of households and their heads, farm specific variables.

Multistage sampling technique was used for selecting the representative farm households that were used for this study. The first stage was the random selection of 3 out of the 6 Agricultural Development Project Zones in Akwa Ibom State. The second stage sampling was the random selection of 5 villages per ADP zone to make a total of 15 villages. Furthermore, a total of 10 households were randomly selected to make a total of 150 farming households.

Analytical techniques

The Foster, Greer and Thorbecke (FGT) weighted poverty index was used for the quantitative poverty assessment (Foster *et al*., 1984). The reason for this choice is due to its decomposability of the overall population into sub-groups which allows for comparison. United Nations UN (2001) noted that the most important purpose of a poverty measure is to enable poverty comparisons.

The FGT measure for the subgroup $_i$th $P_{\alpha i}$ is given as:

$$Pi = n^{-1} \sum_{j=1}^{qi} \frac{z - Yji}{z,Omax}$$

Where $P_{\alpha i}$ is the weighted poverty index for the ith subgroup; n_i is the total number of households in the ith subgroup households in poverty; Y_{ji} is the per adult equivalent expenditure of household j in sub-group $_{ij}$, z is the poverty line and α is the degree of concern.

When α is equal to zero, it implies no concern and the equation gives the head count ratio for the incidence of poverty (the proportion of the farming households that are poor).

The poverty line used for this study is defined as the two-thirds of mean household expenditure adult equivalent. Adult equivalents were generated

following Nathan and Lawrence (2005) as follows:

$$AE = 1 + 0.7 (N1 - 1) + 0.5 N2$$

Where AE = Adult Equivalent

N1 = Number of adults aged 15 and above

N2 = Number children aged less than 15

$$\text{That is } Pi = ni^{-1} \sum_{j=1}^{qi} \frac{z - Yji}{z,Omax} = qi/ni$$

When α is equal to 1, it shows uniform concern and equation becomes

$$P_{1i} = ni^{-1} \sum_{j=1}^{qi} \frac{z - Yji}{z,Omax} \quad 1$$

This measures the depth of poverty (the proportion of expenditure shortfall from the poverty line) according to Hall and Patrinos (2005), it is otherwise called the poverty gap-the average difference between the income of the poor and the poverty line.

When α is equal to 2, distinction is made between the poor and the poorest (Foster *et al.,* 1984, Assadzadeh and Paul, 2003). The equation become

$$P_{2i} = ni^{-1} \sum_{j=1}^{qi} \frac{z - Yji}{z,Omax} \quad 2$$

The equation gives a distribution sensitive FGT index called the severity of poverty. It tells us the extent of the distribution of expenditure among the poor.

The FGT measure for the whole group or population was obtained using:

$$P = \sum_{i=1}^{m} \frac{P_1 n_1}{n}$$

Where Pα is the weighted poverty index for the whole group, m is the number of subgroups while n and ni are the total number of households in the whole group and the $_i$th sub-group respectively.

The contribution (C_i) of each sub-group's weighted poverty measure to the whole group's weighted poverty measure was determined using;

$$Ci = \frac{n_i P \alpha_i}{n P\alpha}$$

The test of significance of $P\alpha_i$ (subgroup poverty measure) relative to the pα (whole group poverty measure) was given according to Kakwani (1993) by:

$$t = \frac{P\alpha_i - P_\alpha}{SE\,(P_{\alpha i})}$$

The above was used to test if significant difference exist between the Pα measures of a subgroup i with another j.

The weighted poverty measures (Pα) and their corresponding standard errors were calculated using the Microsoft Excel Package.

RESULTS AND DISCUSSION

The first step in the analysis of poverty is the determination of the poverty line. As stated in the methodology, the mean household expenditure adult equivalent was used to determine this threshold. Table I shows the average amount expended on basic consumption items of the households. The mean per adult equivalent household expenditure is ₦1, 652.82 and the poverty line is ₦1, 101.88.

The use of family labor is common in the study area. Findings however reveals that majority of the households (52%) have 50–100 mandays of family labor while 34.67% of the farm households employ less than 50 mandays of family labor.

Farm households with more than 100 mandays of family labor are 13.33%. Findings imply that majority (65.53%) of the households employ greater mandays of family labor suggesting that households had many members/dependants.

Labour Employed

Poverty was profiled among farm households using three labor sub-groups. Table reveals that 38, 46 and 66 percent of households with

Table 4: Poverty by Labour Employed (Mandays)

Labour Employed (Mandays)	P0	P1	P2
1–50 vs 50–100	-2.00**	-0.81	-0.79
1–50 vs 100–150	-0.88	-0.75	-0.81
50–100 vs 100-150	-0.33	-0.67	-0.82

** Significant at 5%.

labor less than 50, 50–100 and above 100 mandays respectively are poor. Their respective contributions to the whole group's poverty incidence are 17, 57 and 26 percent. Poverty incidence is significant (P<0.05) in households with more than 100 mandays of labor relative to that of the whole group. Poverty depth and severity follow similar pattern like the incidence of poverty.

Table 4 shows that the differences in poverty incidence in one of the three possible pairs (1-50 vs 50–100) mandays) is statistically significant (P<0.05). This means that the mandays of labor employed significantly affect the poverty incidence of farm households.

The level of poverty increases as the mandays of labor employed increases. This may be attributed to the fact that increase in household size which is caused by more younger household members, raises the dependency ratio and subsequently raises the poverty level. Thus, farm households with greater mandays of family labor have the propensity to be poorer than the households with smaller mandays of labor.

CONCLUSION

The incidence of poverty among farming households was 0.57 whereas the 0.48 constituted the proportion of expenditure shortfall from poverty line and 0.44 comprised the poorest of the poor. Results of FGT decomposition show that the level of poverty increases as mandays of labor employed increases. The analysis reveals that an increase in labor increases the probability of poverty. This is true because increased family labor results from larger household sizes and dependency ratios which tend to raise the level of poverty.

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Educational Needs of Corn Farmers Regarding Biological Control Bracon Parasitoid of Corn Caradrina in Dezful Township, Khouzestan Province, Iran

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Abstract

The purpose of research was analyzing educational needs of corn farmer's regarding biological control Bracon parasitoid of corn Caradrina in Dezful Township, Khouzestan province, Iran. The method of research was correlative descriptive. A random sample of Dezful township corn farmers of Khouzestan province, Iran (n=350) were selected for participation in the study. A questionnaire was developed to gather information regarding educational needs of corn farmer's regarding biological control Bracon parasitoid of corn Caradrina. The questionnaire was pilot tested in Shoushtar Township. Questionnaire reliability was estimated by Cronbach's alpha. Reliability was 0.85. Data collected were analyzed using the Statistical Package for the Social Sciences (SPSS). The results indicated 53.4% of corn farmers had low and very low knowledge regarding biological control Bracon parasitoid of corn Caradrina. Based on results, farmers need to education regarding all subject area of biological control. Also, there was significant correlation between knowledge of corn farmer's with social participation, level of education, income, technical knowledge and extension activity. The result of regression indicated that 53% of the variances in the knowledge of respondents could be explained by the social participation, level of education, income, technical knowledge and extension activity.

Keywords:
Educational needs, Biological Control, Caradrina, Braconidae, Corn Farmers, Dezful.

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INTRODUCTION

Farmers' adoption of biological control package depends on many factors, such as their technical skill and socioeconomic conditions as well as psychological and cultural factors, etc (Singh *et al*., 2008).

Using improper pesticides have resulted in crop and environmental contamination and detrimental effects on humans. Hence, many of the techniques or practices collectively referred to integrated pest management (IPM) have been designed to address some of the health and environmental concerns of pesticide use. IPM is defined as a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks (Niyaki *et al*., Radjabi and Allahyari, 2010). Abeydeera (1994) reported that biological control application decrease total control cost compared to farmer that did not use biological agent. This study presents a single case study on effective social factors of adoption of biological control by rice farmer in north of Iran. Biological control is often divided into three categories. All of these can be part of an integrated pest management program. The three categories are: classical biological control, augmentative biological control and conservation biological control.

The purpose of research was analyzing educational needs of corn farmer's regarding biological control Bracon parasitoid of corn Caradrina in Dezful Township, Khouzestan province, Iran.

MATERIALS AND METHODS

This study was carried out by survey during July and August 2010. The method of research was correlative causal comparative. A random sample of Dezful Township corn farmers of Khouzestan province, Iran (n=350) were selected for participation in the study. A questionnaire was developed to gather information regarding adoption biological control of Caradrina by Braconidae in corn farms Dezful Township of Khouzestan province. The questionnaire was pilot tested in Shoushtar Township. Questionnaire reliability was estimated by calculating Cronbach's alpha. Reliability was (Cronbach's alpha=0.85). Data collected were analyzed using the Statistical Package for the Social Sciences (SPSS). Appropriate statistical procedures for description (frequencies, per cent, means, and standard deviations) were used.

RESULTS

Demographic Profile

The first section described farmers' demographic profile in Dezful Township, Khuzestan Province of Iran. Approximately, 56% of respondents were between 36 to 50 years of age and 31.7% of them between 22 to 35 years of age (Table 1). Most respondents (46.6%) reported work experience, including 1 to 15 years and the vast majority of them were male (89.04%).

In reference to the frequency of respondents' social participation, 64% of farmers had moderate level. About 32 % of corn farmers had reached primary school level. Based on the results of this study, the income of 68.9% of corn farmers

Table 1: Personal, Social and Economical Characteristics of Corn Farmers.

Characteristics	Frequency	Percent	Cumulative Percent
Age			
20-35	111	31.7	31.7
36-50	196	56	87.7
51-65	40	11.4	99.1
66-80	3	0.9	100
Social Participation			
Low	67	19.1	19.1
Moderate	224	64	83.1
High	59	16.9	100
Level of education			
Uneducated	40	11.4	11.4
Primary school	114	32.6	44
Secondary school	106	30.3	74.3
High school	90	25.7	100

Table 2: Knowledge of Biological Control Bracon Parasitoid of Corn Caradrina (1=Very Low, 2=Low, 3=Moderate, 4=High, 5= Very High)

Dimension	1		2		3		4		5		Mean	sd
	ƒ	%	ƒ	%	ƒ	%	ƒ	%	ƒ	%		
Time of biological control	123	35	104	30	65	18	23	7	35	10	2.27	1.09
Life cycle of Bracon and Carad	109	31	118	34	87	25	13	4	23	6	2.20	1.08
How using biological control	89	25	102	29	98	28	49	14	12	4	2.40	0.98
Awareness of economic benefits biological control	78	22	121	35	68	19	54	15	29	8	2.52	0.88
Awareness of environmental benefits biological control	98	28	99	28	101	29	23	7	29	8	2.39	1.07

were between ten million to one hundred million Rials in year (Table 1).

Educational Needs

The dependent variable of research was knowledge of corn farmer's regarding biological control Bracon parasitoid of corn Caradrina in Dezful township, Khouzestan province, Iran. The dependent variable was assessment with a Likert scale (1=Very Low, 2=Low, 3=Moderate, 4=High, 5= Very High). Based on the table 2, farmers basically need to education regarding biological control Bracon parasitoid of corn Caradrina. Therefore educational needs are vital items that affect on adoption of biological control. Also farmers were stratified to five strata. The results indicated 53.4% of corn farmers had low and very low knowledge regarding biological control Bracon parasitoid of corn Caradrina (Table3). Based on results, farmers need to education regarding all items of biological control that noted in research.

Table 3: Knowledge of Biological Control Bracon Parasitoid of Corn Caradrina (1=Very Low, 2=Low, 3=Moderate, 4=High, 5= Very High)

levels	ƒ	%	Cun%
Very low	97	27.7	27.7
Low	90	25.7	53.4
Moderate	72	20.6	74
High	45	12.8	86.8
Very high	46	13.2	100

Correlation Study

Table 4 displays the results which show that there is a relationship between knowledge of corn farmer's regarding biological control Bracon parasitoid of corn Caradrina in Dezful township, Khouzestan province, Iran and . Spearman coefficient was employed for measurement of relationships between independent variables independent variables.

Based on the results there is significant correlation between knowledge of corn farmer's with social participation, level of education, income, technical knowledge and extension activity.

Regression analysis

Table 5 shows the result for regression analysis by stepwise method. Predicator variables that were significantly related to the knowledge of corn farmers about biological control of Caradrina by Braconidae were entered. The result indicates that 53% of the variances in the knowledge of respondents could be explained by the social participation, level of education, income, technical knowledge and extension activity.

DISCUSSION AND RECOMMENDATIONS

Based on results there is significant correlation between knowledge of corn farmers about biological control of Caradrina by Braconidae with social participation, level of education, income, technical knowledge and extension activity.

According to Singh et al (2008) have shown that technology awareness through formal crop-specific IPM training provided by farmers' field schools is extremely important for wider adoption of IPM in the study area. Hence, investment in IPM education through these programs will have long-term beneficial impact.

Also Niyaki, Radjabi and Allahyari (2010) displayed main important factors of adoption of biological control including education level,

Table 4: Correlation measures between predicator variables and knowledge of corn farmers about biological control of Caradrina by Braconidae

Variable 1	Variable 1	r	p
Age	Knowledge of corn farmers about biological control of Caradrina by Braconidae	-0.022	0.642
Work experience		0.032	0.536
Social Participation		0.426**	0.000
Level of education		0.454**	0.000
Income		0.343**	0.000
Technical knowledge		0.295**	0.000
Extension activity		0.466**	0.000

*p < 0.05; **p < 0.01

Table 5: Multivariate regression analysis

Multivariate regression analysis	B	Beta	T	Sig
Constant	4.332	-------	3.635	0.000
Technical knowledge	0.523	0.324	2.287	0.000
Social Participation	0.453	0.265	2.091	0.000
Level of education	0.456	0.266	2.335	0.000
Income	0.423	0.416	3.957	0.000
Extension activity	0.752	0.454	2.074	0.000

R2=0.533

$Y=4.332+0.523X_1+0.453X_2+0.456X_3+0.423X_4+0.752X_5$

family size, experience in rice culture, rate of participation in educational-extensional activities.

