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Model of Waters Resource Management, based on Capture Fisheries Conflict Resolution

By Rusmilyansari

Universitas Lambung Mangkurat, Indonesia

Abstract - Fisheries conflicts is one issue that needs serious attention, because it could threaten the sustainability of marine resources.This study aims to determine the effectiveness of the causes of conflict and conflict resolution in the management of aquatic resources. Research using survey methods with quantitative approaches. Variables were divided into three groups: input variables (factors causing conflict); output (conflict resolution techniques) and outcome. The primary data source is 200 stakeholders of water resources. Statistical analysis using structural equation modeling. The results showed that the cause of the conflict is a competition factor in the utilization of marine resources, the presence of the opposite parties, the economic condition, the extent of the parties involved as well as the cultural background. Conflict resolution is the most effective use of facilitation techniques.

Keywords : management, waters resources, conflict resolution, capture fisheries.

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Keywords : management, waters resources, conflict resolution, capture fisheries.

I. Introduction

Since the issuance of Law No.32of 2004 on Regional Government, the local authorities have an important role in resource management. Marineand fisheries sector development in South Kalimantan will behamperedif the conflict fisheries do not getattention in proportion. Utilization of marine resourcestend to be unlimited and more oriented to economic interests, adversely impact the sustainability of marine resources.

Conflicts among users of water resources in southern Kalimantan escalated since 1979 until 2011. There are several cases of conflicts such as andon fishermen using purse seine usage with higher technology than the local fishermen, fishing ground scramble case, case of catch sea cucumbers using a compressor, case of modification lampara by adding outer board, case of bagan, and cases of illegal fishing (Rusmilyansari. 2012).

Management of aquatic resources is essentially the management of human use. Management of human behavior is setting them in terms of resource management. Priscoli (2002) suggests that natural resource conflicts can be caused by poor communication, different perceptions, ego battles, differences in personality and stereotype issues, differences of opinion about the good and the bad, different interests and structural factors. Conflict fisheries varies between regions and over time. Bennett and Neiland (2000) stated that the conflict is multidimensional and generally involve multiple parties in complex relationships.

The Government has sought to address the fisheries conflicts that arise by issuing rules, but the results have not been effective.Research on water resource management model based conflict resolution is important because it will contribute significantly to the fishery resource management planning, because without proper management, conflicts can inhibit the development of fisheries and marine in South Kalimantan. This study aims to determine the causes of conflict and determine the effectiveness of conflict resolution in the management of aquatic resources.

II. Research Methods

The experiment was conducted in the coastal village of South Kalimantan. Selection of the study area conducted purposive as the base area of conflict Kotabaru district, Tanah Bumbu district and Tanah Laut District. The study was conducted in 2012.

Research using a survey of 200 stakeholders methods of fishing resources. comprising government agencies, nongovernmental organizations, village chiefs, community leaders, fishermen, and academics. Information was collected using a structured questionnaire aimed to determine the perceptions of the three groups of variables respondenden the variable causes of conflict, conflict resolution and variable variables outcome.

Variable factors causing conflict consists of people's economic condition (X1), the extent of the parties involved (X2), the presence of the opposite party (X3), a growing issue in society (X4), number of fishermen (X5), kompotesi in resource use (X6), the presence of a character in conflict (X7), public perception of the stock (X8), a certain desire in society (X9), the existence of regulatory and law enforcement (X10), cultural backgrounds (X11). Conflict conflict resolution techniques fishery consists of litigation (Y1), negotiation (X2), Facilitation (X3), avoidance (X4). Outcame variables consist of community participation in fisheries management (Z1), resource sustainability (Z2), the management of fisheries resources with justice (Z3).

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Data were analyzed using structural equation modeling statistics. According Wijanto (2007) Structural equation modeling is an integrated approach between factors, structural models and path analysis, but it is an integrated approach to the analysis of the data by construction concept.

III. Results and Discussion

a) Causes of Conflict

Referring to the analysis of structural equation modeling (Figure 1 and Figure 2) showed a significant relationship between the causes of conflict, conflict resolution and outcome. There are indicators that the causes of conflict significantly contributed to the causes of the conflict, namely: competencies in resource use, the presence of the opposite parties, the economic condition, the extent of the parties involved and the cultural background.

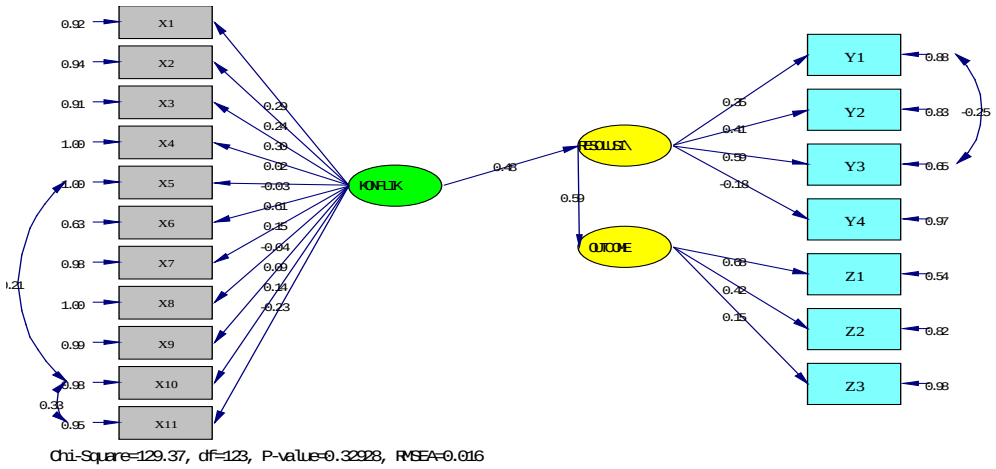

Figure 1 : Structural equation modeling showed that the estimated value

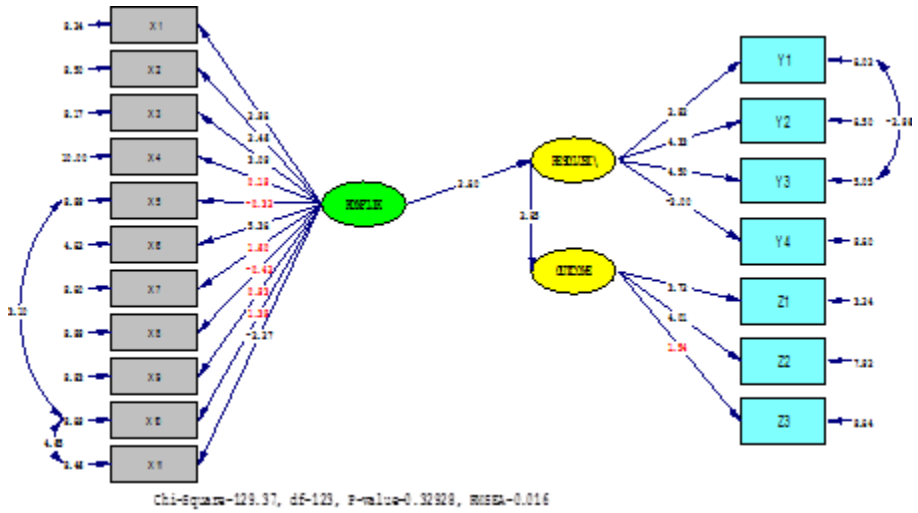

Figure 2 : Structural equation modeling showed-calculated value

Factors causing conflict in South Kalimantan caused by the interaction of several factors. This is consistent with research Walter (2000) who pointed out that the conflict is not only caused by a single factor but a combination or accumulation of various factors that cause conflict. The results Bennett (2004) also stated that the cause of the conflict variables can be derived from three-dimensional variables, namely actors, resource conditions and environmental conditions. Additionally reinforced by research Boediono (2005) which states that the cause of the conflict consists of one or a combination of several variables causes of conflict.

The first factor is influential as a factor of conflict is Competition. Competition is the greatest indicator of the effect as the cause of conflict fishing in the waters of

South Kalimantan. Competition in this study is a resource dimension. Competition is closely linked to community activities, such as competition in the use of fishing gear and fishing ground scramble.

Competition in the utilization of fishery resources also relates to the behavior of fishers in the operation of fishing gear. The existence of different fishing gear or have a higher technology tends to be considered a contender for the local fishermen. For example, the presence of purse seine fishing using lights, cantrang fishing with high technology and the hunting of sea cucumber fishing using compressor. The presence of such a device believed to be a competitor and a very deplete water resources. This is consistent with Dahuri et al. (1996) which states use conflicts occur due to multiple competing resource users to use the same resource in the same sea space, and implement activities that take advantage of the resources that do not fit with the others.Lasut and Kumurur (2001) also found that competition among users for the same land or facilities may lead to conflict among users. Other researchers also said the same thing, In (Cincin-Sain and Knecht 1998) conflict generally occurs due to several reasons such as the area of competition, resource competition, or competition over resources that are interrelated. Neither the Warner (2000) identified four things that can explain the emergence of conflicts over natural resources, such as natural resource competition (increased dependence on natural resources can increase competition).

The second, factor influencing the conflict factor is is the opposition. The opposition in this study include the actor dimension. In this case opposition occured where many parties who have direct or indirect interests in fisheries resources. The opposition is due to the policies that are inconsistent, as happened in the case of fishing ground. In that case, a group of fishermen who joined INSAN (Saijaan Fishermen Association) does not support the division of fishing areas.

The third, factor influencing the conflict is economic condition. The economic condition of the people in this regard include the environmental dimension. Perceptions of economic conditions of fishing communities is the trigger conflict fishing. Poverty and high dependence on coastal and marine resources often leads to people engage in activities that degrade the quality of resources

Differences in economic conditions of fishermen in South Kalimantan look at the difference fisheries conducted consisting of traditional fishermen, as well as the spring and modern social classes in fishing communities. The differences seen in the fishing equipment (boats, nets, and other equipment), differences in the level of capital investment scale its business, as well as the level of technology used fishing equipment. Fishing gear is used including gillnet, purse seine, charts and so on. This condition has the potential to increase the scale of exploitation of marine resources. As stated Nikijuluw (2002) that the majority of people living in coastal areas are poor, this is caused by the limited ability and knowledge, limited access to capital, technology, information, and market and community involvement in decision-making and resource allocation coastal islands small island. This condition, also has the potential for exploitation by irresponsible fishing.

Further influencing factors as causes of the conflict is an actor. The extent of the parties involved regarding the characteristics of individuals and groups. Increasingly diverse character of the individual in a region increasingly lead to conflict. These differences are d to individual expertise, the agreement to a group, individuals in the group as well as the strength of social relationships.

Finally, the influencing factors as the cause of the conflict is cultural. Culture negative effect as a cause of conflict. Thus the smaller the difference in cultural background of the community, the greater the likelihood of conflict. This is understandable because of cultural differences in coastal communities in South Kalimantan has become part of life of coastal communities. As in Tanah Bumbu regency has several ethnic groups. Based on the history since the 17th century. Bugis tribes borrowed land in the Coastal South Kalimantan, later founded the kingdom Pagatan. Until now many coastal areas of ethnic people from Bugis, Mandar, Bajau, Banjar, Java, Madura and Bali.

b) Effectiveness of Conflict Resolution in Water Resource Management

Conflict resolution techniques performed in South Kalimantan consists of litigation, negotiation, facilitation and avoidance. By passing tenik right and appropriate to the needs of the completion of the case, the results are significantly influenced the development of fisheries. In this case an increase in community participation in fisheries management and resource sustainability.