The results indicated 53.4% of corn farmers had low and very low knowledge regarding biological control Bracon parasitoid of corn Caradrina. Based on results, farmers need to education regarding all items of biological control that noted in research.

Cullen *et al.,* (2008) noted that farmers must perceive biological pest control innovations to have economic advantages at an acceptable level of risk when compared to the relatively simple conventional agrichemical control methods. The key finding of this paper is that biological control innovations must be developed in a manner which gives consideration to the realities at the farm level. Also, activities must be focused on educational needs and increasing of farmer's knowledge (Ommani and Chizari, 2010).

According to the obtained results, emphasis on in diffusion of new technology training needs must be considered. Ommani and Chizari (2010) and Hosseini *et al.,* (2010) supported of this result.

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Determinants of Fresh Fruits and Vegetables (FFV) Farmers' Participation in Contract Farming in Peninsular Malaysia

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Abstract

The purpose of this research was identifying socio-economic characteristics affected on respondents' participation in contract farming. The survey was conducted using structured questionnaire in populous states namely Kedah, Kelantan, Terengganu, Pahang, Perak, Selangor and Johor in Peninsular Malaysia. A total of one-hundred and sixty seven FFV farmers were randomly selected and personally interviewed. Logit analysis was carried out to identify determinants that influenced fresh fruits and vegetables (FFV) farmers participating in contract farming. The findings in the paper show that, based on the output from logistic regression, ownership, land size, education background, perceived benefit, complicated process, lacking in opportunities and price risk are dominant variables influencing FFV farmers' willingness to participate in contract farming. Land ownership, land size, education and perceived benefit are dominant variables that positively influenced FFV farmers to participate in contract farming. Complicated process, lack of opportunities and price risk negatively influenced FFV farmers' participation in contract farming.

Keywords:
Supply chain, Contract farming, FFV Farmers and Logit analysis.

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INTRODUCTION

The New Agriculture program, as proposed in the Ninth Malaysia Plan and of which contract farming is a part, has been supported and motivated by Malaysian government with the purpose of making agricultural production more profitable and competitive. Contract farming offers a means to effectively connect fresh fruits and vegetables farmers (hereafter referred to as FFV) farmers and large-scale retailers such as hypermarkets. Malaysian government are also recognized the potential of contract farming for transforming the structure of agriculture and raising farm income (Ninth Malaysian Plan).

In Malaysia, the development of modern retail outlets such as hypermarkets has seen tremendous growth since the 1990s. One of the observed impacts of the rise of hypermarkets in developing economies is the marginalization of small market intermediaries and farmers. A combination of various factors makes it difficult for FFV farmers to access and supply to hypermarkets. Hypermarkets respond to the demand for goods and services by consumers and basically maximize profits in the face of stiff competition from other retailers. To remain competitive and survive in the market place, hypermarkets set high quality standards for their fresh produce and offer low prices to consumers. To reduce transaction cost, hypermarket may integrate their supply chains and centrally procure products. Due to the high cost of transacting cost with small-scale farmers, hypermarkets prefers to source from large-scale farmers and therefore further marginalize small-scale farmers. While the risk of exclusion of smallholders is real, it is argued that there are opportunities as well (Fatimah Mohamed Arshad *et al*., 2006).

Contract farming would be an effective mechanism to integrate FFV farmers to the market and improve their livelihood. However, contract farming is a fairly new venture for the Malaysian agricultural sector that has emerged as a result of the government's agricultural industrialization programs (Arumugam *et al*., 2010).

The scale to which contract farming is practiced in Malaysia is difficult to assess since quantitative data are scarce and difficult to obtain. Lots of studies were carried out in Thailand and Indonesia indicating that this type of linkage is significant in those countries. Much of the literature assumes that producers predominantly contract to earn additional income. Although a subset of studies do acknowledge, or at least imply, individual farmers may contract for varying reasons.

This paper will broaden the understanding on FFV farmers' current marketing practices by ascertain the determinants for FFV farmers to be involved in contract farming.

In modern chains, contract farming is a means for vertical coordination that is growing in popularity. According to Singh (2002), contracts usually involve advance agreement between producers and purchasers on the some or all four parameters: price, quality, quantity (or acreage) and time of delivery. In contract, the specific terms and arrangements determine the ways of both parties share the benefits, costs and risks of coordination. Simmons *et al.*, (2005) mentioned that this type of arrangement will help to ensure a reliable supply for the buyers.

Morrison *et al*., (2006), stated that within last 30 years, contract farming has become an increasingly characteristic organizational form in global agrifood system, facilitating linkages between the various nodes of ever more complicated commodity complexes.

Da Silva (2005) indicated that such systems are becoming organized into tightly aligned chains and networks, where the coordination of production, processing and distribution activities is closely managed.

Arumugam *et al*., (2010) stated that there were five important factors motivate fresh fruits and vegetable farmers to involve in contract farming, namely, market stability, access to marketing information and technology, transfer of technology to improve farm practices, access to inputs and indirect benefit.

There is a limited body literature that qualitatively and quantitatively reported on the determinants of participation in contracts. In India, among the poultry producers, those who face lower opportunity cost of labor, which do not have other sources of income and engaged in small scale production, are more likely to par-

ticipate in contract farming. The effect of experience (as proxied by age) in poultry production on the likelihood of participation, while yielding a significant but negative coefficient, was perceived by authors to be indeterminate (Fairoze, *et al*., 2006; Tiongco, *et al*., 2006). Son *et al*., (2007), stated that for pig producers in Vietnam, certain demographic characteristics influence farmers' decisions in enter into various types on contracts. Those who are older, more educated and spend more time in raising pigs are likely to engage in formal or informal contracts with cooperatives. But those who already devote more time to the pig-raising activity are less likely to enter into informal contracts with non-cooperative agents such as feed traders or output suppliers. Furthermore, farmers who have large landholdings are more likely to engage in formal contracts in pig production.

This paper examines the extent to which selected socio-economic or demographic characteristics and attitudes have influenced the respondents' participation in contract farming.

MATERIALS AND METHODS

Field surveys were conducted in the states of Kedah, Kelantan, Terengganu, Pahang, Perak, Selangor and Johor in Peninsular Malaysia. One hundred and sixty seven FFV farmers were randomly interviewed to obtain information regarding their participation in contract farming via a questionnaire. The questionnaire is divided into two sections; the first section included some perceived benefits and risks like (i) the benefits that farmers obtain from engaging in contracts, (ii) the opportunities and constraints they face in engaging in contract farming, (iii) their capacities to comply with the requirements of such agreements, and (iv) the requirements that integrators of market intermediaries impose on farmers. The second elicit relevant socio-demographics such as level of education, age, land size and types of ownership.

Table 1: Explanatory Variables to Measure Determinants of FFV Farmers' Participation

Variables	Design value (Coding system)
Ownership	0.Not Owner 1.Owner
Land Size	0.Less than 5 acres 1.More than 5 acres
Education	0.Not Educated 1.Educated
Perceived Benefit	0.No 1.Yes
Complicated Process	0.No 1.Yes
Lacking in Opportunities	0.No 1.Yes
Price Risk	0.Flexible Price 1.Fixed Price

From the survey, descriptive statistics on household demographics and farm characteristics were generated to determine and compare similarities and differences between contract and independent farmers. Using farmers and farm characteristics, a logit model was estimated to determine the likelihood of independent farmers to engage in either formal or informal contracts. The logit model for the representative farmer 'i' can be expressed as follows:

$$Y_i = \log \left(\frac{p_i}{1-p_i}\right) = a + \sum_{j=1}^{n} \beta x_{it} + e_i$$

Where; Y_i is an dependent variable "willing to be involved in contract farming" that had two categories such as "farmers are willing to be involved in contract farming" coded as one and "otherwise" coded as zero. The variable X_i represents the different attributes affecting the representative farmers' willingness. In this regression model, the vector consists of variables such as type of ownership, land size, price risk, perceived benefits, and lack of opportunities and education level of farmers (Table 1).

Where; $\log \left(\frac{p_i}{1-p_i}\right)$ is called log-odd ratio.

The Log-odd ratio is the logarithm of the odds that a particular purchasing choice will be made by the representative household. P_i is the probability of proxy variable $Y_i = 1$ and (1 - Pi) is the probability of $Y_i = 0$ and $_{ei}$ is the error term.

The interpretation of the estimated coefficients of the logit is a little tricky. The signs of parameter estimates and their statistical significance indicate the direction of the response associated with the presence or level of a particular

variable. The changes in the probabilities associated to the intermediate categories (1 to $j-1$) cannot be signed a priori. Thus, category-specific marginal effects are often reported (Gujarati, 1988).

RESULTS AND DISCUSSION

Table 2 shows the socio-economic profile of independent farmers. From the survey, it was discovered that there were 167 independent farmers and 41 contract farmers. The Table 1 also illustrates that the majority 43 (25.7 per cent) of independent farmers were in the age category of between 51-60 years old. Forty-two (25.1 per cent) of the independent farmers were from the 41-50 years old category while 41 (24.6 per cent) of the independent farmers were from the age category of between 31- 40 years old. 28 (16.8 per cent) of the independent farmers were more than 61 years old while 13 (7.8 per cent) of the independent farmers were from 21-30 years old category. The findings show that 126 (75.4 per cent) of the independent farmers from the age category of 31-60 were actively involved in traditional farming in Peninsular Malaysia.

Out of the 167 independent farmer respondents, 147 (88 per cent) were male and 20 (12 per cent) were female. The traditional gender imbalance dominated by males associated with farming was present in FFV sectors. Eighty-seven (52.1 per cent) of the independent farmers were Malay, 64 (38.3 per cent) were Chinese, 12 (7.2 per cent) were Indians and 4 (2.4 per cent) were others.

In terms of education, the findings showed that of the independent farmers, 71 (42.5 per cent) had secondary education, followed by 57 (34 per cent) with primary education while 26 (15.6 per cent) were illiterate and 12 (7.2 per cent) of them had tertiary education. In terms of farming, 156 (93.4 per cent) of independent farmers were involved in a full-time capacity and 11 (6.6 per cent) of them were part-timers.

Fifty-seven (34.1 per cent) of the independent farmers have been involved in farming between 1-10 years, followed by 54 (32.3 per cent) of them between 11-20 years, 35 (21 per cent) of them 21-30 years, 17 (10.2 per cent) of them for 31-40 years and 11 (2.4 per cent) of them more than 41 years.

Table 3 shows the farm size of the FFV independent farmers. The findings reveal that of the independent farmers, 19 (11.4 per cent) have farm size of less than one acre, 85 (50.9 per cent) had farm sizes of were between 1.01 – 5.00 acres. And 34 (20.4 per cent) own farms of between 5.01 – 10.00 acres in size. Only 6 (3.6 per cent) of the independent farmers have farm more than 40 acres. The average farm size was 3.70 acres for independent farmers. With regards to land tenure, Table 4 shows that 81 (48.5 per cent) of independent farmers owned the farms, followed by 59 (35.3 per cent) of independent farmers renting the farms. Two (1.2 per cent) of whom mortgage the farms while 18 (10.8 per cent) of independent farmers operate with a temporary occupation licence (TOL) farm.

The logit analysis was used to estimate the extent to which socio-economic or demographic characteristics and attitudes influenced FFV

Table 2: Sosio-economic Profile of Independent Farmers

Variables	Independent Farmers (n=167) %
Age	
21 - 30	7.8
31 - 40	24.6
41 - 50	25.1
51 - 60	25.7
> 61	16.8
Gender	
Male	88.0
Female	12.0
Ethnics	
Malays	52.1
Chinese	38.3
Indian	7.2
Others	2.4
Education Level	
No Education	15.6
Primary	34.0
Secondary	42.5
Tertiary Education	7.2
Farming Business	
Full Time	93.4
Part Time	6.6
Number of Years of Farming	
1 – 10	34.1
11 – 20	32.3
21 – 30	21.0
31 – 40	10.2
> 41	2.4

Source: Survey, 2007

Table 3: Farm Size Categories of Independent Farmers (acre) (%)

Farm Size (Acre)	Independent Farmers (%)
<1.00	11.4
1.01-5.00	50.9
5.01-10.00	20.4
10.01-25.00	8.4
25.01-40.00	5.4
>40.01	3.6

Source: Survey, 2007

farmers' willingness to participate or engage in contract farming.

The dependent variable "FFV farmers' willingness to participate in Contract Farming" which had two categories, namely "The farmers' willingness to be involved in contract farming" are coded as one and "otherwise" coded as zero. The estimated factor scores were then used in a binary logit analysis along with selected socioeconomic factors, such as ownership, land size, education, perceived benefit, complicated process, lacking in opportunities and risk (Table 1).

The estimated logit model was statistically significant with a Likelihood Ratio Test Probability of <0.0001, which indicates joint significance of all coefficient estimates. The estimated coefficients are tested by using standard errors, t-ratios and p-values. A positive sign on the statistically significant parameter estimates of one variable indicates the likelihood of the response increasing, holding other variables constant, and vice versa. Four variables were all positive and statistically significant, suggesting that response categories are indeed ordered properly. Thus, the farmers' characteristics in the ordered model equation are relevant in explaining their willingness towards contract farming. The results indicated that, the farmers' characteristics play an important role when explaining their willingness towards contract farming.

Table 4: Land Tenure Status of Independent Farmers (%)

Category	Independent Farmers (%)
Own	48.5
Rent	35.3
Mortgage	1.2
Government	4.2
TOL	10.8

Source: Survey, 2007

Based on the statistically significant coefficients, OWNERSHIP is an important determinant for farmers' willingness to participate in contract farming, and the effect is positive (Table 5). This finding indicates an increasing likelihood to participate in contract farming for the farmers who have their own land. According to the results, farmers with their own land are more likely to be involved in contract farming rather than those who rent their land.