Referring to tructural equation modeling analysis showed that the greatest indicator of contribution is facilitation, conflict resolution techniques thus best suited to study the causes of conflict in the region is facilitated. This is consistent with Koesno (1979) which says that the characteristics of Indonesian society that prefers harmony and cooperation, an important prerequisite for the successful use of Alternative Dispute Resolution techniques. It is also evident that the use of conflict resolution techniques correlated significantly with outcome variables especially community participation in fisheries management and resource sustainability.

In the case of conflict andon fishermen using purse seine and conflicts taking trepang and pearl oysters. Occurred among fishermen in South Kalimantan with Central Java, including the fishermen

inter-provincial scale. So done with the involvement of government (Figure 3). Based on Figure 3 shows the relationship between the conflicting parties and involves a lot of facilitators. In this case the facilitator will help create a climate for problem solving and help frame the issue so that it can be solved. Facilitators can also suggest formatting options or procedures to help the group work more effectively.

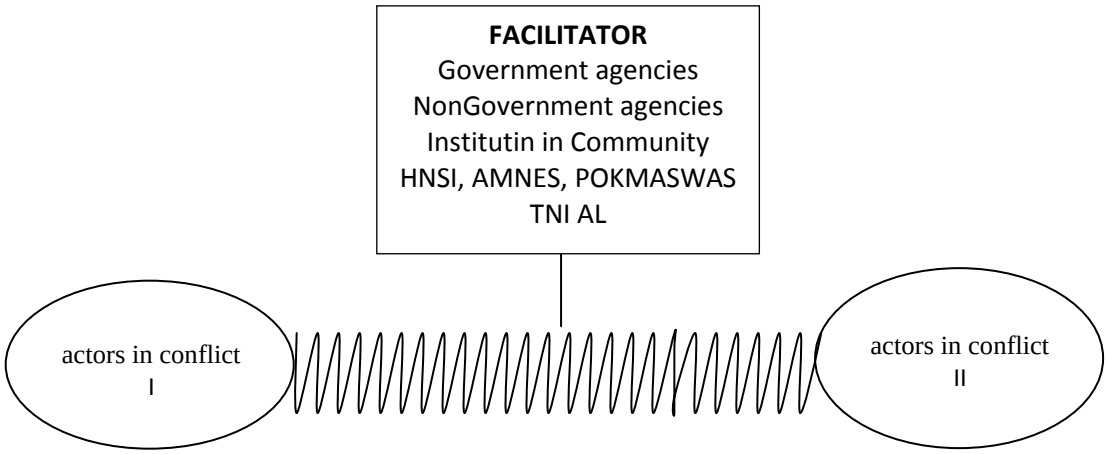

Figure 3 : Relationship between the stakeholders in the process of conflict resolution

Facilitation techniques performed by qualified facilitators just as mediator, should not affect decisions made. The deal is expected to reach a state of "continuous agreement (durable settlement). In order to achieve a durable settlement to the conditions according to Lincoln (1986) there are three (3) things that have to be considered, namely: (1) substantive interest, namely: content need, funds, time, materials and resources (2) procedural interest, namely the need and certain behavior or the way something can be resolved (3) relationship or phsychological interest, namely the requirement refers to one's feelings, how one is treated and preconditions for creating an ongoing relationship.

In the context of water resource management in South Kalimantan, the government can do with policy attention Influential factors as causes of conflict. Then conducting conflict resolution should be prudent and careful in using resolution techniques, because these techniques certainly have their advantages and disadvantages. To respond to this, and before approving a method of conflict resolution, the local communities need to prepare as well as possible. In this case one of the effective ways is organizing.

Malik et al. 2003 states that the organizing, the parties involved can learn from each other. On the one hand, the outsiders can learn from the experiences of local community issues or problems other communities. Organizing goal is to integrate the funds, manpower, knowledge, experience, technique and strategy between the local community with the care oursiders efforts on natural resource conflict resolution.

IV. Conclusion

1. Factors that cause water resource conflicts in South Kalimantan is the competition in the presence of resource use are contradictory, the economic conditions, many at least the parties involved as well as the cultural background.
2. Conflict resolution that has the largest and most significant contribution to public participation in fisheries management and resource sustainability is influential in the use of facilitation techniques.

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Agronomic Characteristics of Dihaploid Lines of Oriental Tobacco Obtained *in Vitro*

By Gordana Miceska
Tobacco Institute Prilep, Rebublic of Macedonija

Summary - One of the most frequently used biotechnical methods today is the method of double haploids. By application of induced androgenesis in the in vitro Laboratory of Tobacco Institute - Prilep 10 dihaploid lines of oriental tobacco were obtained in 2004. For assessment of agronomic characteristics of the dihaploid lines and their analogues (P 146-7/1, Yk 301/23 and Hyb. 301/H), in the course of 2005 and 2006 three haploid lines were set up in field conditions (P 146- 7/1 DH, Yk 301/23 DH and Hyb. 301/H DH) and investigations were made of the number of leaves and plant yield per hectare. With reference to the characteristic number of leaves, dihaploid lines showed a signifi cantly low variational coefficient (CV = 1.75, 2.96: 4.70 %) compared to their analogues, which indicated that they were morphologically stable. According to their agronomic characteristic (g/plant and kg/ha), they were somewhat better or equal to those of their analogues.

Keywords : *oriental, tobacco, dihaploids, in vitro, androgenesis.*

GJSFR-D Classification : *FOR Code: 820305, 079999*

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Keywords : oriental, tobacco, dihaploids, in vitro, androgenesis.

I. Introduction

The method of double haploids is one of the most frequently implemented biotechnical methods today. Guenter Setz (Burchet, 2004) said: "If induction of hybrids was the biggest event in selection and the use of glass houses the second biggest, technology of double haploids will be the third one".

The basic aim of this method is to reduce the breeding process in field conditions, where the process of self pollination and selection continues as long as uniformity of the varieties is achieved and until 100 % of them become homozygous. These varieties are comparable with standard varieties. It takes nine to 11 years to standardize some variety or to release a new one (Patrascu and Ioan, 1984). Namely, in reductional division of sex cells, cells with unique inherited information are developed, i.e. even in the first generations decomposition of hybrid in dihaploid lines occurs, but by doubling the genome of each haploid, the dihaploids obtained differ from their parental forms in some morphological and agronomic characteristics (Dimitrova, 1991). Yet, each dihaploid progeny is homozigous. Some authors reported that dihaploid lines achieved higher yields compared to their analogues (Zagorska et al, 1978) and the others (Arcia et al., 1978; Deaton et al., 1986) consider that dihapoid lines are less productive. Variation in yield and quality of dihaploid lines can depend greatly on the initial genotype (Deaton et al., 1982).

The aim of this paper was to study the yield characteristics of dihaploid lines of oriental tobacco, in direct creation of new tobacco varieties, and also to confirm the application of induced androgenesis depending on the aims of selection in obtaining the homozigous dihaploid lines.

II. Materials and Methods

Estimation of dihaploid progenies in the period 2005 - 2006 in field conditions was made in Tobacco Institute - Prilep. The trial was designed as randomized block with four replications and it included three dihaploid oriental tobacco lines (P 146-7/1 DH, Yk 301/23 DH and Hyb.301/N DH) and their analogues. Results on agronomic characteristics of the investigated dihaploid lines and their analogues were statistically processed using LSD test analysis of variance (Najčeska, 2002) The main plot size was 1.87 m^2.

Dihaploidization was made by direct organogenesis of haploid plants, using the method of tissue culture (meristems, leaf segments 0.5 cm in size), on Murashige and Scoog (1962) nutrient medium, modified for direct organogenesis and optimized with various chemical substances: casein hydrolyzate - 1 mg/l; L-glutamine – 250 mg/l; glicine 200 mg/l; IAA-0.2 mg/l; BAP - 0.5 mg/l; adenine-20 mg/l; kinetine-3 mg/l and myoinosite-100 mg/l. The first progenies were grown in Biological laboratory in vegetative broth 3:1 (perlite:soil) up to obtaining seed material.

III. Results and Discussion

a) Morphological Properties

One of the most important tasks of selection is to increase the varieties yield. Knowledge of the genetic control of yield and of the factors that influence its variability in tobacco plant is essential for creation of new varieties with optimum yield (Dimitrova, 1991). By

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the methods of androgenesis and meristems culture (organogenesis and rhizogenesis) applied in *in vitro* laboratory of Tobacco Institute-Prilep, we obtained several dihaploid lines of oriental tobaccos 'Prilep' and 'Yaka', investigated in field conditions during 2005-2006.

Phenological investigations showed uniformity of dihaploid lines for the characteristic height of the plant with inflorescence and number of leaves per plant (Table 1).

Table 1 : Morphological properties

Varieties Lines	Height of the plant with inflorescence, cm			Leaf number per plant, cm		
	0	δ±Sδ	CV %	0	δ±Sδ	CV %
P 146–7/1Ø	71.4	2.21±0.60	3.81	46.35	1.10±0.22	2.38
P146–7/1DH	67.05	1.33±0.30	2.14	46.65	1.21±0.27	2.57
Yk.l.301/23 Ø	122.50	5.91±1.32	5.09	50.40	3.02±0.72	5.93
Yk.l.301/23DH	126.60	5.96±1.33	4.91	47.30	1.88±0.42	3.94
Hyb.301/N Ø	74.10	1.68±0.37	2.22	35.3	0.98±0.22	2.79
Hyb.301/N DH	71.35	1.24±0.36	2.64	48.9	0.58±0.12	1.53

0 – aritmetical means (cm); δ – standard deviation; Sδ – standard deviation error; CV – variational coefficient %

Investigations in 2005-2006 showed that variation of plant height was lower in dihaploid lines, compared to their analogues, and the coeffi cient of variation averaged from 2.14 % (P146- 7/1 DH) to 5.09 % (Yk.l 301/23 Ø). For the character leaf number per plant, all dihaploid lines also showed lower coefficient of variation compared to their analogues.

Our investigation is in agreement with those of Dimitrova (1991) and Enčeva et al. (2000) who reported lower coefficient of variation in dihaploid lines compared to their analogues, showing signifi cant uniformity in relation to these characters.

Dry tobacco yield in dihaploid lines ranged 18.26 g/plant and 3010 kg/ha (P 146-7/1 DH and Hyb. 301/H Ø) to 21.90 g/plant and 3610 kg/ha (Yk.l. 301/23 Ø). According to this, the dihaploid line Hyb. 301/N DH achieved 14.62 % higher yield per plant and hectare compared to its analogue Hyb. 301/H Ø (18.26 g/plant; 3010 kg/ha), i.e. statistically signifi - cant diff erence of 1 % (Tables 2 and 3). Both dihaploid lines P 146-7/1 and Yk. l. 301/23 gave lower yields compared to their analogues.

Many authors reported that yields of dihaploid lines vary depending on whether they originate from the same haploid or from diff erent ones (Arcia et al., 1978; Deaton et al., 1986; Šmalcelj and Ćurković Perica, 2000).