Table 5 also presents the estimate odds ratio. The odds ratios are calculated by the binary logit coefficients (Probability = [odd / (1-odd)]) and it means that farmers with their own lands are 3.447 more interested in contract farming compared to others. The estimated odd ratio of farmers with bigger lands (more than 5 ACRE) is 2.475 times higher than the farmers with smaller land, indicating that these farmers are more inclined to be involved in contract farming. Education level of farmers, which is significant at the 0.01 willingness (significant) level, has positive and significant effect on the probability to be involved in contract farming. Educated farmers are more likely to be involved in contract farming. The odd ratio for education is 3.271 more than not educated farmers. Respondents who indicated an interest in contract farming are 2.28 times more likely to be involved in this arrangement as compared to those who indicated otherwise. Meanwhile the "complicated process" affects farmers negatively. This suggests that the farmers who find the requirements difficult to be involved in contract farming are 0.647 less likely to be involving in contract farming.

The response "No Opportunities" negatively influences the probability of farmers' willingness towards contract farming i.e., 0.653 times less likely. It is anticipated that the "less opportunities" for farmers to participate in contract farming, the less they are likely to be involved in contract farming. Results of logit model indicate a negative relationship between the farmers' willingness towards contract farming and "contract farming is not beneficial activity". Estimated coefficient for "no benefit from contract farming" is negative and statistically significant at 99 per

Table 5: Logit Model Estimates for Determinants of FFV Farmers' Participation

Variables	Estimated Coefficients	Standard Error	Z Statistic	P-value	Ratio
Age	0.000461	0.009641	0.047817	0.9619	1.00046110
Gender	0.057977	0.063893	0.907408	0.3653	1.05969062
Ownership	1.237584***	0.046402	26.67092	0.0000	3.44727478
Farming Business	0.116771	0.074192	1.573903	0.1172	1.12386203
Size of Land	0.906397***	0.056009	16.18306	0.0003	2.47538762
Experience	0.036697	0.045358	0.809052	0.4195	1.03737864
EDUCATION (Educated, NOT Educated)	1.185002***	0.047868	24.75562	0.0002	3.27069336
Perceived Benefit	0.818849***	0.048196	16.98998	0.0000	2.26788799
Complicated Process	-0.434352***	0.120374	-3.60835	0.0004	0.64768423
Lack of Opportunities	-0.425062***	0.124893	-3.40341	0.0008	0.65372925
Prick Risk	-0.433633***	0.118681	-3.65377	0.0003	0.64815008
C	-0.398667	0.130476	-3.05548	0.0026	0.67121417
McFadden R-squared	0.539585	Log likelihood		-13.94119	
S.D. dependent var	0.382900	Restr. log likelihood		-91.496	
P-value for the Goodness of Fit test	0.0000	Avg. log likelihood		0.451433	

cent level of confidence. Farmers who do not find contract farming as beneficial activity are less likely to be involved in this agreement compared to others.

In order to assess how well the model fits the data, Goodness-of-Fit test statistic was developed and a chi-square test from observed and expected frequencies was computed. As shown in Table 5, the model for has a P-value of 0.000, which confirms that the fit of the model is good.

The results suggest that most farmers view contract production favorably and would like to be involved in contract farming if offered the opportunity. The primary reason farmers do not participate in contract farming is the lack of opportunity due to lack of interest from contractors operating in their area. Investment in public infrastructure such as roads and transportation will induce retailers to invest in fresh fruits and vegetable farming. Farmers strongly identify price fluctuation as the key disadvantage to contracts where the farmers prefer a stable income for their produce. Several price strategies often used in contracts are suggested in this context. The flexible price strategy specifies that the goods transaction price be equal to the market price at delivery. The fixed price strategy means that the delivery price would be fixed in advance of signing contracts. The fixed price provision is favored by most farmers because it limits downside risk exposure. The primary perceived benefits like quality improvement of products, stabilizing the sale price and lowering marketing costs were likely to be more influential for farmers to be involved in contract farming. Moreover farmers with larger farms and with relatively high yields were also more likely to adopt contract farming. Educational level also was a significant determinant in a farmer's decision to participate in contract farming program.

The results from this study indicate that, given adequate infrastructure and an enabling policy environment, vertical coordination has the potential to contribute toward improving the contract farming program among the fresh fruit and vegetables farmers in Malaysia. However, this has not been backed up by legal instruments that provide protection to producers as well as to processors against problems like moral hazards, willful defaults, and the like. A proactive role by the government is needed to provide adequate legal protection to facilitate sharing of risks and benefits for both contracting parties.

CONCLUSION

The paper determines that seven variables influence FFV farmers' willingness to participate in contract farming. Four variables such as land of ownership, land size, education and perceived benefit positively influenced FFV farmers' to participate in contract farming. Three variables, namely complicated process, lack of opportunities and price risk negatively influenced FFV farmers' participation in contract farming.

RECOMMENDATIONS

Contract farming is emerging as an important form of vertical coordination in agro-food markets in Malaysia, and its economic and social consequences are attracting considerable attention in the food policy debates. This paper has examined the determinants, which are likely to influence fresh fruits and vegetables farmers to participate in contract farming. The fruit and vegetable sectors in Malaysia are mostly dominated by smallholders, and from the point of view of the retailer, contracting with a large number of smallholders is a very complicated process. This problem can be overcome by contracting with a single person in the village, often an agent, who acts as an intermediary between the retailer (hypermarkets) and producers.

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Impacts of Drought on Socio-Economic Conditions of Paddy Farmers in Guilan Province, North of Iran

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Abstract

The purpose of this study was to survey impacts of drought on Socio-economic conditions of Guilan Paddy farmers. Besides recognizing these impacts, it ranked them according to the viewpoint of the Paddy farmers. It was of the descriptive-correlation type. Questionnaire was the main tool of this study. To determine the validity of questionnaire used of comments of panel experts and reliability of the questionnaire by using of Cronbach's alpha coefficient was 89%. The information gathered by using the survey method. The statistical population was the farmers whom their basic career was production of rice and according to the information of Agricultural Organization (Jihad-e-Keshavarzi) in 2009 was caught by drought. By using the proportional stratified sample method, 270 of these individuals were chosen and filled in the questionnaires. In order to determine the scale of drought impacts, year 2008 (a year which paddy farmers had ensured water reservoir) compared to year 2009 (a year which paddy farmers were caught by drought and water shortage). The results indicated that drought caused decrease in white-rice production for 312 kg per hectare. This problem also caused increase in costs, decrease in income, decrease in saved money, and increase in anxiety, mental problems etc on Guilan paddy farmers. Other findings indicated that there hasn't been statistically significant relationship between age and farming experience of paddy farmers with the amount of damage. But, there was statistically significant relationship between literacy, type of water resource and taking extension advices with amount of damage.

Keywords:
Drought, Paddy farmer, Damage,Water resource.

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INTRODUCTION

Drought is one of the most important natural disasters which could be defined as: less-than-average annual rainfall and discordant distribution of rainfall in the region. With lack of rainfall for a long period of time; farms, gardens, pastures, and forests which their required water resources are provided from the atmosphere rainfall are damaged directly. Particularly, agriculture which has an important role in national economy and is a set of activities that its aim is supplying food needs of community and produce raw materials for other sectors including industry (Karbassi, 2001). Iran, with a rainfall average about 252 mm in year is among the dry regions in the world. Low rainfalls, irregular distribution of these rainfalls and climate warming, cause economic, political and social crisis in different areas. In recent years impacts of drought were high on water resources, agriculture, livestock production, pastures, migration, rebellion of pests and disease. Studies indicate that drought has priority to other natural disasters in the frequency of occurrence, duration, extent, loss of life, economic and social impacts and severe effects in the long run (Wilhite, 2000). Damages of drought will affect economic, environmental and social status of communities (Wilhite & Glantz, 1985). Drought includes a set of negative effects which not only affect economic and social activities of farmers and related industries, but also affect those who are not actually employed in agriculture but are living in agricultural regions (Edwards *et al*., 2008). Bimal (1998), in a study titled "coping mechanism practiced by drought victims (1994-95) in North Bengal, Bangladesh" surveyed the people who were damaged from drought. The results indicated that drought is a reversible phenomenon in Bangladesh, affecting plant growth and leading to loss of crop production, food shortage, and; for many people; starvation. Peter (2008) has studied the impacts of drought on the social well-being of rural communities and farm families. The results of his studies indicated that drought has significant impact on individuals in Victoria, particularly in rural and regional areas. The economic impacts of drought include reduced agricultural production and exports. In fact it decreases activities of each individual and provides base for them to immigrate. Horridge *et al.,* (2005) in research as the impact of the 2002-2003 droughts in Australia concluded that the effects of drought on some statistical divisions are extreme, with 20% of decrease in income. Despite the relatively small share of agriculture in Australian GDP, the drought has reduced GDP by 1.6%, and has contributed to a decline in unemployment and to a worsening of the balance of trade. Shokri (2005) surveyed environmental, economic and social effects of drought and effect of solutions applied in order to reducing its effects in Sistan Province (Iran) and concluded that between the effects of drought (environmental, economic and socio- psychology) the economic effects are more than others, then environmental impacts and at last the least impacts were socio-psychology effects. Yazdani & Haghshenas (2007) in their study surveyed the management of drought and have submitted solutions for it. Results indicated drought make irreparable losses on agricultural and animal products and use of non-efficient management and inappropriate strategies will cause more problems in future droughts. Nuri & Bazrafshan (1996-2004) investigated direct and indirect effects of drought on rural economy of Sistan, and stated that direct effects include damage to crops, horticulture and animal husbandry and indirect effects include an increase in the population covered by the support-relief organizations, an increase in migration from rural regions, reducing price of agricultural lands and orchards and also change rural economic structuring.

Shortage of Water is the main reason for the decrease in rice yield in more than 40 million hectares land in Asia (Venuprasad *et al*., 2007). About 75% of the total rice in the world is produced in land under irrigation, and for production 1 kilogram grain of rice farmers use water two to three times more than other cereals (Toung *et al*., 2005). In northern provinces of Iran the time mismatch of rainfalls with the cultivation season, has caused waste of water of rivers and their flowing into the sea which results in a tremendous amount of problems that has overshadowed the

agricultural of these areas (Dargahi, 2007). Guilan is one of the Northern Provinces that in recent years have caught with drought and water shortage. This problem has created many limitations for growth and yield of rice in this province. According to available statistics, the area under rice cultivation in Iran is 587 thousand hectares, which is about 4% of the total land under cultivation of rice in the world. And more than 214 thousand hectares of them are located in Guilan Province (Pilevar, 2009). Reliable statistics indicate that Guilan Province will face with severe water shortage in the future and this shortage, more than anything, would affect rice production (Abrshahr, 2008).

The main purpose of this study was to survey Impacts of Drought on Socio-Economic Conditions of Paddy farmers in Guilan Province which follows the specific objectives below:

1- Describing personal and agricultural characteristics of paddy farmers

2- Studying socio-economic impacts of drought in Guilan province, based on viewpoint of paddy farmers

3- Studying relationship between individual characteristics of paddy farmers and rate economic impacts of drought

4- Studying amount of usage of extension education courses to deal with drought and investigating amount of impact of these educations in reducing these impacts.

5- Prioritizing economic and social impacts of drought.

MATERIALS AND METHODS

The present study was of the descriptive-correlation type and ex-post facto in which its information gathered by using the survey method and designed questionnaire. To determine the validity of questionnaire used of comments of panel of experts including faculty members of Rural Development Department of Guilan University and researchers in Rice Research Center. To measure the reliability of questionnaire, 30 questionnaires implemented in selected rural areas by whose were randomly selected and lastly reliability of the questionnaire by using of Cronbach's alpha coefficient was 89%. The statistical population of this research was farmers whom their basic career were production of rice and according to the information of Agricultural Organization (Jihad-e-Keshavarzi) in 2009 was caught by drought and water shortage. While in the previous year (2008) they had safe water for cultivation. This population contains 100,000 paddy farmers' households. Sample size was 270 by using Cochrane formula and these individuals selected by using proportional stratified sample method. First, three cities of the province were selected. Then, from each city three villages and samples were randomly selected proportional to population of each village.

Data analysis fulfilled through descriptive and inferential statistics by using SPSS software. Independent variables include personal-agricultural characteristics of paddy farmers (age, literacy level, farming experience, and water source), applying extension recommends and socio-economic impacts. Dependent variable was amount of damage (Rice yield).

Research hypotheses

1- There is relationship between personal-agricultural characteristics of paddy farmers and economic impacts of drought.

2- There is relationship between using extension recommendations and adjustment of economic impacts of drought.

3- Drought has affected economic and social condition of paddy farmers.

RESULTS

The results were analyzed in two parts, descriptive and inferential, by using the SPSS software. In descriptive section were used of frequency, percentage, Cumulative Percentage and mean; and in inferential section were used of Spearman, Pearson, Eta and Biserial correlation coefficient for evaluating relationship between independent and dependent variables.

The average of paddy farmers agricultural experience was 35.8 years and average of theirs age was 52 years, so the community is going to get old. 61% of paddy farmers were illiterate or have elementary educations, which indicate low levels of literacy among the paddy farmers. Paddy farmers used different sources of water

Table 1: Personal-agricultural characteristics of paddy farmers

		Frequency	Percent	
Agricultural experience	5-15	22	8	Mean=35/8
	16-25	38	14	minimum=5
	26-35	76	28	maximum=60
	36-45	65	24	
	>46	69	26	
	Total	270	100	
Age	< 40	53	19/6	Mean=52
	41-50	76	28/1	minimum=23
	51-60	76	28/1	maximum=81
	>60	65	24/2	
	Total	270	100	
Water sources	well	31	11/5	
	Channel	7	2/6	
	river	125	46/3	
	pond	7	2/6	-
	Well & river	84	31/1	
	Pond &river	16	5/9	
	Total	270	100	
Literacy level	illiterate	77	28/5	
	elementary	88	32/6	
	Pre-high school	55	20/4	-
	diploma and upper	50	18/5	
	Total	270	100	

for irrigating their rice farms. The most important water sources of paddy farmers for rice farms were: river, well, water channel, pond, well and river, pond and river. Table 1, shows more information about personal-agricultural characteristics of paddy farmers include; agricultural experience, age, water sources, and literacy level.

Regarding the Training-extension classes about solutions against drought in Guilan province, only 37% of farmers attended in these classes and 63% not attended. Most of them stated that they were unaware of such classes.

In the year of study, that paddy farmers faced with water shortage, their average area under cultivation reduced 1% rather than previous year (average area under cultivation in 2008 was 1.5 hectares and in 2009 was1.4 hectares); In other words, due to drought and water shortage, a number of the paddy farmers didn't cultivate part of their farms; regarding proceeding in these two years compared, results indicated that the average yield reduced of 2623 kg/hec in 2008 to 2311 kg/hec in 2009. So yield reduced 312 kg/hec, which directly reduces the income of rice farmers.

Hypothesis 1: there is relationship between personal-agricultural characteristics of paddy farmers and economic impacts (amount of damage) of drought. In connection with this hypothesis some variables were considered such as age, literacy level, agricultural experience and kind of water source.

1-1-The relationship between the age of paddy farmers and economic impacts:

The results of Pearson correlation indicated that there was no significant relationship between the age of paddy farmers and economic impacts of drought, and these two variables were independent and had no effects on each other ($P = 0.118$, $r = 0.52$).

1-2- The relationship between literacy level of paddy farmers and economic impacts:

The results of Spearman correlation indicated that there was negative and significant relationship between the literacy levels of paddy farmers and economic impacts of drought with 99% level of confidence. In other words, with increasing the literacy level of paddy farmers, the economic impacts of drought reduce ($S = -0.177$, $r = 0.004$).

1-3-The relationship between agricultural experience of paddy farmers and economic impacts:

The results of Pearson correlation indicated that there was no significant relationship between agricultural experience and economic impacts of drought and these two variables have no

Table 2: Comparison of rice damage according to water sources

Water source	Pool & river	Well & river	Well	River	Pool	Channel
Number	16	84	31	125	7	7
Average of damage (Kg/hec)	135/6	136/3	201/3	361/7	368/5	458/5

effect on each other (P = 0.102 , r = 0.096).

1-4- The relationship between water resources and economic impacts:

The results of Eta correlation indicated that there was significant relationship between water source of paddy farmers and economic impacts of drought with 99% level of confidence (Eta= 0.264, r = 0.003).

Table 2, shows there was statistically significant difference between the averages of loss in yield due to drought among paddy farmers that used various sources of water to irrigate their farms. Paddy farmers who used two sources of water during the crop year confronted less damages rather than paddy farmers who used only one source. The most damage was also related to paddy farmers that only used water channel, because these paddy farmers were at the bottom of the cannel network and had less access to water resources after that most damage was related to whom that have only one resource of water.

Hypothesis 2: There is relationship between using of extension recommendations and economic impacts (amount of damage) of drought:

The results of Biserrial correlation (two string-test) indicated that there was relationship between using extension recommendations and economic impacts of drought (B = -0.228, r = 0.003).

Also the results of T test indicated that there was significant different between the average damage of those who participated in extension classes compared to those who did not participate in 99% level of confidence. It means with 1 percent error we can say whose has participated in the classes, confronted less damages than others. Table 3, shows difference of amount damage between these two groups.

Table 3: Comparison of rice damage according to attend and non-attend in extension classes

Attend in the classes	Number	Average of damage (kg/hec)
Yes	100	165/2
No	170	319/6

Table 4: Results of research hypothesis

Row	Independent variable	Dependent variable	Type of test	Correlation coefficient	Significant level	Significant relationship
1	Age	Economic impacts	Pearson	0/118	0/052	No
2	Literacy level	Economic impacts	Spearman	-0/180	0/003	Yes
3	Background of rice farming	Economic impacts	Pearson	0/102	0/096	No
4	Type of water resource	Economic impacts	Eta	0/264	0/003	Yes
5	Extension recommendations	Economic impacts	Biserial	-0/228	0/003	Yes

Table 5: Prioritizing the economic impacts of drought

Priority	Economic impacts	Mean	SD
1	Increase in costs labor and eradicating weeds	4.60	0.65
2	Increase in costs for water supply	4.21	0.87
3	Decrease in purchasing power	4.04	0.84
4	Decrease in savings	3.98	0.84
5	Non-payment of bank loans and obligations	3.13	1.58
6	Increase in the false financial relationship	2.99	1.46
7	Decrease in Price of crops due to reduction of quality	2.94	1.02
8	Decrease in income due to reduction of cultivation	2.13	1.65
9	Decrease in land price	1.92	1.03
10	Decrease in income from side jobs, such as sericulture, fishing etc	1.69	1.17
- - - -	Average of economic impacts	3.16	- - - -

Table 6: Prioritizing the social impacts of drought

Priority	Social impacts	Mean	SD
1	Increase in frustration, anxiety, insecurity and emotional problems	4.23	0.85
2	Feeling of poverty and decrease in life level	3.57	1.05
3	Decrease in recreational activities caused by income reduction	3.52	1.11
4	Increase in local divisions to supply water	3.48	1.24
5	Weakened position of institutions and cooperative unions	3.16	1.53
6	Weakened traditions of cooperation	2.91	1.16
7	Tend to migrate	2.77	1.40
8	Decrease in social ceremonies	1.77	1.30
9	Decrease in the level of education in children and juveniles	1.29	0.84
10	Disintegrate of consistency and continuity in family system	1.27	0.45
- - - -	Average of social impacts	2.79	- - - -

Hypothesis 3: drought has affected on socio-economic condition of paddy farmers.

In the light of this first identified 10 economic impacts and also 10 social impacts, and then investigated them with using of Likret scale in view point of paddy farmers. After that these effects was prioritized by using mean. The results showed that incidence of economic impacts of drought have been more than social impacts. This result is consistent with the finging of shokri (2005). Tables 5 and 6 shows economic and social impacts that caused by drought.

So on one hand, drought decreased the yield, and on the other hand, it increased some costs (labor, eradicating weeds and water supply) which, resulted in decrease of profit of paddy farmers and following that, resulted in other social and economic impacts. So survey of economic and social impacts indicated that drought had negative impacts on both factors. In economic section reduction of yield (312 kg/ha) and also area under cultivation that directly leads to income reduction of farmers etc. In social section, drought leaded to increase in frustration, anxiety, insecurity, emotional problems, sense of poverty, reduce living standards etc that ultimately reduced Farmers incentive to farming. This result is consistent with the finding of Horidg *et al.,* (2005), Bimal and (1998) Peter (2008). That stated drought has several socio-economic impacts. In other part of the research specified that high literate level, attend in extension classes and using of two water sources caused reducing of economic impacts of drought.

DISCUSSION AND CONCLUSION

Drought is one of the most important natural disasters which affect on economic, environmental and social conditions of communities. Guilan is one of the Northern Provinces of Iran that in recent years caught with drought. This problem caused to reduce yield of rice in this province, and follow that leaded to other direct and indirect socio-economical problems for paddy farmers. According to results of this research it is recommended that first, besides using main source of water for irrigation in areas that there is possibility of drought crisis, farmers plan using a lateral source such as well, pool etc. Also some arrangements come into work for division water between paddy farmers. Second, Extension training courses should be hold in connection with the solutions to deal with drought before cultivating season and paddy farmers should be informed through mass medias. Third, creating new job positions based on capacities of each region for preventing drought problems.

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Perceptions of Secondary School Students towards Natural Resources Management: Case Study of Participants in FoF and Non-Participants

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Abstract

Integrating natural resources management in the secondary school curriculum in Kenya has received a lot of talk without adequate practical activities. The Farmers of the Future Programme under the World Agroforestry Centre, formally the International Centre for Research in Agroforestry (ICRAF), initiated a practical approach to integration of natural resources management in the secondary school curriculum in Kenya. This paper provides information on significant findings of a study that was carried out to determine the potential of FoF in integrating natural resources management into the secondary school curriculum in Kenya. A comparison between secondary school students who are involved in FoF programme and those not involved was done to determine their perceptions towards natural resources management. Further, comparison of perceptions by gender among learners who are involved in the FoF initiative was done. The study employed an ex-post-facto design in data collection using questionnaires. Questionnaires and were analysed using t-test at alpha = 0.05. The findings indicated that the FoF programme had a significant influence on learners' perceptions towards natural resources management. It was therefore concluded that FoF programme enhanced positive perceptions towards natural resources management among learners. On the basis of the findings, it was recommended that the FoF programme be expanded to cover more schools.

Keywords:
Agricultural education, Agroforestry, Natural resources, Perceptions.

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INTRODUCTION

The Farmers of the Future (FoF) Programme is a recent initiative that was conceptualised in 2000 by the World Agroforestry Centre. The aim was to facilitate and contribute to integration of agroforestry and natural resources management into the school curriculum, mainly in the basic education (Vandenbosch *et al*., 2002). Programme under the World Agroforestry Centre, formally the International Centre for Research in Agroforestry (ICRAF), initiated a practical approach to integration of natural resources management in the secondary school curriculum in Kenya (Vandenbosch *et al*., 2002). This paper provides information on significant findings of a study that was carried out to determine the potential of FoF in integrating natural resources management into the secondary school curriculum in Kenya (Kanyi, 2007).

Many agricultural programmes have been practiced in Kenyan schools for a long time with the aim of developing technical skills in learners as well as teachers (Moir, Vandenbosch, Scull and Carvalho, 2007). Educators need to develop abilities necessary in empowering learners in vocational education such as agriculture (United States Office of Education, 1976). In some developed countries such as the United States of America, agricultural institutions have taken charge of providing leadership and human resource development among the learners of agriculture even at post-secondary level (Foster & Dodge, 1991). Empowered human resource has a great potential to manage natural resources more sustainably. School curriculum should empower human resource with the vocational skills to manage natural resources in sustainable manner (Phipps, Osborne, Dyer and Ball (2007).

During the 1990s, International Centre for Research in Agroforestry (ICRAF) evolved into the World Agroforestry Centre with a vision that by the year 2010, 80 million peasant farmers would get access to agroforestry research innovations that will improve their livelihoods and help to sustain the global environment, Maundu and Tengnas (2005). Many development and research organisations are now using schools to create awareness and positive perceptions towards sustainable agriculture. Innovative education is now seen as a crucial aspect of rural development, food security and wealth creation (Vandenbosch *et al*., 2002).

Despite its effort in education for sustainable agriculture, the potentials of FoF programme in influencing learners' perceptions towards natural resource management are not well understood. Literature concerning potentials of FoF initiative in Kenya secondary schools has not been documented adequately. There was therefore a need to study the FoF programme in Kenya secondary schools and document empirical data on the programme's potentials in influencing learners' perceptions towards natural resources management for sustainable development. This paper explores the effects of the Farmers of the Future (FoF) programme on learners' perceptions towards natural resources management in selected secodary schools in western region of Kenya hence ascertaining the contribution and potentials of the FoF programme in advancing sustainable development in Kenya. Collaborating schools and the farmers forms a strong bond for agroforestry and natural resources management at farm level (Noordin, Niang, Jama, & Nyasimi, 2001). Sustainable agriculture and natural resources management cannot be achieved without adopting a more holistic approach to land management. African educators have realized that they have a major role to play in bringing about better integration and coordination of land use education (Temu, Rudebjer, & Zulberti, 1996). Parties involved in this systematic joint learning process can benefit from the synergy generated which is superior to individualized working.

Lopokoiyit (1995) observed that perceptions of learners towards agriculture are enhanced by an appropriate curriculum. Perceptions of natural resources management among learners as a result of participation in FoF activities can be measured in terms of scores that learners obtain in validated instruments (Makau, 1997). It is therefore imperative to utilise locally available resources to inculcate positive perceptions among school going pupils. World Agroforestry Centre through FoF is enhancing positive perceptions towards natural resources management among

learners particularly in primary schools by using approaches that entertaining for instance, drama, with the theme of environmental sustainability.

PURPOSE AND OBJECTIVES

The purpose of the study was to investigate the effects of the FoF programme on learners' perceptions towards natural resources management. The study sought to investigate the activities of FoF programme and also determine if there is any difference in perceptions towards natural resources management by gender among the learners who are exposed to the FoF programme in Kenya secondary schools.

The specific objectives of the study were:

Describe and compare the secondary school learners' perceptions towards natural resources management between those exposed to FoF activities and those not exposed.

Describe and compare differences in perceptions towards natural resources management by gender among secondary school learners' who are exposed to Farmers of the Future programme.

MATERIALS AND METHODS

The purpose of the study was to investigate effects of the Farmers of the Future (FoF) programme on secondary school learners' perceptions towards natural resource management. The study also sought to investigate the activities of FoF programme and determine if there is any difference in perceptions towards natural resources management by gender among the learners who are exposed to the FoF programme in Kenya secondary schools.

This study employed an ex-post facto design. In the study, learners' perceptions towards management of natural resources as a result of exposure to Farmers of the Future programme were studied. Adoption of ex-post facto design in the study was supported by the fact that the researcher was seeking to determine possible antecedents of events that had happened and was not in a position to manipulate them. These events were the FoF activities and the effects that they had already caused on the learners' perceptions towards natural resources management. The target population of the study was secondary school learners who are members of environment club, agroforestry club, wildlife club, some of whom are involved in FoF programme while others are not.

Reliability of the instrument was tested through pilot testing where thirty secondary school learners were involved. Cronbach's alpha was used to determine the reliability of items. Reliability coefficient of 0.722 was realised. This was above the reliability coefficient of 0.70 thresholds as recommended by Koul (1993). Six secondary schools were randomly selected for inclusion in the study; three were involved in FoF programme while the other three were obtained from schools that are not involved in the FoF programme. 20 pupils were randomly selected from each participating school. The sample was composed of 120 respondents.