Berbeć and Laskowska (2003) reported that some dihaploid lines of the variety Wiślica have higher yields and some of them lower yields, compared to their analogues.

Table 2 : Dry tobacco yield, g/plant

Varieties Lines	Years		Average	Difference from the control	
	2005	2006		Absolute	Relative
P 146–7/1Ø	17.12	25.05	21.08	–	100.00
P146–7/1DH	15.29	21.23	18.26	–2.82	86.62
Yk.l.301/23 Ø	19.67	24.13	21.90	–	100.00
Yk.l.301/23DH	19.32	22.54	20.93	–0.97	95.57
Hyb.301/N Ø	18.64	17.89	18.26	–	100.00
Hyb.301/N DH	21.01^{++}	20.85^{++}	20.93	+2.67	114.62
LSD 5%	1.42^{++}	2.13^{+}			
LSD 1%	1.97^{++}	2.95^{++}			

Table 3 : Dry tobacco yield, kg/ha

Varieties Lines	Years		Average	Difference from the control	
	2005	2006		Absolute	Relative
P 146–7/1Ø	2822	4129	3475	–	100.00
P146–7/1DH	2521	3499	3010	–465	86.62
Yk.l.301/23 Ø	3243	3978	3610	–	100.00
Yk.l.301/23DH	3185	3716	3450	–160	95.57
Hyb.301/N Ø	3072	2949	3010	–	100.00
Hyb.301/N DH	3464^{++}	3437^{++}	3450	+440	114.62
LSD 5%	86.11^{+}	351.98^{+}			
LSD 1%	119.30^{++}	487.65^{++}			

Table 4 : Percentage of high grades (I and II), %

Varieties Lines	Years		Average	Difference from the control	
	2005	2006		Absolute	Relative
P 146–7/1Ø	43.48	16.60	30.04	–	100.00
P146–7/1DH	47.66	17.65	32.65	+2.61	108.69
Yk.l.301/23 Ø	0.00	2.16	1.08	–	100.00
Yk.l.301/23DH	5.36	5.08	5.22	+4.14	483.33
Hyb.301/N Ø	4.59	14.81	9.70	–	100.00
Hyb.301/N DH	0.00	21.54	10.77	1.07	111.03

Table 5 : Average purchase price, € /kg

Varieties Lines	Years		Average	Difference from the control	
	2005	2006		Absolute	Relative
P 146–7/1Ø	1.95	1.71	1.83	–	100.00
P146–7/1DH	2.04	1.61	1.82	–0.01	99.71
Yk.l.301/23 Ø	1.69	1.48	1.58	–	100.00
Yk.l.301/23DH	1.70	1.52	1.61	+0.43	101.32
Hyb.301/N Ø	1.67	1.63	1.65	–	100.00
Hyb.301/N DH	1.63	1.67	1.65	0.00	100.00

In relation to quality, it can be stated that the investigated dihaploid lines of oriental tobacco had higher quality compared to their analogues. The higher grades percentage ranged from 1.08 % (Yk.l.301/23 Ø) to 32.65 % (P 146-7/1 DH) (Table 4). Accordingly, dihaploid lines quality was better for 8.69 % (P 146-7/1 DH), 383.33 % (Yk.l. 301/23 DH) and 11.03 % (Hyb.301/N DH), compared to their analogues.

Average purchase price varies from 1.58 €/kg for Yk l. 301/23 Ø to 1.83 €/kg for P 146-7/1 Ø. All investigated lines have lower values for this parameter

compared to their analogues, except for the variety Yk.l. 301/23 DH with 1.61 €/ kg, which is 1.32 % higher than its analogue Yk.l. 301/23 Ø.

Table 6 : Economic eff ect, € /ha

Varieties Lines	Years		Average	Difference from the control	
	2005	2006		Absolute	Relative
P 146–7/1Ø	5494.30	7068.30	6278.70	–	100.00
P146–7/1DH	5073.20	5646.30	5359.70	–919.00	85.36
Yk.l.301/23 Ø	5496.10	5900.10	5700.80	–	100.00
Yk.l.301/23DH	5388.80	5623.50	5506.10	–194.70	96.58
Hyb.301/N Ø	5011.20	4808.50	4909.80	–	100.00
Hyb.301/N DH	5800.10^{++}	5754.00^{++}	5777.00	+867.20	117.66
LSD 5%	140.02^{+}	577.19^{+}			
LSD 1%	193.89^{++}	799.66^{++}			

A part from the line Hyb.301/N DH, all dihaploid lines of investigated tobacco varieties, showed lower economic effect compared to their analogues. Economic effect of Hyb.301/N DH was 17.66 % higher compared to its analogue Hyb.301/H Ø, which is statistical difference of 1 %. This data was confirmed with the investigations of Deaton (1982), who reported that genotype from which dihaploid lines came signify-cantly affected their yield variability and their quality level.

III. Conclusions

Based on the data obtained during our investigations, compared to those from the literature, the following conclusions can be drawn:

- The obtained dihaploid progenies with uniform morphological characteristics present an initial material for further investigations in breeding.
- Some of the investigated dihaploid lines (Hyb. 301/N DH) gave higher yields per stalk and per hectare for even 14.2 % compared to their analogues and they also achieved better quality.
- Biochemical methods (plant tissue culture and androgenesis) can be successfully applied in breeding programs for oriental tobaccos, in creation of new, superior homozygous lines.

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Application of Game Theory to Cocoa Production Management Systems in Ondo State, Nigeria

By Oluyole K. A., Yusuf S. A. & Alao T. K.
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Abstract - Cocoa production is susceptible to a number of risks such as unavailability of enough land, unavailability of agro-chemicals, variation in product prices and a host of others. This study utilized game theory to determine the cocoa production management system which maximizes the income of farmers under risks. Data on cocoa production were collected from a random sample of 200 farmers practicing the three cocoa production management systems viz: Owner management system, Lease management system as well as Sharecropped management system. The games were constructed based on the income per hectare obtained from each of the three management systems. Maximax and Maximin criteria of game theory were used in the analysis. The Maximax criterion showed that the best management system to practice by cocoa farmers was Sharecropped management system (Income per hectare of ₦214,847) while the result of the Maximin showed that the best management system was Owner management system (Income per hectare of ₦92,463). The study therefore recommended for optimistic farmers to practice Sharecropped management system while Owner management system is recommended for pessimistic farmers.

Keywords : *cocoa production, game theory, agro-chemicals, management systems, decision criteria.*

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Abstract - Cocoa production is susceptible to a number of risks such as unavailability of enough land, unavailability of agro-chemicals, variation in product prices and a host of others. This study utilized game theory to determine the cocoa production management system which maximizes the income of farmers under risks. Data on cocoa production were collected from a random sample of 200 farmers practicing the three cocoa production management systems viz: Owner management system, Lease management system as well as Sharecropped management system. The games were constructed based on the income per hectare obtained from each of the three management systems. Maximax and Maximin criteria of game theory were used in the analysis. The Maximax criterion showed that the best management system to practice by cocoa farmers was Sharecropped management system (Income per hectare of ₦214,847) while the result of the Maximin showed that the best management system was Owner management system (Income per hectare of ₦92,463). The study therefore recommended for optimistic farmers to practice Sharecropped management system while Owner management system is recommended for pessimistic farmers.

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I. Introduction

Agricultural production is the mainstay of the Nigerian economy; considering the fact that over 80 percent of the economically active populations are involved in agricultural production and that over 90 percent of the food consumed in the country is from the local agricultural production. It is the second largest earner of foreign exchange; next to the petroleum sector, and also it provides a ready market for industrial products (Ayanwale, 2002). The main agricultural sub-sector which contributes immensely to Nigeria's GDP is cocoa. Cocoa contributes about 15% to the total Nigerian export in 1970 (Adebile and Amusan, 2011). Cocoa which belongs to the family *Steruliacaea* and genus *Theobroma* was discovered in 18th century at the Amazon basin and later spread to other tropical areas of South and Central America, and West Africa (Opeke 1987). Since the end of the first world war, West Africa has been the highest producer of cocoa. The crop was eventually introduced into Nigeria in 1887 (Ayorinde 1966). Nigeria as a developing country was rated the second largest world producer of cocoa in the 1960s (Adegbola and Abe, 1983), and, for a long time, the crop has been generating substantial foreign exchange earnings for the country. However, the production of this important cash crop for export has suffered a reduction in the recent years in the country owing to a number of factors. Villalobos (1989) identified some of these factors as: low yield, inconsistent production patterns, disease incidence, pest attack and use of simple farm tools. In addition, Oduwole (2004) identified ageing cocoa farms as one of the factors responsible for the decline in cocoa production in south western Nigeria. He observed that many farms were over 40 years old and such farms constitute as much as 60% of the cocoa farms in Nigeria. However, in a study conducted by Daramola *et al*. (2003), it was found that most cocoa farms in Ondo and Osun states are very old with low productivity. Government in her effort to curb these problems has introduced some policies aiming at resuscitating cocoa production in Nigeria. One and perhaps the most recent policy is the establishment of National Cocoa Development Committee (NCDC). The committee is saddled with the responsibility of increasing cocoa output in Nigeria.

According to Nkang *et al*, (2009), there are three cocoa production management systems. These are Owner-managed farms, Lease-managed farms and Sharecropped farms. These management systems are practiced across all cocoa producing regions in Nigeria. One fundamental issue is the approach to the understanding of how different farm management systems have implications on cocoa production. For this reason and other reasons, the theory of games has been utilised to analyse cocoa production management systems especially in this study. Game theory is a situation where outcomes depend on the behaviour of all competitors (Gough and Hill 1979). Game theory is a probabilistic model which as already mentioned is used in analyzing, and driving rules for making decisions when two or more people are competing for some objectives. Game theory attempts to look at the relationships between participants in a particular model

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and predict their optimal decisions (Investopedia, 2010). According to Wikipedia (2010), economists and business professors suggest two primary use of game theory: *descriptive* and *prescriptive*. In the descriptive use, game theory has been used to study a wide variety of human and animal behaviors; thus when finding the equilibrium of games we can predict how actual human prediction can be understood. One frequently cited example of descriptive use of game theory is the Nash equilibrium (Investopedia, 2010). In the prescriptive (normative) use, game theory has also been used to attempt to develop theories of ethical or normative behavior. That is, an attempt to look at economic and human practices as they ought to be, talking about judgment and looking at what is right and what is wrong. One frequently cited example of descriptive use of game theory is the prisoner's dilemma (Investopedia, 2010). Game theory bridges mathematics, statistics, economics, and psychology to model conflict between two or more rational decision-makers.

Game theory was developed in 1953 by John Von Newmann (Mathematician) and Oskar Morgenstem (Mathematical Economist), and was greatly in use then in the field of Economics (Oziegbe, 2011). According to the empirical studies by Gough *et al*. 1991, game theory is being used with low frequency by corporate managers in the developed countries. On the other hand, from the surveys in underdeveloped country like Nigeria, corporate managers do not use the theory at all; moreover, most of the managers have little or no idea about the technique (Oziegbe, 2011).

Game theory is a theory of rational behavior for interactive decision problems. In a game, several agents strive to maximize their expected utility index by chosen particular courses of action and each agent final utility payoffs depend on the profile of courses of action chosen by all agents. The interactive situation, specified by the set of participants, the possible courses of actions of each agent and the set of all possible utility payoffs, is called a game; the agents playing a game are called the players (Fudenberg and Tirole, 1991.)