Data were collected using a questionnaire. The statements related to natural resources management which secondary school learners responded to were scored on a five point Likert scale. The legend were strongly disagree (SD), disagree (D), Undecided (U), agree (A), and strongly agree (SA). Sorting out of the positive and negative items in the questionnaire was done manually before coding of the data for analysis. Some items in the questionnaire were stated positively while others negatively. This was done to minimise chances of pattern answering of the items by some respondents. In the scoring of the negatively stated items therefore "SD" carried a maximum of 5 points, "D" 4 points, "U" 3 points, "A" 2 points and "SA" 1 point. SD in this case indicated very positive perceptions while SA indicated very negative perceptions towards natural resources management.

The Statistical Package for Social Science (SPSS) was used for date analyses. The hypotheses were analysed using t-test at alpha= 0.05.

RESULTS

Objective one of the study was to describe and compare the perceptions of secondary school students towards natural resources management between those involved in FoF activities and those not involved. The data for this objective were gathered from secondary school students

Table 1: Comparison of perceptions of secondary school students towards natural resources management between those involved in FoF and those not involved by mean and standard deviation per statement

Statements related to natural resources management which secondary school students responded to.	Participation in FoF	Mean	Std. Deviation
1. Enhance Inorganic fertilizers in farming	Non participants	3.38	1.39
	Participants	3.16	1.52
2. Herbicides should be banned in weed control	Non participants	2.47	1.28
	Participants	2.53	1.29
3. Education is powerful against poverty	Non participants	4.34	1.16
	Participants	4.39	0.95
4. Present education curriculum in Kenya has minimal focus on skills for life and sustainable development	Non participants	2.66	1.25
	Participants	3.32	1.32
5. Participation of the underprivileged and marginalized is enhanced in present curriculum	Non participants	3.67	1.12
	Participants	3.66	1.19
6. Prefer learning by doing in agriculture	Non participants	4.05	1.29
	Participants	4.47	0.89
7. Involving students and teachers in community work should be discouraged	Non participants	4.72	0.85
	Participants	4.84	0.37
8. Community members be involved in club activities	Non participants	4.40	0.94
	Participants	4.68	0.62
10. Much time is wasted on subjects like geography and agriculture	Non participants	4.64	0.69
	Participants	4.71	0.57
11. Soil erosion can be controlled effectively by planting more trees	Non participants	4.53	0.68
	Participants	4.61	0.50
12. Environmental conservation as a main subject should be introduced in schools	Non participants	4.03	0.95
	Participants	4.34	0.78
13. Discourage farmers from cultivating on the river valley	Non participants	3.58	1.44
	Participants	3.82	1.61
14. Debate on pollution is a waste of time	Non participants	4.16	1.15
	Participants	4.71	0.73
15. More comfortable with English and Kiswahili teachers than biology, agriculture and geography teachers	Non participants	4.12	0.99
	Participants	4.63	0.71
16. Cleaning cloths in the river should NOT be discouraged because it saves time	Non participants	4.53	0.80
	Participants	4.68	0.62
17. Find it difficult to plant and care for tree seedlings	Non participants	4.16	1.04
	Participants	3.97	1.13
18. Agriculture is not interesting	Non participants	4.68	0.69
	Participants	4.87	0.53
19. Some large forests in Kenya should be cleared to settle the landless people	Non participants	4.25	1.11
	Participants	4.55	0.76
20 Agriculture practical in schools should be stopped	Non participants	4.55	0.78
	Participants	4.87	0.34
21. Would like a career that does not require any farming activity	Non participants	4.07	1.18
	Participants	4.39	0.89
22. Likely to become a successful environmental conservationist	Non participants	4.46	0.83
	Participants	4.68	0.53

(n=109)

using a questionnaire. Some statements were negatively stated while others were positively stated so as to avoid pattern response from certain respondents.

Students who were exposed to FoF programme had better mean scores in individual items in the questionnaire than those not exposed except in items number 1, 5, and 17. In these three items however, the difference in mean of individual items in the two groups was quite low. Students exposed to FoF had interestingly high mean score in individual items for instance in items number 4 and 14 with means of 3.32 and 4.71 respectively against 2.66 and 4.16 respectively of those who were not exposed to FoF programme.

The positive perceptions towards natural resources management among students exposed to the FoF programme is indicated by the high mean scores in individual items. It can therefore be concluded that FoF programme had a significant contribution in learners' positive perceptions towards natural resources management among secondary school students.

Table 2 shows the overall perceptions index of secondary school students exposed to FoF programme and those not exposed in their perceptions towards natural resources management. From the table, the overall mean of students that are involved (exposed) in FoF programme was higher than that of those not participating in FoF programme. The overall mean of students participating in FoF was 4.3194 against 4.0593 of the non-participating and standard deviations of 0.4459 and 0.3409 respectively. Learners who were involved in FoF indicated positive perceptions towards natural resources management than those who were not involved. FoF programme enhances application of theory into practical situations among learners in their faming environment. The findings of the research therefore indicated that the FoF programme has potential of enhancing sustainable agriculture among the young people who are the future farmers.

Table 2: Perceptions index towards natural resources management of secondary school students exposed to FoF programme and those not exposed

Exposure to FoF	Overall mean	Overall SD
Not exposed	4.0593	0.3409
Exposed	4.3194	0.4459

(n=109)

T-test was applied to determine whether there was a significant difference in perceptions towards natural resources management between secondary school learners exposed to the Farmers of the Future programme (FoF) and those not exposed. The results of the analysis are provided in table 3. The results from Table 3 indicate that the perceptions difference between secondary school students involved in FoF programme and those not involved is statistically significant. From the table, the P-value of 0.002 which indicates the level of significance is less than the fixed alpha level of 0.05. This indicates that there was a statistical significant difference between secondary school learners exposed to the Farmers of the Future programme (FoF) and those not exposed, with those exposed indicating better perceptions towards natural resources management.

This could be explained by the fact that students exposed to FoF programme have attained some information on natural resources management over those not exposed hence scored better in the rating scale. FoF programme puts emphasis on learning by doing and thus enhances psychomotor skills in the teaching learning process. The learners are involved in practical activities such as planting trees, planting cover crops, soil conservation, planting vegetables, livestock keeping and tree nursery management.

Perceptions towards Natural Resources Management by Gender among Secondary School Students exposed to the Farmers of the Future Programme

Objective two of the study aimed at describing and comparing perceptions of secondary school students towards natural resources management by gender. The respondents were the students involved in FoF programmes and comparison was according to gender of the student. The findings of the study indicated that there was no gender difference in perceptions towards

Table 3: T-test on perceptions towards natural resources management of secondary school students involved (participate) in FoF and those not exposed

Participation in FoF	N	Mean	Std. Dev.	t-value	df	P-value
Not involved	58	4.0593	0.3409	3.231	94	0.002
Involved	51	4.3194	0.4459			

Significant at the 0.05 level

natural resources management among secondary school students involved in FoF programme. This could be attributed to the fact that the approach taken by FoF appeals to both boys and girls hence similar level of performance in secondary school learners perceptions towards natural resources management.

Results of this objective are tabulated in Table 4. The overall mean of boys was 4.4227 while that of girls was 4.2825. This variation was however insignificant in this study. Maccoby and Jacklin (1974) while studying the attitudinal and value differences between sexes noted that girls have different interests, express different attitudes, and hold different values with regard to learning what is important to them. The findings of this study indicated that FoF programme added a new dimension to learning that was favourable to both boys and girls. This is indicated by their close mean as indicated in Table 4.

This may be attributed to the fact that FoF programme engages different methods in the teaching and learning process on environmental management matters. These teaching learning methods include drama, debates, discussion, excursion and practical work. These approaches appeal to both boys and girls and thus all are motivated thus resulting to similar perceptions towards natural resources management as indicated in this study.

This study investigated whether there was statistical significant difference in perceptions towards natural resources management by gender among secondary school students who are exposed to the Farmers of the Future programme. Studies have been done to investigate and explain abilities and achievements of learners by gender (Mutonga, 1995). Maturation differences have been found to be some of the causes of sex differences in abilities (Lyung, 1965). Lyung further found that girls had accelerated physical development at puberty stage, which could otherwise affect their perceptions. This study therefore investigated whether there were significant gender differences in perceptions towards natural resources management among secondary school students who have been exposed to FoF programme.

Results of this study revealed that the perceptions means from the rating scale, between boys and girls did not differ significantly, with boys scoring 4.4227 while girls scored a mean of 4.2825. The findings of the study could be explained by the fact that FoF initiative is involved in instructional methods that are equally preferred by both girls and boys. The findings of this study concurs with those of Walton (1986) who suggested that the fact that males and females are biologically and genetically different does not necessarily make males better learners in the world of science. And to suggest any innate differences is to promote gender stereotypes.

Table 4: T-test on perceptions towards natural resources management by gender among secondary school students exposed (participants) to FoF programme

Gender	N	Mean	Std. Dev.	t-value	df	P-value
Male	29	4.4227	0.7048	0.851	49	0.401
Female	22	4.2825	0.3186			

Significant at the 0.05 level

From Table 4, the P-value was 0.401. The value is greater than the fixed alpha value of .05. This implies that the boys and girls did not differ significantly in their perceptions towards natural resources management. This may be attributed by the fact that involvement of boys and girls in the Farmers of the Future programme does not give any apparent advantage to either group of learners along the gender divide.

The perceptions of secondary school learners towards natural resources management varied significantly depending on whether they are involved in FoF programme or not. Those involved indicated better perceptions than those not involved. This could be attributed to the fact that FoF programme empowers learners with real life skills in agroforestry and natural resources management.

Comparison of boys and girls who are involved in FoF programme was made to ascertain whether there was a statistical significant difference in their perceptions. The study found no significant difference in perceptions towards natural resources management between boys and girls that are involved in FoF programme in Kenya secondary schools. This may be attributed to the fact that FoF initiative ensures that there is no gender bias in its activities.

RECOMMENDATIONS

Based on the findings of the study, the researcher made the following recommendations that policy makers in education and environmental matters as well as curriculum developers may find important. Teachers being the implementers of school curriculum may also benefit from the recommendations given.

• The FoF programme should be expanded to cover more schools. The expansion of the programme to cover more schools is supported by the fact that the learners involved in the programme in secondary schools indicated better perceptions towards natural resources management than those who are not in the FoF programme. This indicates that the learners in the FoF programme are more likely to manage natural resources in agriculture better than those not involved in the programme in the future.

• The FoF training approaches should be maintained. Since the learners in secondary schools that are involved in FoF programme indicated similar level of perceptions towards natural resources management, FoF should maintain the same approaches that is using in integrating natural resources management into the schools' curricula. The approaches are not gender biased according to the findings got in this study. This was indicated by the lack of statistical significant difference between boys and girls involved in FoF programme in their perceptions towards natural resources management.

• Comparative study should be carried out in a country where FoF programme has been going on for a long period of time. The findings of such a study would give opportunity to compare the programme under different education systems.

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Intensification of Rice Production Systems in Southeastern Nigeria: A Policy Analysis Matrix Approach

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Abstract

The Nigerian rice sector has made remarkable improvement in the last decade as production has increased significantly thereby reducing the gap between domestic supply and demand. In the last three decades, rice imports make up greater proportion of Nigerian imports as rice forms a structural component of the Nigerian diet. Past government inconsistent policies were not successful in securing good market share for domestic rice producers, hence producers suffered great losses. The recent resurgence of interest by the present administration to intensify domestic rice production has yielded positive results. The objective of this study is to analyze and assess the costs and benefits of intensification of rice production systems in southeastern Nigeria using a policy analysis matrix approach. Multi Stage sampling technique was employed in selecting 75 upland and 75 lowland rice farmers who were interviewed with structured and validated questionnaire. Data were analyzed using Policy Analysis Matrix (PAM). The result shows that upland; lowland and double rice cropping systems in southeastern Nigeria are profitable based on the policy analysis matrix (PAM) model, and rice production under various systems and technologies is socially profitable and financially competitive. While there exist comparative advantage in the various production systems, with lowland and double cropping being highest, substantial tax was imposed on rice imports in Nigeria and government investment in intensifying rice production had a positive impact on the output of local rice production. The study concludes with strategies for the development of rice sub sector in Nigeria.

Keywords:
Policy Analysis matrix, financial competitiveness, production systems, social profits, and technologies.

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INTRODUCTION

Rice has traditionally been important basic food commodity in Sub-Saharan Africa. Of the total landmass of 98.3 million hectares in Nigeria, only 1.5 million hectares of the cultivable 71.2 million hectares are under rice production. Sorghum and cassava had 3.3 and 4.0 million hectares respectively. Statistics show that agricultural food production in Nigeria increases at about 2.9% per annum while food demand is growing at a rate of 8.3% annually (FOS 1999). This excess demand portrays the problem of food scarcity, which is a consequence of low productivity of staple foods like rice. The widening gap between regional rice supply and demand has been met by imports, which increase at a rate of 20% annually (FAO, 1996).

Revolutionary changes in dietary pressures of West African countries have created a wide and growing imbalance between regional rice supplies and demand. Since 1973, regional demand has grown at an annual rate of 6.0%, driven by a combination of population growth (2.9%) and substitution away from traditional coarse grains (WARDA, 2000). The consumption of traditional cereals, mainly sorghum and millet, has fallen by 12kg per capita, and their share in cereals used as food decreased from 61% in the early 1970s to 49% in the early 1980s (Akpokodje, 2001). In contrast, the share of rice in cereals consumed has grown from 15% to 26% over the same period. Hence, growth in regional rice consumption, however, remains high. The most important factors contributing to the shift in consumer preferences away from traditional staples and towards rice are rapid urbanization and associated changes in family occupational structures (Fabusoro 2000). According to Ernstain and Larcon (2002), as women enter the labour force, the opportunity cost of their time increases and convenient foods such as rice, which can be prepared quickly, rise in importance. Similarly, as men work at greater distances from their homes in the urban setting, more meals are consumed from the market where the ease of rice preparation has given it a distinct advantage. Iheke and Nwaru (2008) noted that these trends have meant that rice is no longer a luxury food but has become a major source of calories for the urban poor and low-income food-deficit countries.

On the other hand, the government of Nigeria had in the past three decades, actively intervened in domestic rice economy, but policy has not been consistent. The policy on rice has oscillated between import tariffs and import restrictions. For instance, from 1986 to the mid 1990s, imports were illegal. In 1996, the tariff was reduced to 50 percent but increased to 85 percent in 2001. From 2002 till date, there has been a 100 percent import tariff and consumer tax on rice. The erratic policy reflects the dilemma of securing cheap rice for consumers and a fair price for producers (Ezedinma 2001). Notwithstanding the various policy measures, domestic production has not increased sufficiently to meet the increased domestic demand. The inconsistency and inability of domestic rice production in Nigerian to meet domestic demand has raised a number of important questions both in the policy circle and amongst researchers.

Intensification of rice production systems using a combination of various technological packages may be a good strategy to increase output in the different rice production ecologies of Nigeria, and this can be achieved with appropriate policies and institutional support measures that increase farmers' incentives. Taking cognizance of this, this paper seeks to answer the question: what are the alternative technological packages available as well as costs, output and revenue associated with each of the rice production systems in Nigeria; and which of the production systems and alternative technologies should be recommended to farmers to ensure increased output and income? Policies are very important as they shape the prices of inputs and outputs, and influence the relative profitability and competitiveness of technologies.

MATERIALS AND METHODS

The study was carried out in Southeastern Nigeria. The region lies in the humid tropical agro ecological zone of Nigeria, within latitude 04° 24'N to 07° 00'N and longitude 05° 34'E to Longitude 09° 24'E. The humid tropical ecology is characterized by two distinct seasons, namely the dry season, which starts from November to late March and the rainy season, which starts from April to October with a short

Table 1: Rice Production Systems Practiced in Nigeria and the Alternative Technologies under each System

System	Intensification ↓
I	**Upland**
	Single Rice Cropping
	Single Rice + Fertilizer (+kg)
	Single Rice + Fertilizer (-kg)
	Single Rice + Fertilizer + Herbicide
II	**Inland Valley/Swamp**
	Single Rice Cropping
	Single Rice + Fertilizer (+kg)
	Single Rice + Fertilizer (-kg)
	Single Rice + Fertilizer (-kg) +Herbicide
	Single Rice + Fertilizer (+kg) + Herbicide
III	**Double Rice Cropping**
	Double Rice + Fertilizer (+kg)
	Double Rice + Fertilizer (-kg)
	Double Rice + Fertilizer (-kg) + improved Irrigation
	Double Rice + Fertilizer (+kg) + improved Irrigation

dry spell in August. The general vegetation consists of woodland savannah in the northern part of the zone and mangrove forests in the deep Niger Delta area.

The study was concentrated in the major rice producing states in the region comprising of Ebonyi, Enugu, Anambra, Imo and Abia states. Data were collected from a sample of 150 rice farmers stratified into upland and lowland (75 upland and 75 lowland) in eight (8) communities using a pretested questionnaire. The communities include: Akaeze, Uburu, Eda and Abakaliki (Eboyi state); Adani (Enugu state); Uzuakoli and Akoli Imenyi (Abia state) and Okigwe in Imo State. The questionnaire elicited responses from the respondents on their rice output, revenue from sale of output, cost of tradable inputs, factor costs (land, labour and capital) and other capital items for 2008 cropping season. Policy analysis matrix (PAM) (Pearson and Monke 1989; Adesina and Coulibaly 1998) was used to analyze the financial competitiveness of rice-based systems under alternative technologies. The social profitability of (upland, lowland and double) rice production systems at social prices was computed, while the existing alternative technologies in each of the production systems at different levels of fertilizer use and other inputs were also analyzed. The alternative technologies considered in each of the rice production systems include local rice production with varying quantities of inorganic fertilizer and with alternative resource management technology (the use of herbicide and improved irrigation).

Data on yields were collected from farmers' rice fields. The financial prices were real local market prices while the social prices were determined by multiplying the market price by a conversion factor, which is assumed to be a foreign exchange premium (Pearson and Monke 1989; Adesina and Coulibaly 1998). Table1 shows the various rice production systems and technology options under each system practiced in Nigeria, which was used for the study. The systems are considered on a spectrum of intensity. System I is 'low technology'; making relatively high use of domestic resources such as land and labour, while the 'high technology' end of the spectrum is system III with irrigation production. As one moves down the table, production is intensified.

Least Square Difference (LSD) for multiple comparisons was used to ascertain whether there is any significant difference in the output and profitability associated with the various rice production systems.

RESULTS AND DISCUSSION

Table 2 shows a brief demographic distribution of upland and lowland rice farmers in South-eastern Nigeria. A total of 72.01% and 70% of the lowland and upland rice farmers ranged in age between 31 and 50, implying that this age group are physically able to embrace new technologies and in learning new concepts than older farmers. Respondents under age 30 represented only 13.33% and 16%, reflecting that they are new to rice farming. Formal education plays an important role in technology adoption through more rapid adjustment in resource use towards achieving economic optimum. About 21.34% and 21.33% of lowland and upland rice farmers were at least college educated, which is much lower than the percentage without a college education. In the context of education in this study, where six years is the least accepted level for one to be considered educated in Nigeria, the trend is encouraging when compared with previous findings (e.g. Obibuaku 1979) where none of the rice farmers attended secondary or post secondary education.

About 45.33% and 52% of lowland and upland

Table 2: Survey respondents' demographic distribution

Criteria		Frequency		Percentage	
		Lowland	Upland	Lowland	Upland
Age	21-30	10	12	13.33	16.00
	31-40	16	17	21.33	22.00
	41-50	38	36	50.68	48.00
	Over 50	11	10	14.66	12.73
Education	Under College education	59	59	78.66	78.66
	College education and above	16	16	21.34	21.34
Years of farming experience	≤ 10	41	36	54.67	48.00
	11-20	20	24	26.67	32.00
	Over 20 years	14	15	18.66	20.00
Size of farm holdings (ha)	≤ 2.0	22	14	29.33	18.67
	2.1-4.0	23	24	30.67	32.00
	Over 4.0	30	37	40.00	49.33

Source: Field survey data, 2008.

rice farmers respectively had over eleven years of farming experience in rice production, while 70.67% and 81.33% cultivated above 2 hectares of farmland. This shows that upland rice farmers have more years of rice farming experience and cultivated relatively larger area than their lowland counterpart, reflecting more land availability for upland rice production.

Three indicators[1] of economic efficiency under the policy analysis matrix were used to assess the three (upland, lowland and double) rice production systems. The indicators of economic efficiency include the Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC) and Domestic Resource cost (DRC). Nominal Protection Coefficient (NPC) is the ratio of the private price of the commodity to its social price, and measures the extent of policy intervention on the output (i.e. it indicates the impact of policy and any market failure that

Table 3: Policy Analysis Matrix table for upland, lowland and double rice production systems in Southeastern Nigeria.

Upland	Revenue (N)	Cost of Tradable Inputs (N)	Cost of Domestic Resources (N)	Profit (N)
Private	74,880.00	9,250.00	38,900.00	26, 480.00
Social	93,600.00	11,562.50	35,165.00	46,872.50
Policy Effect	-18,720.00	-2,312.50	3,735	-20,392.50
Indicators: PCR=0.59, DRC=0.43, NPCto=0.80, NPCti=0.8, EPC=0.80, PPC=0.56				
Inland				
Private	102,960.00	9,500.00	39,800.00	53,660.00
Social	128,700.00	11,562.00	35,750.00	81,387.50
Policy Effect	-25,740.00	-2,062.50	4,050.00	-27,727.50
Indicators: PCR=0.43,DRC=0.31,NPCto= 0.80,NPCti= 0.80,EPC=0.80 PPC=0.66				
Double cropping				
Private	196,560.00	19,000.00	81,700.00	95,860.00
Social [2]	245,700.00	23,750.00	70,810.00	151,140.00
Policy Effect	-49,140.00	-4,750.00	10,890.00	-55,140.00
Indicators: PCR= 0.46, DRC= 0.32, NPCto=0.80, NPCti=0.80, EPC=0.80, PPC=0.63				

Source: Field survey data, 2008.
*See appendix II for calculation of these indicators.

[1] Calculations of all economic indicators are based on the prevailing US Dollar – Nigerian Naira exchange rate as at August, 2008. The exchange rate was US$1 = N115

[2] Private price is lower than social price because private price is multiplied by a conversion to give the social price.

Table 4: LSD for Multiple comparisons

Comparisons		Mean difference	Std error	Sig	95% confidence Interval	
Systems					Lower Boundary	Upper Boundary
1.00	2.00	-19.9000*	9.133	0.032	-38.0533	-1.7467
Upland	3.00	-75.9667*	9.133	0.000	-93.1200	-56.8133
2.00	1.00	19.9000*	9.133	0.032	1.7467	-38.0533
Lowland	3.00	-55.0667*	9.133	0.000	-73.2200	-36.9133
3.00	1.00	74.9667*	9.133	0.000	56.8133	93.1200
Double rice	2.00	55.0667*	9.133	0.000	36.9133	73.2200

LSD 0.05 = 19.9 (significant).
* = Significant at 5 percent

causes a divergence between the private and social prices. Effective Protection Coefficient (EPC) is an indicator used to assess whether government policy tends to tax or protect consumers and producers while Domestic Resource Cost (DRC) is an indicator that measures the ratio of domestic factors (at social price) to the value-added to the system at social prices (total revenue less cost of tradable inputs).

Table 3 shows the policy analysis matrix for upland, lowland and double rice production systems in southeastern Nigeria. Four rice varieties were cultivated by farmers in the region. They include faro 44 (*wuriwuri*), faro 52 (*wita 4*) for inland; and faro 46 (*wita 50*) and faro 55 (*Nerica 1*) for upland production system. The social revenue was calculated by multiplying the market revenue by a conversion factor, which is an assumed foreign exchange premium. 1.25 is used for revenue and tradable inputs, 1.00 for non-tradable inputs (domestic factors), 0.28 for fixed factors and 0.37 for credit facilities (Pearson and Monke, 1989). Social costs for the considered items were also calculated in the same way. See appendix III for upland rice production. Input cost of machinery was not considered here because the average farm size for upland and inland are 3 and 4 hectares respectively. Therefore, the farmers use manual labour in all their farming activities. In addition, transportation cost was not considered here as the paper does not focus on marketing and profitability of rice output; rather it focuses on production and prices.

The results show a private cost ratio (PCR) of 0.59, 0.43 and 0.46; domestic resource cost (DRC) of 0.43, 0.31 and 0.32; nominal protection coefficient (NPC) on tradable inputs and output of 0.80 and private profitability coefficient (PPC) of 0.56, 0.66 and 0.63 for upland, lowland and double rice cropping systems respectively. The results indicate that rice farmers in the three production systems have comparative advantage (DRC<1) in rice production with lowland system having the highest comparative advantage. The results further show that rice farmers in the three systems are receiving considerably less than the world market price equivalent of their rice even in the event of input subsidies (EPC<1). The private profitability[3] coefficient (PPC) is less than one in the three systems indicating that rice is a profitable crop for farmers to grow. The positive signs of private and social profits[4] show that rice farmers in the study area can still produce without transfers from the government.

The results further indicates that social profit which shows the magnitude of benefit (profit) accruing to the society from each of the rice production systems is highest in double rice production system followed by lowland, and least in upland rice system. This is because some lowland rice farmers seem to have a relatively higher rice yield per unit area than upland rice producing farmers.

The analysis of financial competitiveness

[3] Private profit refers to observed net revenue reflecting actual market prices received or paid by farmers, merchants or processors in the agricultural system. Its calculations show the competitiveness of the agricultural system, given the current technologies, output levels, input costs and policy transfers.

[4] Social profit valuations measure comparative advantage or efficiency in the agricultural commodity system. Efficiency outcomes are achieved when an economy's resources are used in activities that create the highest level of output and income.

(Table 5, 6, and 7) of rice under alternative technologies was carried out using three measures of profitability assessment. They include: net private profitability (NPP), which is the profit evaluated at the private market prices; net social profitability (NSP) defined as the profit evaluated at the social price for both output and inputs; and domestic resource cost (DRC) referred to as the ratio of costs at social prices of non-tradable domestic resources used in production of the commodity to the value added at social prices. The DRC is used as a measure of comparative advantage.

Analysis of financial profitability in the three production systems (table 5, 6 and 7) show that all the systems had a positive Net Private Profitability (NPP), indicating that rice farmers in the study area have financial incentives to produce under the existing technologies. This explains the impact of the recent agricultural loan given to rice farmers by the federal government as part of the strategies to increase local rice production in Nigeria. While all the production systems and technologies are socially profitable (Net Social Profitability (NSP) >0), the result further shows that input transfers were all negative, indicating the existence of input subsidies for rice farmers in the region, which the government used as a motivating factor to boost rice production in the region.

The computed Domestic Resource Cost (DRC) value for all the systems and technologies are positive and less than one, suggesting that farmers have comparative advantage in all the existing technologies while they have the highest comparative advantage in single rice + 50kg fertilizer +Herbicide technology in the case of upland and lowland, and double rice + 100kg fertilizer + Improved irrigation technology (both having the lowest computed DRC value). The negative signs of net policy for all the systems and technologies show that recent government interventions on importation of foreign rice in Nigeria have had positive impact on the financial and social profitability of local rice production. With respect to revenue, double rice cropping system gives the highest revenue, which was optimized under double rice +100kg fertilizer + improved irrigation technology.

Table 6 (the Least Significant Difference) shows that at 5 percent level, there exist significant differences in output and revenue (profit) between the three systems while the difference is more between systems I (Upland) and II (lowland) as P- value (0.032) < 0.05 and LSD 0.05 = 99.9. Therefore, there is a significant difference in the output and profit associated with upland, lowland and double rice cropping systems with double rice system being the most profitable in the study area.