Agricultural productions are risky activities. These risks can be caused by production, market, credit etc. (Ferdosi, 1995). Some policies have been made to reduce the risk in traditional practices and support programmes by farmers and government such as diversification, rotation, price stabilization, crop insurance as well as delivery contracts (Ferdosi, 1995; Martin, 1997; Mishra and Perry, 1999; Olesen, 2003). If producers wants to maximize their profits, they have to accept the risk of production and marketing process. Growers must take risks if they are to have any chance of obtaining profit. It is not possible for a management strategy to be potentially profitable and free from risk. Growers must balance the risks of loss against the potential for profit among alternative management strategies. Farmers have to manage risk and uncertainty. In these structures, management of farms has become more important than in previous years. The main objective of this paper, therefore, is to discuss some of the various ways in which the choice of farm management systems can influence the effective and efficient cocoa production through the use of the game theory.

II. Methodology

a) Study Area

The study was conducted in Ondo State. The state is one of the thirty-six states in Nigeria and was carved out of the old Western State in 1976. Ekiti state was carved out of the state in 1996. Ondo State has a land area of 14,769Km$^{2.}$ Going by 2006 census, the state has a population of 3,441,024million. There are eighteen Local Government Areas (LGAs) in Ondo state. Out of these, fifteen Local Government Areas produce cocoa. The occupation of the inhabitants of the State is predominantly farming. Ondo State is the highest cocoa producing State in Nigeria (Ojo, 2003). Geographically, Ondo state is located in south west of Nigeria between Longitude 4.30^{o}E and 6.00^{o}E of the Greenwich and Latitude 5^{o}45^{1} and 8^{0}15^{1} of the equator. Kogi and Ekiti states bounded the State to the North; Edo and Delta States in the East; Ogun and Osun States in the west and Atlantic Ocean in the south. With respect to the climate, it is tropical with two distinct seasons of rainy and dry season in the state. The rainy season occurs between April and October, while the dry season begins in November and last till April. Although in recent times, minor alterations are noticeable in rainfall regimes due to global climatic change. The state is blessed with a moderate year temperature of around 25^{o}C. Annual rainfall varies from 2000mm in the southern part to 1,150mm in the Northern extremes (Ondo state, 2003).

b) Data Collection

The study employed stratified random sampling technique for the selection of its respondents. There was random selection of four notable cocoa producing Local Government Areas (LGAs) out of a total of fifteen cocoa producing LGAs in the state. The selected LGAs included two high cocoa producing LGAs (Idanre and Ondo East) and two low cocoa producing LGAs (Akoko South East and Akoko North West). The classification is in accordance with Cocoa Research Institute of Nigeria classification of the cocoa producing LGAs in the state and is based on the quantity of cocoa beans being produced by each LGA. From each of the four selected LGAs, there was random selection of two communities while the respondent households were randomly selected from the selected communities. However, from the eight communities, a total of two hundred respondent households were randomly selected. Meanwhile, the two hundred respondents cut across the three cocoa production management systems in the

study area viz: Owner management system, Lease management system and Sharecropped management system. The number of samples taken from each community depended on the entire population of cocoa farming households in the communities. Hence, the sampling was carried out proportionate to size.

High cocoa producing LGAs are the LGAs where the substantial proportion of cocoa produce in the State comes from and as such there are some good conditions favouring the production of cocoa in the area. These conditions include more available land for cocoa production, availability of agro-chemicals and increase in product price. However, low cocoa producing LGAs are the LGAs where a little proportion of cocoa produced in the State comes from. This is due to the fact that the conditions of cocoa production in the area are not favourable. These conditions include less available land for cocoa production (because the cocoa farmers in the LGAs devotes the substantial proportion of their land for food crop production), unavailability of agro-chemicals and decrease in product price.

For each of cocoa production management systems, the highest and lowest income per hectare was calculated under good and bad conditions. Following Sahin *et al,* (2009), successful production situation represented a good condition where there is more available land for cocoa production, availability of agro-chemicals and increase in product price. On the other hand, unsuccessful production situation represented a bad condition where there is less available land for cocoa production, unavailability of agro-chemicals and decrease in product price.

c) Decision Criteria

In game theory, there are different criteria for which decision can be taken. Some of these include maximax criterion, maximin (Wald's) criterion, Laplace criterion, Hurwicz's criterion and Salvage regret criterion (Burhan and Handan, 2001). Each criterion requires different strategies. However, in this study, two criteria will be considered, these are maximax criterion and maximin (Wald's) criterion.

d) Maximax Criterion

The maximax criterion indicates that the decision-maker should choose the alternative which maximizes the maximum value of the outcome. This optimistic approach implies that the decision-maker should assume the best of all possible worlds (Business Dictionary, 2011).

e) Wald's (maximin) Criterion

According to the maximin criterion, the players tries to choose "the best of the worst". The player in this study is farmer. This means that the farmer selects the management system which will maximise his minimum income. This strategy gives the farmer maximum security. The reasons behind this strategy for the farmer can be several. The farmer has only small equity in his farm; he has large and different family responsibilities and so on. If the farmer pursues the maximin strategy he can be regarded as a pessimist or an ultra careful (Barnard and Nix, 1979).

Table 1 : Strategies of players which represent production conditions

Strategies	Characteristics of production conditions
Good conditions	-More available land for cocoa production -Availability of agro-chemicals -Increase in product price
Bad conditions	-Less available land for cocoa production -Unavailability of agro-chemicals -Decrease in product price

III. Results and Discussion

a) Maximax Criterion

Considering the Maximax criterion, the farmer is optimistic about production, availability of land and pricing conditions. An optimistic farmer will therefore adopt Sharecropped management system. Share-cropped management system had the highest average income per hectare of N214,847 in good conditions. This is followed by Owner management system with N168,000 (Table 2).

Optimists prefer the adoption of Sharecropped management system might be due to the fact that the management system is a joint management system. Under the Sharecropped management system, a farm is jointly managed by the original owner of the farm and the sharecropper. The owner of the farm provides the agro-chemical input needed for the farm while the sharecropper provides the labour input. The proceeds from the farm is shared between the owner of the farm and the sharecropper in certain proportion. Hence, the fact that the resources to maintain the farm managed by sharecropped management system come from different sources enables the farm to be properly managed and hence enabling the system to have more income per hectare than the other management systems thus

making the optimists to prefer the management system. Another advantage of sharecropped management system is that in case of crop failure, the loss is shared by the two parties instead of it being borne by an individual. Sharecropped system of farm management is a means by which the State (Ondo) can provide job for the people from other parts of the country since sharecroppers are mostly from the Southern or Southeastern part of the country. However, the greatest disadvantage of Sharecropped management system is that sole decision on the farm can not be taken. Any major decision on the farm has to be jointly agreed upon by the two parties.

b) Maximin (Wald's) Criterion

According to the Wald's criterion, the player (which is farmer in this case) tries to choose the best of the worst. Table 2 shows that the highest income per hectare under bad condition is obtained from owner management system with N92,463 per hectare. The farmer is regarded as a pessimist based on this criterion. This means that the farmer selects the management system that will maximize his minimum income. The strategy gives the farmer maximum security. Owner management system of cocoa production might however be preferred by the pessimists due to the fact that under the system, the farmer gets a full control of the farm. There is no need to consult anybody before a decision on the farm is taken. Also, under owner management system, the proceeds from the farm does not need to be shared with anybody. The whole proceeds belongs to the owner of the farm. However, one of the disadvantages of the system is that the whole cost of maintaining the farm is borne by the owner of the farm. Hence the owner provides the cost of agro-chemicals as well as the cost of labour. Also, the owner of the farm solely bears the risk of the farm. The risks may include crop failure as a result of bad weather or the incidence of fire outbreak on the farm.

Table 2 : Game theory results for cocoa farmers

Criteria	Income per hectare (N)	Preferred management system
Maximax	214,847	Sharecropped management system
Minimax	92,463	Owner management system

Source: Field survey, 2011.

The decision criteria used in the study are maximax and minimax. These were used to take decision on the best cocoa production management systems to be chosen by the optimistic and pessimistic farmers. Based on the result of the findings, the optimistic farmer will choose sharecropped management system while pessimistic farmer will choose owner management system. This is due to the fact that optimistic farmers are not risk averse while pessimistic farmers are risk averse in nature.

IV. Conclusion

Decision criteria used in the study are maximax and maximin criteria. Optimistic farmer will adopt sharecropped management system while pessimistic farmers will adopt owner management system on the farm. This is due to the fact that optimistic farmers are not risk averse while pessimistic farmers are risk averse in nature.

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Leaching of Nutrients in *Luvisol* as Affected by Catch Crops and Straw

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Keywords : *lysimeter; leaching; catch crops; straw; leaching; nitrogen; potassium; calcium, c_{org}.*

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Leaching of Nutrients in *Luvisol* as Affected by Catch Crops and Straw

Liudmila Tripolskaja [α], Colin A. Booth [σ] & Michael A. Fullen [ρ]

Abstract - The aim of this work was to determine the impact of green manure (Trifolium pratense L, Raphanus sativus var. oleiformis L.) and barley (Hordeum vulgare L.) straw on filtration of precipitation and leaching of chemical elements (N, K, Ca, C_{org}) in Haplic Luvisol. The lysimetric data during 1987–2008 was used in the study. Lysimetric equipment surface area was 1.75 m^2; the test soil layer is 0.60 m.Catch crops reduce precipitation filtration by 7.0-8.3 % on average. Insertion in autumn of straw and catch crops increases the concentration of N, Ca and K and C_{org} in lysimeter waters. Substantial increase in concentration takes place mostly during the first months after insertion and in warm and rainy autumn period. Due to lower precipitation of catch crops the loss of Ca and K, as compared with unfertilized soil, did not substantially increase, and the C_{org} decreased from 10.6 to 8.3-8.5 kg ha^{-1} TOC.

Keywords : lysimeter; leaching; catch crops; straw; leaching; nitrogen; potassium; calcium, c_{org}.

I. Introduction

About 40 % of the farmland in Lithuania are light textured soils, and fertilization with a variety of organic fertilizers is necessary to maintain their productivity. Currently green manure crops are being extensively used as the source of organic matter. However, due to favourable conditions for decomposition of organic matter and surplus moisture content, resulting in the percolative soil moisture regime, part of the mineral elements released from the green manure may be leached into groundwater and adversely affect its chemical composition (Kutra et. al., 2006; Strusevičius et. al., 2009; Adomaitis et. al., 2010; Baigys, 2010). In order to reduce the nutrient leaching after autumn crop harvest, in Lithuania various catch crops are cultivated for green manure. According to the soil characteristics and hydrothermal conditions of autumn, the following plants are considered most suitable for cultivation: fodder radish, spring rape, red clover, orchard grass (Nedzinskas, Nedzinskienė, 1999; Arlauskienė, Maikštienienė, 2008).