RECOMMENDATIONS

The results from this study suggest a number of such factors that will help improve local rice production not only in southeast Nigeria but also in Nigeria at large.

First, results reveal that the three rice production systems are profitable with double rice cropping giving the highest profit followed by rice produced in lowland systems. Rice production systems are location specific. Therefore, the choice of a particular system should depend on such factors as topography and availability of inputs like fertilizer, water and herbicides. In any case, 50kg fertilizer with herbicide per hectare is recommended for optimal output, as this technology gives the lowest DRC (highest comparative advantage) among all the technologies within each system.

Second, results show that Domestic Resource Cost (DRC) for the three production systems are less than unity, implying that farmers have comparative advantage in the three systems with double cropping giving the highest comparative advantage and profit. Therefore, rice farmers, especially in lowland areas, can maximize land use and consequently improve their farm income through double rice cropping since the rainfall regime of the study area can accommodate two rice crops in a year. The use of appropriate technologies such as blow dryers, power tillers and improved irrigation using water retention dykes and bunds will intensify rice production. The dykes will help retain water, long after the rainy season, while the blow dryers will enable farmers dry their early rice crop output, which is likely to be harvested within the rainy months.

Third, results indicate that government policy shifts had positive effect on the private and

social profitability of local rice production, as the Nominal Protection Coefficient (NPC) is less than unity in all the systems. Policy inconsistency in the rice sub sector has actually discouraged local production over the years. Since the removal of the ban on rice imports in 1992, growth in domestic rice output declined significantly justifying the urgent need for government positive and proactive intervention. The policy imposes a tax on rice imports as well as a 100% tariff. This import substitution strategy should be maintained to encourage domestic rice production and improve local unemployment.

Fourth, for efficient performance of the rice sector in Nigeria, private sector participation with institutional and market support services should be encouraged by the government. This approach requires private sector participation, especially in the areas of credit, transport, resource inputs, storage facilities, and institutional inputs for research, infrastructure and a consistent policy environment from government. This will serve as a key to commercialization of rice production in Nigeria.

CONCLUSION

The economic analysis shows a high level of financial and social profitability of various technologies in rice production systems. The high financial incentive for rice production suggests that farmers can easily adopt new technologies provided such technologies would increase their output and income. The high social profitability of rice production calls for increased attention in these technologies, as they represent a socially efficient use of domestic resources. There is need to increasingly target rice-based production technologies into areas where preconditions for their adoption exist. Recent policy shifts on rice importation in Nigeria have created a positive impact on local rice production. Therefore, effective and conducive policies are important to stimulate local uptake of improved technologies. This is important for Nigeria to gain economics of scale, efficiency and self-sufficiency in domestic rice production, ensure food security, better nutrition, poverty alleviation and improvement of rural livelihood.

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Appendix I

Table 5: Policy Analysis Matrix for Alternative Technologies in Upland Rice Production System in Southeastern Nigeria (Net Financial Profitability)

Technology	Revenue	Costs		Net Private Profitability (NPP)	Revenue	Costs		Net Social Profitability (NSP)	Net effects of policy distortion				
		Tradable input	Domestic factor			Tradable input	Domestic factor		Output transfer	Input transfer	Factor transfer	Net Policy	DRC
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	
Single rice cropping	56130	3250	38900	13980	70162.0	3750	35165	31247.0	-14032.0	-500	3735	-17267.0	0.50
Single rice +100kg fertilizer	70880	12250	38900	19730	88662.5	15000	35165	38497.5	-17782.5	-2750	3735	-18767.5	0.40
Single rice + 50kg fertilizer	73005	9250	38900	24855	91256.25	11250	35165	44841.25	-18251.25	-2000	3735	-19986.25	0.39
Single rice + 100kg fertilizer + Herbicide	71130	12500	38900	19730	88912.5	15312.5	35165	38435.0	-17782.5	-2812.5	3735	-18705.0	0.40
Single rice + 50kg fertilizer + Herbicide	74880	9500	38900	26480	93600.0	11562.5	35165	46872.5	-18720.0	-2062.5	3735	-20392.5	0.38

Source: Field survey data, 2008
US$1 = 115 Nigerian Naira
NB: A =revenue valued at private price; B = tradable inputs valued at private prices; C = domestic factors valued at private prices; D =NPP = A – B- C.
E = revenue valued at social price; F = tradable inputs valued at social prices; G = domestic factors valued at social prices;
H = NSP = E – F – G; Output transfers I = A – E; tradable input transfers J = B – F; K = C – G; net transfer for policy effects L = D – H; DRC = G/E.

Table 6: Policy Analysis Matrix for Alternative Technologies in lowland Rice Production System in Southeastern Nigeria (Net Financial Profitability)

Technology	Revenue	Costs		Net Private Profitability (NPP)	Revenue	Costs		Net Social Profitability (NSP)	Net effects of policy distortion				
		Tradable input	Domestic factor			Tradable input	Domestic factor		Output transfer	Input transfer	Factor transfer	Net Policy	DRC
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	
Single rice cropping	78960	3250	39800	35910	98700	3750	35750	59200.0	-19740	-500	4050	-23290.0	0.36
Single rice +100kg fertilizer	98280	12250	39800	46230	120000	15000	35750	69250.0	-21720	-2750	4050	-23020.0	0.30
Single rice + 50kg fertilizer	102960	9250	39800	53910	125700	11250	35750	78700.0	-22740	-2000	4050	-24790.0	0.28
Single rice + 100kg fertilizer + Herbicide	100560	12500	39800	48260	122700	15312.5	35750	71637.5	-22140	-2812.5	4050	-23377.5	0.29
Single rice + 50kg fertilizer + Herbicide	102960	9500	39800	53660	128700	11562.5	35750	81387.5	-25740	-2062.5	4050	-27727.5	0.27

Source: Field survey data, 2008.
US$1 = 115 Nigerian Naira
NB: A = revenue valued at private price; B = tradable inputs valued at private prices; C = domestic factors valued at private prices;
D =NPP= (A – B – C).
E =revenue valued at social price; F = tradable inputs valued at social prices; G = domestic factors valued at social prices;
H = NSP = (E – F – G); Output transfers I = (A – E); tradable input transfers J = (B – F); K = (C – G); net transfer for policy effects L = (D – H); DRC = G/E.

Table 7: Policy Analysis Matrix for Alternative Technologies in Double Rice Production System in Southeastern Nigeria (Net Financial Profitability)

Technology	Revenue	Costs		Net Private Profitability (NPP)	Revenue	Costs		Net Social Profitability (NSP)	Net effects of policy distortion				
		Tradable input	Domestic factor			Tradable input	Domestic factor		Output transfer	Input transfer	Factor transfer	Net Policy	DRC
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	
Double rice + 100kg fertilizer	172245.0	21500	81700	69045.0	248336.2	20250	70810	157276.2	-76091.2	1250	10890	-88231.2	0.285
Double rice +50kg fertilizer	179737.5	18500	81700	79537.5	241745.6	17250	70810	153685.6	-62008.1	1250	10890	-74148.1	0.293
Double rice +100kg fertilizer + Improved Irrigation	190560.0	22000	81700	86860.0	255273.7	26750	70810	157713.7	-64713.7	-4750	10890	-70853.7	0.277
Double rice + 50kg fertilizer + Improved Irrigation	196560.0	19000	81700	95860.0	245700.0	23750	70810	151140.0	-49140.0	-4750	10890	-55280.0	0.288

Source: Field survey data, 2008.
US$1 = 115 Nigerian Naira
NB:A = revenue valued at private price; B = tradable inputs valued at private prices; C = domestic factors valued at private prices;
D = NPP = (A – B – C).
E = revenue valued at social price; F = tradable inputs valued at social prices; G = domestic factors valued at social prices;
H = NSP = (E – F – G); Output transfers I = (A – E); tradable input transfers J = (B – F); K = (C – G); net transfer for policy effects L = (D – H); DRC = G/E.

Appendix II

Calculation of indicators shown on table 3

Upland Rice Production System

a) Private Cost Ratio (PCR): $$\frac{\text{Private cost of domestic resources}}{\text{Private revenue – Private cost of tradable inputs}}$$

$$\frac{38900}{74880\text{-}9500} = \frac{38900}{65380} = 0.59$$

b) Domestic Resource Cost (DRC): $$\frac{\text{Social cost of domestic resources}}{\text{Social revenue – Social cost of tradable inputs}}$$

$$\frac{35165}{93600\text{-}11562.5} = \frac{35165}{82037.5} = 0.43$$

c) Nominal Protection Coefficient (NPC) on tradable output : $$\frac{\text{Private revenue}}{\text{Social revenue}}$$

$$\frac{74880}{93600} = 0.8$$

d) Nominal Protection Coefficient (NPC) on tradable inputs: $$\frac{\text{Private cost of tradable inputs}}{\text{Social cost of tradable inputs}}$$

$$\frac{9500}{11562.5} = 0.8$$

e)Effective Protection Coefficient (EPC) : $$\frac{\text{Private revenue – Private cost of tradable inputs}}{\text{Social revenue – Social cost of tradable inputs}}$$

$$\frac{74880\text{-}9500}{93600\text{-}11562.5} = \frac{40670}{82037.5} = 0.8$$

f) Private Profitability Coefficient (PPC) : $$\frac{\text{Private profit}}{\text{Social profit}}$$

$$\frac{26480}{46872.5} = 0.56$$

Inland Rice Production System

a) Private Cost Ratio (PCR): $$\frac{\text{Private cost of domestic resources}}{\text{Private revenue – Private cost of tradable inputs}}$$

$$\frac{39800}{102960\text{-}9500} = \frac{39800}{93460} = 0.43$$

b) Domestic Resource Cost (DRC): $$\frac{\text{Social cost of domestic resources}}{\text{Social revenue – Social cost of tradable inputs}}$$

$$\frac{35750}{128700\text{-}11562.5} = \frac{35750}{117137.5} = 0.31$$

c) Nominal Protection Coefficient (NPC) on tradable output : $$\frac{\text{Private profit}}{\text{Social profit}}$$

$$\frac{102960}{128700} = 0.8$$

d) Nominal Protection Coefficient (NPC) on tradable inputs : $$\frac{\text{Private cost of tradable inputs}}{\text{Social cost of tradable inputs}}$$

$$\frac{9500}{11562.5} = 0.8$$

e) Effective Protection Coefficient (EPC) : $$\frac{\text{Private revenue – Private cost of tradable inputs}}{\text{Social revenue – Social cost of tradable inputs}}$$

$$\frac{102960\text{-}9500}{128700\text{-}11562.5} = \frac{93460}{117137.5} = 0.8$$

f) Private Profitability Coefficient (PPC) : $$\frac{\text{Private profit}}{\text{Social profit}}$$

$$\frac{53660}{81387.5} = 0.66$$

Double Rice Cropping System

a) Private Cost Ratio (PCR): $$\frac{\text{Private cost of domestic resources}}{\text{Private revenue – Private cost of tradable inputs}}$$

$$\frac{81700}{196560\text{-}19000} = \frac{81700}{177560} = 0.46$$

b) Domestic Resource Cost (DRC): $$\frac{\text{Social cost of domestic resources}}{\text{Social revenue – Social cost of tradable inputs}}$$

$$\frac{70810}{245700\text{-}23750} = \frac{70810}{221950} = 0.32$$

c) Nominal Protection Coefficient (NPC) on tradable output : $$\frac{\text{Private profit}}{\text{Social profit}}$$

$$\frac{196560}{245700} = 0.8$$

d) Nominal Protection Coefficient (NPC) on tradable inputs : $$\frac{\text{Private cost of tradable inputs}}{\text{Social cost of tradable inputs}}$$

$$\frac{19000}{23750} = 0.8$$

e) Effective Protection Coefficient (EPC) : $$\frac{\text{Private revenue – Private cost of tradable inputs}}{\text{Social revenue – Social cost of tradable inputs}}$$

$$\frac{196560\ \text{-}19000}{245700\text{-}23750} = \frac{117560}{221950} = 0.8$$

f) Private Profitability Coefficient (PPC) : $$\frac{\text{Private profit}}{\text{Social profit}}$$

$$\frac{95860}{151140} = 0.63$$

Appendix III

Table 8: PAM Simple for Upland Rice Production System

		Units	Qty	Market Price (N/kg)	Conversion Factor	Social Price (N)	Market Value (N)	Social Value (N)	Transfers
1	**Revenue**								
	Rice output /50kg (milled)	Kg	12.8	5850	1.25	7312.5	74880	93600	-18720
2	**Tradable inputs**								
	seeds	Kg	50	60	1.25	75	3000	3750	-750
	fertilizer	Kg	50	120	1.25	150	6000	7500	-1500
	agrochemical	-	2	250	1.25	312.5	500	312.5	-62.5
3.	**Not tradable inputs**								
	(Domestic factors)	Manday							
a	Labour	"	4	600	1.00	600	2400	2400	0.00
	Nursery	"	6	700	1.00	700	4200	4200	0.00
	Land Clearing	"	6	800	1.00	800	4800	4800	0.00
	Land Preparation	"	4	700	1.00	700	2800	2800	0.00
	Transplanting	"	4	600	1.00	600	2400	2400	0.00
	Fertilizer Application	"	4	1500	1.00	1500	6000	6000	0.00
	1st Weeding	"	4	1000	1.00	1000	4000	4000	0.00
	2nd Weeding	"	1	2000	1.00	2000	2000	2000	0.00
b	Bird Scaring	ha	4	1200	1.00	1200	4800	4800	0.00
c	Harvesting& threshing	N/ha	1	3000	0.28	840	3000	840	2160
	Land Costs		1	2500	0.37	925	2500	925	1575
	Interest on capital								

Indicators: PCR = 0.59 DRC = 0.31 NPC_{to} = 0.80
NPCti = 0.82 EPC = 0.80 PPC = 0.56

Note: the conversion factor is an assumed foreign exchange premium.1.25 is used for revenue and tradable inputs, 1.00 for non-tradable inputs (Domestic factors), 0.28 for fixed factors and 0.37 for credit facilities (Pearson and Monke, 1989).