Nutrient leaching losses are associated not only with the agrarian use of soils, but also with climatic factors – amount of precipitation and air temperature. The mean annual amount of precipitation on the territory of Lithuanian is 681 mm, the mean annual air temperature is 6.2 °C; that creates the conditions for filtration of atmospheric precipitation and consequent leaching of chemical components from the arable soil layer (Galvonaitė et. al., 2007). Meteorological data of the past decades (1993–2003) indicate the tendencies of climate warming: average annual air temperature increased by 0.1–0.9 °C. The most evident increase is observed in late autumn and spring temperatures; the number of days with below zero temperatures decreased (Galvonaitė, Valiukas, 2005). Longer autumn and spring periods have a positive impact as well because it allows growing more catch crops for green manure and using them to improve soil fertility. However, plant selection and cultivation technologies must be based not only on their impact on soil in supplementing it with organic matter and nutrients but also on the impact produced on the leaching of chemical elements.

The aim of this work was to determine the impact of green manure (clover, fodder radish) and barley straw on filtration of precipitation, plant nutrition and leaching of chemical elements (N, K, Ca, C_{org}), which influence the soil agrochemical properties.

II. Materials and Methods

Experiments were performed at the Vokė Branch of the Lithuanian Research Centre for Agriculture and Forestry (54°37´ N, 25°08´ E) in 2002–2008. Lysimetric equipment consists of a cylindrical concrete structure with a surface area of 1.75 m^2, the test soil layer is 0.60 m (corresponding to the drainage depth). Lysimeters are filled with typical soil of Southeastern Lithuania – sandy loam *Haplic Luvisol (LVh)*. Agrochemical characteristics of the arable layer (0–20 cm) were the following: pH_{KCl} 5.4–5.6, available phosphorus (A-L) – 208–225 mg kg^{-1}, potassium (A-L) – 101–112 mg kg^{-1}, organic carbon (C_{org}) – 0.77–0.80 %. Changes in the leaching of nutrients due to application of green manure and straw were investigated in the segment barley (*Hordeum vulgare* L.) → potato (*Solanum tuberosum* L.). The test was performed in three replications (2002–2003, 2004–2005 and 2006–2007). Testing scheme (variants of organic matter): 1) control variant (without organic matter), 2) barley straw + N_{30}, 3) aftercrop fodder radish for green manure + N_{30} + barley straw, 4) red clover catch crop for green manure + barley straw.

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Barley of the cultivar 'Aura' were sown during the third decade of April, seed rate – 180 kg ha^{-1}. Before sowing the barley, $N_{60}P_{60}K_{60}$ fertilizers were used. Catch crop clover (*Trifolium pratense* L.) sown in spring into the barley crop (variant 4) and aftercrop fodder radish (*Raphanus sativus* var. *oleiformis* L.) sown after barley harvest (variant 3) were used for green manure. Barley straw was chipped to 4–6 cm in length and left on the soil surface, while in lysimeters of the control variant (variant 1) it was removed. In order to obtain larger amount of fodder radish biomass (variant 3), they had been fertilized with N_{30} before sowing. The same nitrogen amount (N_{30}) was used to optimize the processes of straw mineralization in variant 2. In the years following the addition of green manure potato cultivar 'Goda' was cultivated. The potatoes were fertilized with $N_{90}P_{60}K_{90}$.

a) Estimation of the filtration of precipitation and calculation of chemical elements leaching losses

The amounts of filtrate were calculated for separate months, periods of a year (seasons) and years. Season length of spring (March–May), summer (June–August) and autumn (September–November) matched the calendar periods of a year. Estimation of atmospheric precipitation in winter corresponded with the accounts of filtration during this period, i.e. the precipitation amount in December of the current year (n) was summed up with precipitation amount of January and February of the following year (n + 1). Such calculation is based on the temperature regime of winter period, because at temperatures below 0 °C solid precipitation occurs, which takes a liquid form only at positive air temperatures, and the infiltration can start much later than the precipitation occurrence. Thus, the amount of atmospheric precipitation filtrate per year was calculated from 1 March of the current year till 28 February of the following year (12 months); the studies lasted from 1 March, 2002 to 28 February, 2008. Nitrate concentration (NO_3^- mg L^{-1}) in lysimetric water was determined monthly, concentrations of potassium, calcium and organic carbon – once per season. The weighted concentrations of the elements were calculated for separate months, seasons and years. The average concentration was calculated by the formula:

$$K_{average} = (K_1*V_1 + K_2*V_2 + K_3*V_3) / (V_1 + V_2 + V_3),$$

where $K_{1,2,3}$ – concentration of a chemical element in mg L^{-1} in lysimetric water of one lysimeter of a particular variant (1, 2, 3 – replications) over a given period (month, season),

$V_{1,2,3}$ – amount of atmospheric precipitation filtrate in L m^{-2} from one lysimeter of a particular variant over a given period (month, season, year).

The standard deviation (S) of the concentration and coefficient of variation (V %) were calculated.

Elements leaching losses (kg ha^{-1}) were calculated by multiplying the average concentration and the amount of filtrate of a particular period:

$$FN = K_{average} \times F \times 1000000/10000$$

when $K_{average}$ – the average element concentration over a season (year) mg L^{-1}, F – amount of the filtrate L m^{-2}, 1000000 – transfer coefficient from mg to kg; 10000 – transfer coefficient from m^{-2} to ha.

b) Methods of chemical analyses

The amount of total nitrogen was determined employing the Kjeldahl (ISO 11261) method, of nitrates – by colorimetry, of Ca – ISO 7890-86 (atomic absorption), K – LST ISO 9964-3; 1998 (flame emission), C organic – ISO-8245:1999 method.

All experimental data were analysed using Analysis of Variance (ANOVA).

III. Results

a) Biomass yield of catch crop plants and straw

Meteorological conditions during the vegetation season had a significant impact on the yield of barley and other plants grown for green manure. Depending on the applied agro-technical measures and the hydrothermal conditions of a year, the dry matter (DM) yield of barley straw ranged from 0.358 to 0.992 kg m^{-2}, and during the study period (2002–2008) approximately 585 g m^{-2} of DM were added into the soil with the straw (Table 1). Green mass yield of fodder radish very much depended on soil moisture conditions at sowing time and ranged from 102 to 337 kg m^{-2} of DM. Together with barley straw and green mass of fodder radish the soil was supplemented with 766 g m^{-2} of DM. The biomass yield of red clover catch crop was by 22 % on average higher than of fodder radish, but the yield variation was larger – from 0.169 to 0.640 kg m^{-2} of DM. Throughout the study period, higher amount of organic matter (1024 kg m^{-2} DM) was added with green mass of clover catch crop, while the amount added with fodder radish was by 34 % lower (766 kg m^{-2}).

Table 1 : The total amount of green manure and straw biomass as well as biogenic elements added into soil during the study period

Organic matter	Dry matter yield g m^{-2}	*S.D.*	Added with straw and green manure biomass g m^{-2}		
			N	K	C_{org}
Barley straw	585	327	6,2	19,4	234
Fodder radish and straw	766	156	17,4	37,2	306
Undersown red clover and straw	1024	393	26,0	39,0	410

Considerably higher (26.0 g m^{-2}) nitrogen content was added into soil with clover and straw than in case of other fertilization variants. Depending on the hydrothermal conditions during plant vegetation, variation in the content of nitrogen added with green manure was quite high – 52.4 and 85.1 %. Less nitrogen were added into soil with straw than with the green manure crops – an average of 6.2 g m^{-2} over the study period. Potassium accumulation in the biomass of fodder radish and red clover did not differ significantly and was 37.2 and 39.0 g m^{-2} respectively, while in barley straw it was almost twice lower.

Filtration of atmospheric precipitation

During the study period, annual precipitation amount ranged from 607 mm (in 2006) to 785 mm (in 2005). Deviation from the climate normal (681 mm) made 11–15 % respectively (Table 2). Filtration of precipitation depended not only on the precipitation amount, but also on the intensity and plant cover. According to the average survey data, in sandy loam Luvisol 46.4 % of the annual precipitation infiltrated to a depth of 0.60.

Table 2 : The amount of atmospheric precipitation and its infiltration into sandy loam Luvisol

Indicator	*Year*						*Mean*
	2002	2003	2004	2005	2006	2007	
Annual amount of precipitation mm	615	647	724	785	607	722	683
Treatments	*Infiltration of atmospheric precipitation L m^{-2}*						
Without organic fertilisers	199,7	226,8	382,6	348,7	455,2	370,4	330,6
Straw + N_{30}	198,5	212,9	382,4	345,1	430,6	389,4	326,5
Fodder radish + N_{30} + straw	166,7	216,1	353,4	328,8	387,0	367,0	303,2
Red clover + straw	186,2	223,0	311,4	340,8	399,0	383,2	307,3

Analysis of the filtration of precipitation in the course of a year evidently demonstrated that under climatic conditions of Southeastern Lithuania the filtration was higher in spring – approximately 116.6 L m^{-2} or 36.9 % of the annual amount of filtered water percolated then (Fig. 1). During autumn and winter the infiltration slightly decreased and was similar – 72.3 and 83.4 L m^{-2}, or 22.8 and 26.3 % of the annual amount. During the summer period higher amount of precipitation evaporates from the ground or is consumed by plants, therefore only an average of 44.5 L m^{-2} of water percolates through the soil. Sometimes the filtration ceases for the summer. Only abundant atmospheric precipitation over a short period of time, as happened in 2005 and 2007, may significantly increase the filtration in summer. Due to such seasonal dynamics of atmospheric precipitation filtration, the agro-technical measures, which increase the contents of nutritional elements or their availability in soil, should be particularly carefully applied in autumn.

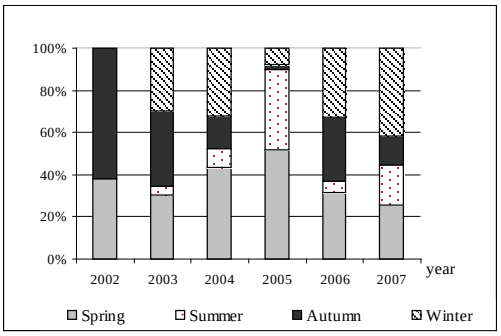

Figure 1 : The distribution of the amount of atmospheric precipitation according to the seasons of the year

Analysis of the effect of catch crops on filtration of precipitation revealed that it was strongest in August–October, i.e. during the vegetation of catch crops. It was determined that catch crops reduced the percolation of precipitation by 7.0–8.3 % per year on average, and in autumn periods of the years of their cultivation – by 21.7–19.4 %. Such a phenomenon is very important in order to reduce nutrient leaching from agricultural land,

especially lately as the duration of autumn period increases.

b) Leaching of Nutriens

Nitrogen (N). Decomposition rate of organic fertilizers and migration of mineralized chemical elements in the soil depend on various factors, but especially on the hydrothermal regime. In leachate of the non-fertilized soil lower concentration of NO_3^- was observed in spring (37.8 mg L^{-1}), while during other seasons it was quite similar (57.2–67.2 mg L^{-1}). The coefficient of variation was quite high – 35.4–95.6 %.

Compared with the control variant, the addition of straw supplemented with mineral nitrogen fertilizers (N_{30}) increased the nitrate concentration in lysimetric water in autumn – by 25.9 mg L^{-1} on average (Fig. 2). Probably, mineral nitrogen (N_{30}), added in order to activate the decomposition of straw, is not immediately incorporated into the biological cycle and, in case of heavy rainfall, part of it migrate into the deeper soil layers. No significant differences ($p>0.05$) in nitrate concentrations compared with the control variants were recorded during other seasons because only small amount of nitrogen got into the soil with straw.

The applied agro-technical measures produced varying effects on nitrogen migration. Compared with the control, the addition of cereal straw supplemented with mineral nitrogen fertilizers (N_{30}) increased the annual nitrogen leaching by 9.0 kg ha^{-1} or 12.9 %, and the addition of clover green mass and straw – by 8.0 kg ha^{-1} or 11.5 %. Cultivation of aftercrop fodder radish following the addition of cereal straw was very efficient for the reduction of nitrogen and precipitation filtration. Such agro-technical measure reduced the nitrogen leaching by 16.9 kg ha^{-1} or 24.2 % on average, compared with the control variant and by 25.9 and 24.9 kg ha^{-1} compared with the addition of straw supplemented with N_{30} or of red clover and straw.

Cultivation of aftercrop fodder radish for green manure produced a different effect on the concentration of nitrates, although fodder radish, likewise the straw, were fertilized with mineral nitrogen fertilizers (N_{30}) before sowing (August). However, the used fertilizers were rapidly consumed by intensively growing plants, and nitrogen concentration in lysimetric water in autumn was significantly lower (24.0–64.6 mg L^{-1}) than in case of other agro-technical measures. In winter, spring and summer periods, as fodder radish biomass mineralization proceeded, no significant increase in nitrate concentration was established, but the tendency towards the increase was observed.

During autumn, clover accumulated more biomass and higher amount of nitrogen was added into soil with clover than with fodder radish. Although clover is a highly nitrogenous plant, hosting nitrogen accumulating bacteria on their roots, but their use for green manure, as compared with the control variant, did not increase the nitrate concentration during the autumn. This may be related to a slower decomposition of clover biomass, because at positive winter temperatures in 2006–2007, the nitrate concentration in lysimetric water slightly increased, and it is an evidence of the ongoing process of biomass mineralization. The analysis of the research data of the whole study period suggests that the effect of clover green mass on nitrate concentration depended on the amount of the added biomass. In case of rich harvest, as it was in 2004, in the course of decomposition of clover biomass the nitrogen effect on nitrate concentration was clearly evident for longer than a year. Regression and correlation analyses of the research data showed that in the year following the addition of green manure a strong relation of the nitrate concentration in lysimetric water (y) in spring and summer periods with the content of nitrogen added with clover and straw biomass (x) could be observed; it is described by regression equations:

$$y_{spring} = 0{,}358x + 15{,}65,\ R^2 - 0{,}747;$$

$$y_{summer} = 0{,}665x - 3{,}1815{,}65,\ R^2 - 0{,}688.$$

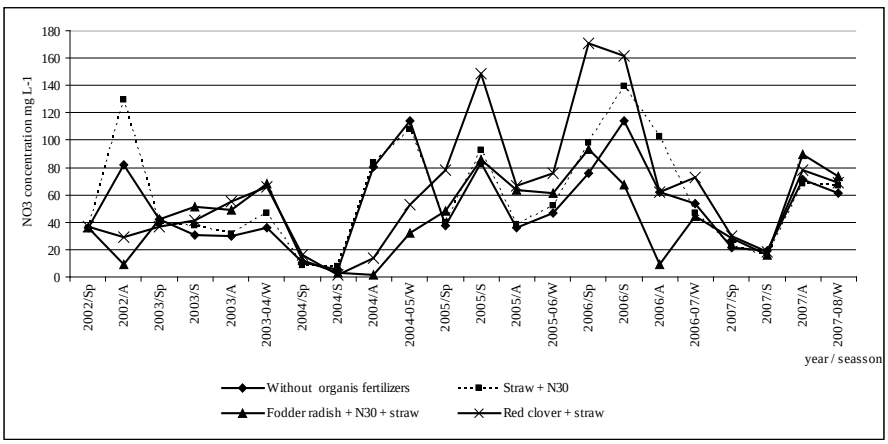

Figure 2 : The impact of green manure and straw on nitrate concentration in leachate (NO_3- mg L^{-1}) according to the seasons of the year

In the autumn of the year following the addition of clover (10–12 months after addition) its effect on nitrate concentration decreased (R^2 – 0,117) and was insignificant.

The studies show that the least nitrogen leaching (4.3–7.6 kg ha^{-1} N) is recorded in summer because filtration of precipitation during this period is negligible, and in some years it may cease for the summer (Fig. 3). Regarding the nitrogen leaching losses, other seasons were quite similar – an average of 10.5–16.0 in spring, 3.9–15.9 in autumn, 11.3–14.1 kg ha-1 in winter. Effect of the applied agro-technical measures on nitrogen leaching was particularly evident during autumn – at the period of catch plants growth. They significantly reduced the filtration of precipitation; nitrate concentrations in lysimetric water were also lower, and therefore the nitrogen leaching decreased significantly ($p < 0.05$) compared with the control: by 65.5 % in case of fodder radish cultivation and by 31.9 % while growing clover. Plough in of straw supplemented with mineral nitrogen fertilizers (N_{30}) had no significant effect on filtration of precipitation but increased the concentration of nitrates in water, leading to 40.7 % ($p > 0.05$) average of nitrogen leaching losses in autumn.

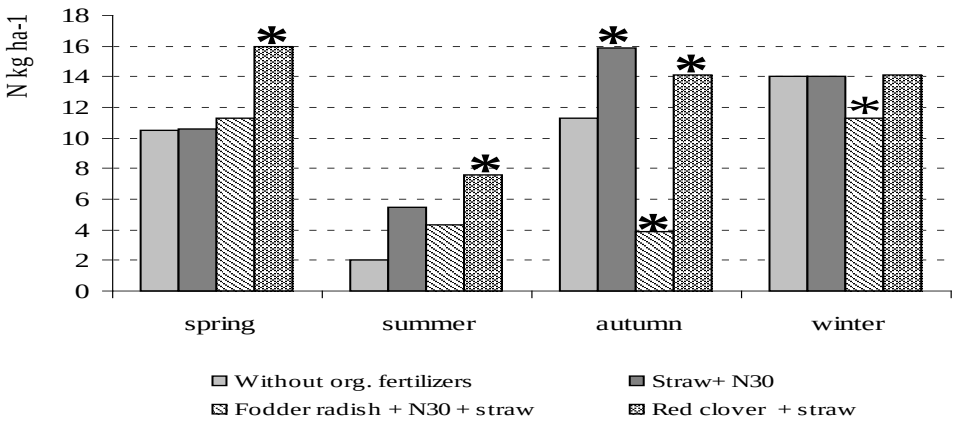

Figure 3 : The impact of green manure and straw on nitrogen leaching (N kg ha^{-1}) according to the seasons of the year

Note. * – significant differences from the control variant (without organic fertiliser) at 95 % significance level.

The effect of the addition of plant biomass in autumn on nitrogen leaching remained evident during other seasons as well. In winter significantly lower (19.3 %) nitrogen leaching was determined in the soil where biomass of fodder radish and straw had been added. Compared with control, the effect of clover biomass on nitrogen leaching in winter was significant during the year of its addition into the soil. During other years no significant increase was observed.

According to the data of 2002–2008, the average annual nitrogen leaching losses were 52.9–77.8 kg N ha^{-1}, depending on the applied agro-technical measures. Hydrothermal conditions played the key role in filtration of atmospheric precipitation, so nitrogen leaching losses in different years ranged from 7.7–43.1 kg N ha^{-1} in 2002 to 45.3–90.5 kg ha^{-1} in 2006.

The applied agro-technical measures produced varying effects on nitrogen migration. Compared with the control, the addition of cereal straw supplemented with mineral nitrogen fertilizers (N_{30}) increased the annual nitrogen leaching by 9.0 kg ha^{-1} or 12.9 %, and the addition of clover green mass and straw – by 8.0 kg ha^{-1} or 11.5 % (Table 3). Cultivation of aftercrop fodder radish following the addition of cereal straw was very efficient for the reduction of nitrogen and precipitation filtration. Such agro-technical measure reduced the nitrogen leaching by 16.9 kg ha^{-1} or 24.2 % on average, compared with the control variant and by 25.9 and 24.9 kg ha^{-1} compared with the addition of straw supplemented with N_{30} or of red clover and straw.

Table 3 : The effect of straw and green manure on chemical elements leaching of a sandy loam *Luvisol*

Treatment	Leaching kg ha^{-1}			
	N	K^+	Ca^{2+}	C_{org}
Without organic fertiliser	69,8	19,7	135,5	10.6
Straw + N_{30}	78,8*	20,7	136,4	9.9
Fodder radish + N_{30} + straw	52,9*	20,6	119,7*	8.3*

Red clover + straw	77,8*	24,2*	137,1	8.5*
LSD_{05}	3,56	2,78	8,28	1.98

Note. * – significant differences from the control variant (without organic fertiliser) at 95 % significance level.

Potassium (K^+). Rather high amount of potassium 37.2–39.0 g m^{-2} was added into the soil with the green manure biomass; in the course of the biomass decomposition the soil is enriched with mobile potassium compounds and the plant requirements for potassium are optimized. Changes of potassium concentration in the leachate during the period of investigation show that straw and green manure increased its leaching, and their effect had a tendency to increase after each addition of the biomass (Fig. 4). Increased potassium concentration in lysimetric water was recorded not only in autumn, when mineralization of freshly added organic matter begins, but also the next year, i.e. 10–12 months after its addition. However, it should be noted that the increase in concentration was not always significant; only the tendency towards the increase could be mentioned. The average concentration of potassium in the leachate of non-fertilized soil was 6.0±2,67 mg L^{-1} K^+, and, depending on the hydrothermal conditions of a year, ranged from 2 to 14 mg L^{-1}. After the addition of green manure and straw its concentration increased by 1–5 mg L^{-1} K^+ and was from 6.7 ± 3,11 up to 8.60 ± 4,13 mg K^+ L^{-1}. Compared with the control variant, potassium concentration statistically significantly increased (+2.60 mg L^{-1}) only in leachate of the soil fertilized with red clover biomass.

During the study period, coefficient of variation in potassium concentration was high (44.4–49.9 %), because its leaching was influenced not only by the amount and intensity of atmospheric precipitation but also by the amount of the added organic matter.