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Determination of Target Exchange Rate for the Comparative Advantage of Iran Crops (A Case of Sari Township)

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Abstract

In this paper, the value of exchange rate was calculated in order to determine comparative advantage in crops of Sari Township during 2009-2010. Hence, first, comparative advantage indices are estimated by using a policy analysis matrix. The results showed that just wheat has a DRC index of one in the minimum amount of national currency exchange rate value. This indicated the fact that only wheat, compared to Rice, Soybean, Canola and Barley in this region, can compete with global markets and had a social profitable production system. Therefore, it is recommended that executive policies, which make competitive ability in wheat, should also be applied for other products.

Keywords:
Comparative Advantages, PAM, Exchange Rate, Sari.

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INTRODUCTION

Agricultural activities Development are considered as basic indices in developing countries such as; Iran. Principle of comparative advantage is one of the important economic criteria for production planning, import and export. This shows that if a country produces a commodity cheaper than the other countries, it will have comparative advantage in producing of that commodity (karbasi & *et al.,* 2005, p. 2). Also, this principle is one of the very profitable criteria for the optimal allocation of resources in countries with open economy and has the important role in international trade. Developing countries are often facing to lack of capital, which is considered as the most important productive resources. Other productive resources may be abundant in this country, but these resources are wasted because of Non-optimal use which results in low productivity. Thus, it is important for these countries to allocate their limited capital, in order to develop and progress, so that first, it causes to use other production factors and increase their productivity; second, productive resources are used in producing the products which have regional and national comparative advantage (Azizi & Yazdani, 2004, p. 2). It is important to survey and pay attention to comparative advantage of agricultural products, in respect to significant share of agricultural sector in non-petroleum export of country. Paying attention to policy of exchange rate valuation is an effective policy on changing process of comparative advantage in different sectors. In policy makers ' opinion, exchange rate has a special role because of its affecting feature and of signaling to other variables, however, it is introduced as a macro variable in economics. In this study, the effect of exchange rate changes on comparative advantage in agricultural products of Sari, during 89-1388, is investigated. Sari has 3685 /3 square km so allocates about 15 / 3 percents of the total area of Mazandaran province to itself. This city is located between 35 degrees and 58 minutes to 36 degrees and 50 minutes of north latitude and 52 degrees and 56 minutes and 53 degrees and 59 minutes of East longitude of the prime meridian. Policy analysis matrix and related indices are one of the widely used methods in the analyzing of policies and determining of comparative advantage of different products. Mounk and Pearson created policy analysis matrix approach for a comprehensive review of policies, in 1989 (Julayi and Jeirani, 2008, p. 5). Up to now, many studies have been done, in the field of comparative advantage. For example, Fang& Beghin (2000) deal to investigate self-sufficiency, comparative advantage and trade in agricultural products in China. They have used policy analysis matrix (PAM) in their analysis. The results show that China has advantage in products labor and no advantage in products with the earth. Hasan & *et al.,* (1999) was analyzed comparative advantage of agricultural products in South Africa. In this study, DRC method is used. McIntire and Delgado (1985) were estimated comparative advantage of crop in Burkina Faso and Nigeria. They used effective protection coefficient, Net Social Profit and Domestic Resource Cost Indices. Results show that, Burkina Faso does not have advantage in producing, but Nigeria has advantage. Masters and Nelson (1995) concluded that the use of SCB indices has better results than DRC index in Kenya. Moses Nejhad (1996) measured the comparative advantage of pistachio production and export by using the DRC index. The results showed that Iran has comparative advantage in this production. Haddad and Rabiei (2007) estimated comparative advantage of agricultural products by using the DRC index, in Iran. The results indicated that potato, onion, corn, wheat, barley, cotton, apple and citrus have comparative advantage, but rice, beans, sugar beets and soybeans have comparative disadvantage. Azizi and Yazdani (2004) showed that pistachio has comparative advantage among the major horticultural products in Iran compared to rival countries such as; USA, China, Turkey and Syria. The results showed that potato, onion, corn, wheat, barley, cotton, apple and citrus have comparative advantage, in Iran. in the present study, it seems necessary to investigate comparative advantage in respect to its importance, lack of a coherent and clear study in Sari as one of the largest producers of grain in

country, the issue of subsidies and also an emphasis on liberalization Prices in this policy as well as the impact of the high exchange rate policy. Needed Information is collected through filling in 591 questionnaires for five products in Sari, includes rice, wheat, barley, soybeans and canola in 2009-2010.

MATERIALS AND METHODS

There are several indices for evaluating comparative advantage that policy analysis matrix approach (PAM) is used to estimate these indices (Kavoosi Kalashami and *et al.,* 2010). General framework of policy analysis matrix is presented in Table 1. There are various indices in each area to determine the comparative advantage which are presented in table 1. Different types of indices used in this study are shown in Table 2.

In order to calculate the comparative advantage by using these indices, estimating shadow price of applied inputs in production and also shadow prices of exchange rate is necessary. The CIF price and transportation costs are used to calculate Shadow price of tradable input (poison, fertilizer). Also, the opportunity cost method (the value of their best application) was used to calculate the shadow price of domestic inputs (labor, water...). Shadow exchange rate has a special sensitivity in the calculation of comparative advantage and of government support rates. In fact, this rate is based on achieving an acceptable shadow price for products and tradable inputs. Purchasing power parity (PPP) can be used, in both absolute and relative mode, for calculating real exchange rate (Gardner & Rausser, 1998). Real exchange rate (equal rate of Rial against dollar) is obtained from the following equation by using purchasing power parity method, in absolute form (ppp).

Table 1: General framework of policy analysis matrix

	Revenues	Input costs		Profits
		tradable input	domestic factor	
Private	**A**	**B**	**C**	**D**
Social	**E**	**F**	**G**	**H**
Effects of Divergences	**I**	**J**	**K**	**L**

Table 2: Indices of comparative advantage based on a policy analysis matrix

Index	Calculation method	Index Commentary
DRC	$\frac{G}{E-F}$	**This ratio compares cost of domestic factors (G) with differences of shadow income and shadow cost of tradable input If DRC<1, there is Advantage in producing and exporting of products If DRC>1, there isn't Advantage in producing and exporting of products**
SCB	$\frac{F+G}{E}$	**This ratio compares shadow costs of Inputs (F+G) with shadow income (E) If SCB>1, Profitable production and export If 0<SCB<1, Profitable production and export If SCB>1, non-Profitable production and export**
NPIC	$\frac{B}{F}$	**This ratio compares cost of tradable inputs (B) with cost of their domestic factor If NPIC<1, Market inputs are protect If NPIC>1, Market inputs are not protect**
NPC	$\frac{A}{E}$	**This ratio compares Private Revenue (A) with Social Revenue (E) If NPC<1, The product market is not protected (producers pay indirect tax) If NPC>1, The product market is protected (Producer receives indirect subsidies)**
EPC	$\frac{A-B}{E-F}$	**This ratio compares added value in domestic prices (A – B) with added value in shadow prices (E – F). If EPC<1, Total effects of government intervention in inputs and products market is to detriment of producer If EPC>1, Total effects of government intervention in inputs and products market is to favor of producer**
NSP	**(E-F-G)*Y**	**This Index show Difference between shadow income (E) and shadow cast of inputs**

Kannapiran & Fleming (1999)

$$E=\frac{P_{ig}}{P_{dg}} \quad (1)$$

Where P_{ig} and P_{dg} represent an ounce of gold price in the domestic market (in terms of Rials) and global market (in terms of dollar), respectively. By using purchasing power parity method, in absolute form (PPP), real exchange rate (equal rate of Rials against dollar) is obtained from the equation 2.

$$E=\frac{P_i}{P^* i}\times E_o \quad (2)$$

Where P_i , P^*_i and E_o represent Domestic consumer price index, Foreign consumer price index and Free exchange rate in the source, respectively (database of central bank of Islamic Republic of Iran, 2009). In this research, since, consumer price index has more accuracy to express the consumer purchasing power and on the other hand, a gold price is not dynamic enough due to the interference policies of government, relative method is used to calculate real exchange rate

RESULTS AND DISCUSSION

The relative purchasing power parity method is used for calculating real exchange rate, in 2008. Considering the exchange rate value in base year 1383 and the amount of retail price indices in the U.S and Iran, in 2008, the value of a real exchange rate is estimated 16428.5 Rial. The shadow price of fertilizer is the CIF price. The value of imported chemical fertilizer in per kilogram was calculated 4681.8 Rial. According to distance of Sari from the border of import chemical fertilizers (1300 km) and price of per kilogram (724.1 Rials) as transportation cost of input, the shadow price of fertilizer is calculated 5405.9 Rials, in Sari. In addition, the average price of import pesticides (herbicide, fungicide, Insecticide, acaricide) is 9.25 dollars per liter, in 2008. In respect to real exchange rate (16428.5 for per unite dollar), value of import pesticides in per liter is calculated 151963.62 Rials. Finally, by adding the transportation cost in per liter, shadow price of pesticides is estimated 152687.72 Rials per liter. The labor cost per hour was estimated 20,000 Rials. Shadow price of machinery has been considered equal to the highest paid price for an hour using machinery, in region. Hence, the products divided into two groups according to planting and harvest date, firstly. Then, the highest cost in per hour of using machinery, in each group, is calculated, and weighted average is used for calculating shadow price, in regard to common steps of each group. Finally, shadow price of machinery of the wheat, barley and canola has been calculated 418,428 Rials and

Table 3: Comparative advantage indices for products Produced in Sari

product	DRC	SCB	NPIC	NPC	EPC	NSP (million Rials)
Soybean	0.95	0.97	0.46	0.6	0.69	0.51
Rice	0.87	0.9	0.4	0.8	0.95	4.23
Canola	0.84	0.92	0.41	0.75	1.1	1
Wheat	0.7	0.85	0.44	0.66	0.88	2.12
Barley	1.62	1.21	0.34	0.68	1.31	-2

Table 4: Rials Value of exchange rate for determining of index border Of comparative advantage for products in Sari

product	Exchange rate (Rials)	DRC Index	NSP
Soybean	15852	1	-7971.4
Rice	14610	1	-16365.33
Canola	14653	1	-2920.42
Wheat	12982	1	-1258.24
Barley	21523	1	-4724.73

of the rice and soybean has been estimated 410701.5 Rials. For calculating the shadow price of water for irrigation products, expensive cost of extraction method was used. The most expensive cost of extracting was selected for rice and soybean. Rice has expensive cost of water extraction, compared to those other products. The highest irrigation cost for per ton of rice is 1843657.8 Rials and water requirements of rice is 2359.88 cubic meter per ton. So, shadow price of rice is estimated 781.25 Rials. Since, the gasoil import price average had been 0.43 dollars in 2008, therefore import prices of gasoil was considered as shadow price. According to Calculated real exchange rate, this price is 7064.25 Rials in per liter. Rent of per ton - km transporting of product was 385 Rials, at Mazandaran province in 2008. For calculating shadow Price of transportation, subsidies should be removed from gasoil. To this reason, it is regarded that, in average, 0.025 liter gasoil is consuming for per ton-km. Subsidized price of gasoil is 165 Rials per liter; therefore shadow price of transportation (per ton-km) will be 176.6 plus 380.87 Rials (4.125 Rials Fraction is due to gasoil subsidy). In calculating the cost of transportation, the average distance of the province to the border is considered 1300 km. Thus, the cost per ton-km transporting of product was 557.47 Rials in Mazandaran province, in 2008. Results of comparative advantage indices of five products in Sari are reported in Table 3. The DRC index indicates that barley doesn't have advantage. Tradable and untradeable input costs for this product, based on shadow prices, are more than their values based on market prices. Review of EPC index shows that the effects of government intervention on product market in addition to input of soybeans, rice and wheat is detrimental for producers. Effective protection for producing of canola and barley in the Sari is in favor of producers. In other hand, the loss due to product market is lower than benefit of input market, so effective protection is positive in this city.

It is better, in study of Comparative advantage of these products, to estimate amount of exchange rate which leads DRC index o be one in order to present proper offers. Therefore, this exchange rate was calculated through trial and error methods. The results are presented in Table 4. The results show that wheat has advantage in lowest exchange rate in terms of domestic currency. This indicates that if the real exchange rate decreases to 1300 Rials, only wheat producers can compete in global market and this product will have advantage. The highest exchange rate is 21523 Rials belonged to barley. It means if the value per exchange rate unit is less than this amount, the production has disadvantage and it is not economical to produce.

CONCLUSION

In this study, the effect of exchange rate changes on comparative advantage of farm products was investigated Sari. To this aim, Policy Analysis Matrix (PAM) method was used. The results show that barley has disadvantage in this region and compared to foreign import is not profitable. Therefore, it is recommended to do required research in order to increase profitability and performance, as one of the most important effective factors on the comparative advantage of this product. Study of exchange rate valuation in estimating of comparative advantage showed that wheat in lowest level of the exchange rate has advantage. This result indicates that farmers can compete in global markets at this level of exchange rate. Therefore, the government can provide domestic needs and increase export of these products for global markets by applying the appropriate foreign exchange policies with respect to comparative advantage of all products in the region. Furthermore, applying policies which increasing the competitive ability of wheat in global markets can increase competitive ability of other products in world markets, too.

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All manuscripts are reviewed by an editor and members of the Editorial Board or qualified outside reviewers. Decisions will be made as rapidly as possible, and the journal strives to return reviewers' comments to authors within 3 weeks. The editorial board will re-review manuscripts that are accepted pending revision. It is the goal of the IJAMAD to publish manuscripts within 8 weeks after submission.

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All portions of the manuscript must be typed **single-spaced** and all pages numbered starting from the title page.

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Following the abstract, about 3 to 10 **key words** that will provide indexing references should be listed.

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