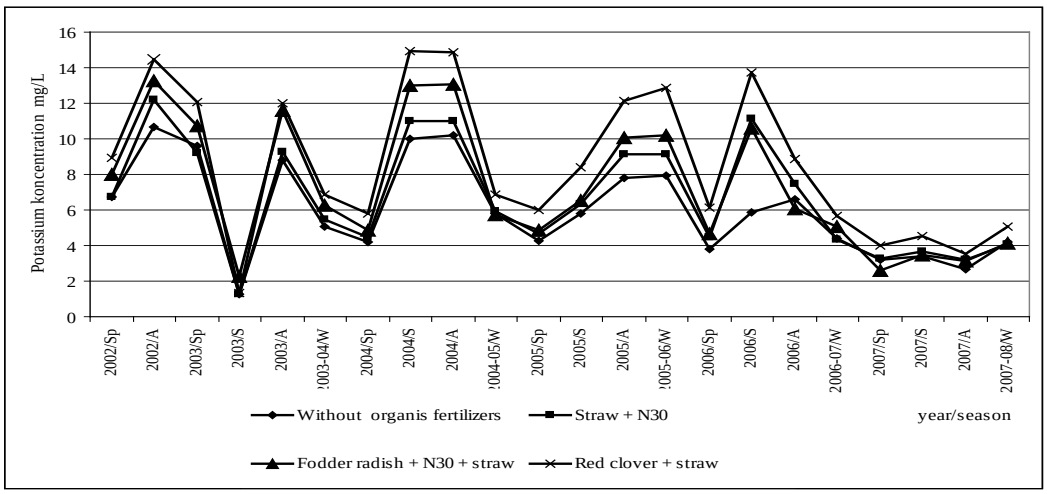

Figure 4 : The impact of green manure and straw on potassium concentration in leachate (K^+ mg L^{-1}) according to the seasons of the year

In sandy loam soil, with no catch crop cultivated for green manure, the average amount of leached potassium was 19,7 kg K^+ ha^{-1} per year (Table 4). The smallest losses (3.11–3.73 kg K^+ ha^{-1}) were determined in summer; it is related with lower filtration of precipitation and smaller potassium concentration in the leachate. Almost twice higher losses were determined in spring and autumn (5.82–97.39 and 6.52–7.69 kg K^+ ha^{-1} respectively) when filtration of precipitation was significantly higher. Although not very strong, but frequent increase of potassium concentration in leachate after the addition of green manure preconditioned the fact that its leaching losses, despite infiltration reduction while growing catch crops, were almost identical as in the control variant or even higher. Compared with the control variant or the variant of fertilization with straw and fodder radish, the leaching of potassium statistically significantly increased (3.6–4.5 kg K^+ ha^{-1} or 11.7–22.8 %) only after the addition of red clover. It should be mentioned that significant increase in potassium leaching was recorded not immediately after the red clover addition but in the period of spring – autumn of the next year. This evidently suggests the prolonged period of potassium release from organic compounds and its slower migration in the soil profile, compared with nitrogen compounds.

Calcium (Ca^{2+}). In this experiment, the leaching of calcium was also studied because it is an important element not just for plant nutrition it also stabilizes the soil acidification processes. In acidic soils, that are characteristic of the Eastern Lithuania, the exchange calcium is not abundant (700-900 mg kg^{-1} Ca), therefore it is important that the applied agro-technical measures would not induce the migration of calcium from the arable layer.

The research showed that the average annual concentration of calcium in the control variant was

41,1±0.21 mg Ca L^{-1} , in the variant fertilized only with straw or together with green manure it changed insignificantly – from 38.2±3.46 to 44.63±3.99 mg Ca L^{-1} (Fig. 5). Statistical processing of the test data showed only a slight upward tendency in the concentration of calcium during the whole study period. The concentration somewhat increased in the leachate of soil fertilized with clover biomass, but the changes were statistically insignificant ($p>0.05$). During the study period the variation in calcium concentration was 0.51–9.05 %.

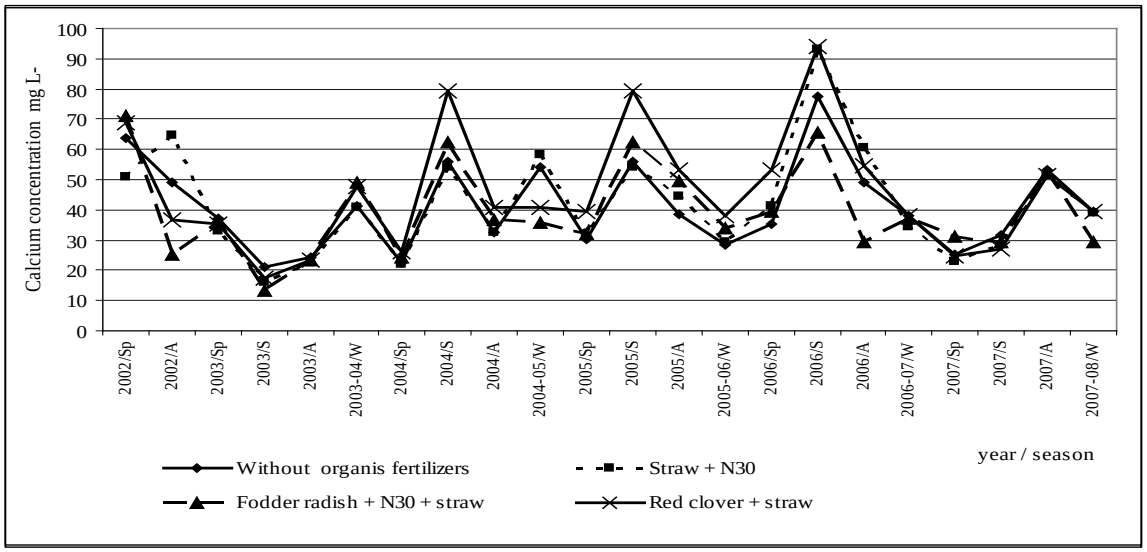

Figure 5 : The impact of green manure and straw on calcium concentration in leachate (Ca^{++} mg L^{-1}) according to the seasons of the year

As the green manure and straw had no significant effect on calcium concentration, so its leaching losses in the soil of all variants were similar, except for the variant with fodder radish (Table 5). From sandy loam soil an average of 119.7–135.5 kg Ca^{2+} ha^{-1} leached per year. Less calcium leaches in summer (21.1–25.7 kg Ca^{2+} ha^{-1}), higher amounts – in spring and autumn (37.1–43.9 and 25.2–42.6 kg Ca^{2+} ha^{-1} respectively).

Cultivation of fondre radish for green manure reduced the calcium leaching by 16.3 kg ha^{-1} or 10.9 % on average. This is due to two factors: lower filtration of precipitation in autumn in fodder radish crop and lower amount of calcium released from radish green biomass. The clover green mass accumulates more calcium than fodder radish biomass, and its decomposition results in larger amount of mobile calcium compounds. Therefore during the year following the addition of clover, the calcium leaching increased significantly (15.7 kg of Ca^{2+} ha^{-1} or 12.5 %) compared with the control variant. But during the year of clover cultivation, due to lower filtration of precipitation, the calcium losses were lower than in the leachate of the control variant.

Total organic carbon (TOC). Investigations on OC concentration in lysimetric water showed that during the experimental period incorporation of catch crops (fodder radish, red clover) biomass and straw did not increase TOC leaching (Figure 6). Significant ($p<0.05$) decreases in TOC concentration after green manure incorporation was only observed in 2002. In other years, treatment differences were not significant ($p>0.05$). Analysis of TOC seasonal data shows no consistent changes in the concentration after green manure and straw incorporation, since many factors affect OM destruction and leaching of mobile organic compounds. However, experimental data averaged over the period (2002-08) suggest that incorporation of green manure in late autumn decreased annual TOC concentration in lysimetric water by 0.56-0.57 mg l^{-1} (17.6-17.9%). These results were determined by the 2002 data, but in the other experimental years there was no observed change ($p>0.05$) in TOC concentration.

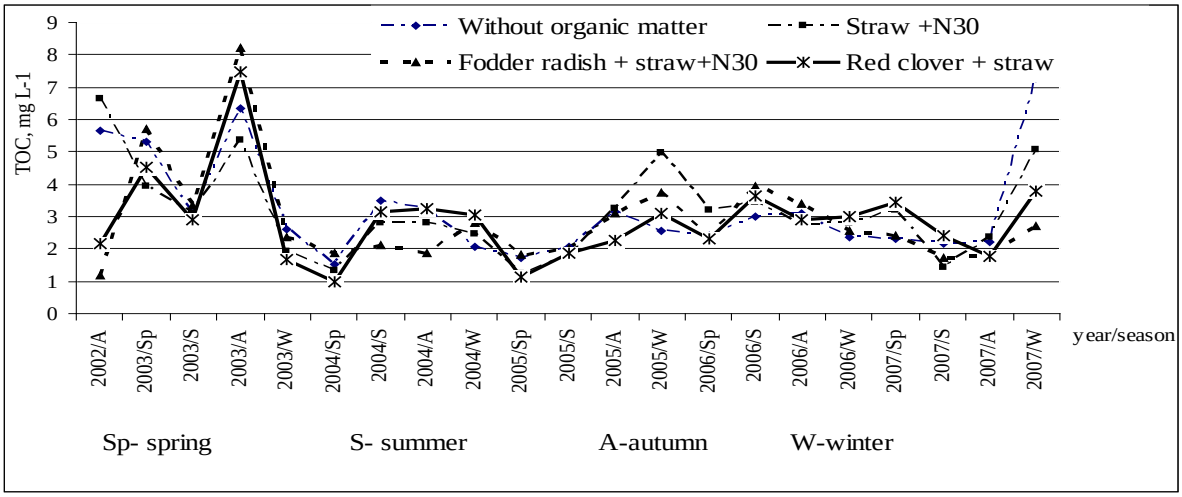

Figure 6 : Organic carbon (TOC) weighted concentration (Corg mg L^{-1}) in lysimetric water

TOC leaching losses varied considerably, with the least in 2004 and 2005 (6.49-8.31 and 5.48-6.83 kg ha^{-1}, respectively), whereas in the other years they were almost double (10-15 kg ha^{-1}) (Table 6). In treatments grown with undersown red clover, infiltration during summer declined by 38.7%, and by 16.5% in autumn, whereas fodder radish (sown in late August) reduced infiltration by 25.3% and 16.9%, respectively. Due to the decreased infiltration, TOC leaching losses after green manure incorporation were lower than those in the soil with only straw or barley stubble incorporated. Significant ($p<0.05$) reductions in TOC leaching due to green manure growth was identified in lysimeters with undersown red clover in 2002 (autumn) and in 2004 (summer and autumn), which grew plentiful (0.41-0.64 kg m^{-2}) during these times. In 2006, TOC leaching from the treatments with green manure crops was also lower, yet differences between treatments were not significant ($p>0.05$). In the years of green manure effect (2003, 2005) TOC leaching losses, due to the decomposition of green manure, did not change significantly ($p>0.05$) but, in comparison with the control treatment, it did reduce TOC leaching.

IV. Discussion

Due to warming climate in Europe (Krauciunene et al., 2010), the plant growth season becomes longer and it facilitates the cultivation of cover crops. In the course of the last 100 years, in Lithuania the temperature increased by 0.1-0.9 °C (Galvonaitė et al. 2007), and plant growth season elongated by 7 days (Kalvane et al., 2009). Changing climatic conditions cause the need for a new assessment of the impact of green manure on soil properties and nutrient leaching.

Studies have shown that in case of prolonged warm period of the year, cover crops for green manure effectively reduce rainfall leaching in sandy loam soil. It was determined that catch crops (red clover, fodder radish), on average, reduce the leaching by 19.4-21.7 % in autumn and by 7.0-8.3 % during the year. Stauffer (2000) determined that under rotations with cover crops, percolate formation was reduced by 10-15%, compared to rotations without or with a reduced presence of cover crops. Dry matter yield had no direct effect on the formation of percolate.

During the decomposition of green manure and straw various chemical elements present in them turn into mobile mineral compounds and can be re-used by plants or increase the nutrient leaching losses (Goulding, 2000 ; Adomaitis et. Al., 2010 ; Erickson et. Al., 2005). Studies showed that the influence of cover crops on nitrogen leaching depended on its chemical composition and biomass decay time (Hansen, Djurhuus, 1997; Jonson et. al., 2005 ; Shi, 2013). In autumn fodder radish consume a lot of mineral nitrogen for their biomass formation, which significantly reduces rainfall filtration. This consequently reduces the concentration of nitrates in filtering water and their leaching by an average of 24.2 % during the year. Capacity of non-leguminous plants for rapid absorption of soil mineral nitrogen in autumn is comprehensively described by various authors (Farthofer et. al, 2004 ; Askegaard et. al., 2006). The content of nitrogen accumulated in red clover biomass was by about 50 % higher than in the fodder radish biomass, so their influence on nitrogen leaching was different. Intensive decomposition of clover biomass begins in spring with the rise in temperature, thus a significant increase of nitrate concentration in lysimetric water took place in the spring (52.4 %) and summer (52.0 %) of the following year. Despite the lower filtration, significantly elevated levels of nitrate concentration resulted in increased nitrogen leaching (by 11.5 % during the year) after clover biomass insertion. Nitrogen migration to deeper soil layers after the insertion of clover was also described by Nykänen et al. (2008). Contrarily, Dabney et al. (2010) stated that winter cover crops reduce the nitrogen

leaching from 70 to 45 kg NO_3-N ha^{-1}, while summer cover crops – up to 30 kg NO_3-N $ha^{-1.}$

Under Lithuanian climatic conditions insertion of cover crops for green manure increased potassium concentration in lysimetric water during the following year. The increase was not always statistically significant ($p > 0.05$). Only after red clover insertion a substantial increase in potassium concentration (+2.60 mg L^{-1} K^+, $p < 0.05$) and its higher leaching (4.5 kg ha^{-1} K+or 22.8%, $p < 0.05$) were determined. According to Askegaard et. al. (2003), in sandy soils (<5 % clay) the green manure crop rotation reduces the potassium leaching from 42 to 21 kg ha^{-1}, while the addition of barley straw helps to reduce the amount of exchange potassium in the soil.

Green manure crops had no significant effect on calcium migration in sandy soils, except for fodder radish, which is related with a lower rainfall filtration in autumn. For this reason calcium leaching decreased by 16.3 kg ha^{-1} or 10.9 % ($p < 0.005$). Under different climatic conditions application of cover crops (Crotalaria juncea, Sorghum bicolor_S. bicolor var. sudanense) increased K, Ca and Mg concentrations and considerably higher leachate concentrations of these elements occurred in the treatment with the leguminous cover crop, sunn hemp, than in sorghum sudangrass treatment. However, only the amount of leached Mg was significantly higher in the sunn hemp (5.7 kg ha^{-1}) than in sorghum sudangrass (Wang . et. al., 2003)

Decomposition of green manure generates different humic compounds which can stabilize or increase the amount of humus in the soil (Blombäck et. al., 2003; Tripolskaja et. al., 2008), but their mobile forms leach into the subsoil. These studies showed that in the sandy loam *Luvisol* incorporation of green manure did not essentially increase ($p > 0.05$) TOC concentration in lysimetric water or its leaching. Positive effect of green manure *(Trifolium pratense,* mixture of *Trifolium repens* and *Lolium multiflorum)* on the reduction of organic carbon leaching was also determined on *Endocalcari-Endohypogleyic Cambisol* (Arlauskienė et. al., 2011). Walmsley et. al. (2011) assessed dissolved carbon leaching from an Irish arable soil. They established that carbon leaching was twice as large from the non-inversion tillage + cover crop treatment. The leaching increased because of increased dissolved inorganic carbon concentrations. However, cover cropping and related additional inputs of organic matter into soil did not increase concentrations and leaching losses of DOC. Smukler et al. (2012) adds that cover crops successfully reduced runoff and loads of several constituents during the storm events, when compared to fallow. Losses of dissolved organic carbon (DOC) were reduced by 58%. Estimates of leaching losses of DOC in the cover cropped fields, however, were 70% higher than the fallow fields in the winter rainy season and were 30% higher than the fallow fields in the summer irrigation season.

V. Conclusions

1. In sandy loam *Luvisol* the catch crops grown for green manure (fodder radish, red clover) reduce the infiltration of atmospheric precipitation by 7.0–8.3 % on average, and in the autumn period of the year of their cultivation – by 19.4−21.7 %. Therefore, plough in of their biomass in spring can serve as a measure preventing the nutrient leaching.
2. Application of mineral nitrogen fertilizers to improve the straw mineralization leads to increased nitrate leaching during the first months after addition (October–December). In case of surplus precipitation, the increase of nitrate concentration can be significant.
3. Application of straw supplemented with N_{30} for fertilization increased the nitrogen leaching losses by 9.0 kg ha^{-1} or 12.9 %, while the addition of clover green mass and straw – by 8.0 kg ha^{-1} or 11.5 %. Fodder radish intensively assimilated mineral nitrogen, reduced filtration of precipitation thus leading to significant reduction of nitrogen leaching compared with the control variant (by 16.9 kg ha^{-1} or 24.2 %) and by 25.9 and 24.9 kg ha^{-1} respectively compared with the application of straw supplemented with N_{30} or clover and straw.
4. Fertilization with barley straw and fodder radish green mass produced no effect on the migration of potassium in the soil. But the addition of red clover green mass, compared with non-fertilized soils, significantly ($p < 0.05$) increased the annual average potassium concentration in the leachate by 2.60 mg of K^+ L^{-1} and the leaching losses – by 4.5 kg K^+ ha^{-1} or 22.8 %.
5. As a result of fertilization with barley straw as well as fodder radish and clover biomass, calcium concentration in the leachate slightly increased, but the changes were statistically insignificant ($p > 0.05$). Calcium leaching losses significantly increased (15.7 kg Ca^{2+} ha^{-1} or 12.5 %, $p < 0.05$) only in the year following the addition of red clover, but over the entire study period the changes were insignificant. Due to lower filtration of precipitation, the aftercrop fodder radish, compared with the control variant, significantly ($p < 0.05$) reduced the calcium leaching losses.
6. TOC leaching losses from a sandy loam soil were low and amounted to, on average, 8.3-10.6 kg OC ha^{-1}. Depending on annual meteorological conditions and experimental treatments, leaching losses varied from 1.97-14.92 kg OC ha^{-1} per year. Mean OC concentration in lysimetric water was 2.61-3.18 mg OC l^{-1} (control and with green manure or straw, respectively). Incorporation of barley straw

and catch crops for green manure (fodder radish, red clover) in late autumn did not have any significant ($p>0.05$) effect on the TOC concentrations of lysimetric water.

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Allelopathic Effects of Aqueous Extracts of Plant Residues on Two Tropical Weeds of South Western Nigeria

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Abstract - The allelopathic effects of aqueous extracts of plant residues from *zea mays* (root and tassel) and *cajanus cajan* (leaves and stem) were examined on the two weeds, *euphorbia heteropyhlla* l. and *bidens pilosa* l. the results obtained showed that the aqueous extracts retarded the germination and the initial growth of both weeds. the effects were concentration dependent as the degree of retardation increased with increase in the concentrations of the extracts. the retardation of germination of *e. heterophylla* seeds was more pronounced in seeds treated with extracts from *c. cajan* leaf. The % germination decreased from 18% in the 5g concentration to 10% in 25g/200mL concentration at 144hrs experimental time. Similarly, the retardation of germination of *B. pilosa* seeds was more pronounced in *C. cajan* stem extract treated seeds. The % germination decreased from 52% in the 5g concentration to 20% in 25g/200mL concentration at 144hrs experimental time. The radicles of the two weeds were also retarded by the extracts. The retardation of radical lengths of *E. heterophylla* and *B. pilosa* seedlings were more pronounced in *Cajanus cajan* stem extract treated seeds as no radicle emerged until 72hrs experiment time. The radicle length of *E. heterophylla* seedling at 144hrs experiment was 0.93cm in the 5g concentration which reduced to 0.29cm in 25g/ 200mL extract concentration.

Keywords : *allelopathy, cajanu s cajan, euphorbia heterophylla, bidens pilosa.*

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Strictly as per the compliance and regulations of :

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Keywords : allelopathy, cajanu s cajan, euphorbia heterophylla, bidens pilosa.

I. Introduction

The presence of weeds in agricultural fields greatly reduces crop yields. This has forced farmers to use herbicides as possible control measure. At present, these herbicides are highly expensive beyond the reach of resource-poor farmers. Quite often they are not available in the rural areas where majority of the farmers reside. Situations abounds where farmers procured resources from diverse sources and yet the herbicides were unavailable to purchase and when available, they could be adulterated and useless. Also the herbicides are environmentally unfriendly.

Consequent on the above, there has been a resurgent of interest in the search for sustainable weed control strategies that would address the problems stated above. Attempts made elsewhere included the use of allelopathy. In Nigeria, there abounds a gross dearth of studies on the allelopathic effects of crop residues until recently when allelopathic effects of some crop residues were considered on some agricultural crops and weeds by Ayeni *et al.,* 2010, Ayeni and Kayode (2012), Ayeni and Kayode (2013). The study being presented here examined the allelopathic effects of two common plant residues on two common weeds in Ekiti State, Nigeria.

II. Materials and Methods

Laboratory experiment was conducted in the Department of Plant Science, Ekiti State University, Ado-Ekiti, Nigeria, in September 2010 to determine the effects of different concentrations of aqueous extracts from residues of maize tassels and roots as well as C*ajanus cajan* leaves and stems on the germination and growth of two tropical weeds (*E. heterophylla* and *B. pilosa)*.

Z. mays' tassels and roots were obtained from the experimental farm of the Faculty of Agricultural Sciences of the Ekiti State University, Ado-Ekiti, Nigeria, after the corns had been harvested. *Cajanus cajan's* leaves and stems were obtained from a farmland in Ikere-Ekiti, a town located at about 15km from the campus of the University.

These materials were chopped into pieces and were air-dried for three weeks after which they were pounded using pestle and mortal. Seeds of *E. heterophylla* and *B. pilosa* were obtained within the University campus.

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a) Extract Preparation

Portions of 5g, 10g, 15g, 20g, and 25g of each of the grounded samples of the crop residues were measured out using G&G Electric Top Loading Digital balance, JJ300Y, China. Each portion was soaked in 200ml distilled water in 500ml conical flasks. The mixtures were shaken intermittently for 24hrs at 25^0C ± 1^0C. The extracts for each crop residue was filtered and the filtrates were stored in a refrigerator for further usage.

b) Allelopathy Bioassay

In each treatment, two layers of Whatman No. 1 filter papers were put in each Petri dish (with a diameter of 9cm). Five seeds, each of the weeds, were sown in the Petri dish and each replicated ten times for each extract concentration. The filter papers were moistened daily with the different extract concentrations using syringe and needle. Control experiments were set up for each extract residues and were replicated ten times. All the Petri dishes were arranged on germination tables at room temperature between 25-30^OC. The seeds were considered as germinated upon radicle emergence and the number that germinated was counted and recorded for six days. The radicle and plumule growth elongations were recorded at 24hrs interval. The data obtained from the experiments were compared to those obtained from the control using Analysis of Variance (ANOVA, $P < 0.05$).

III. Results and Discussion

a) Seed Germination

The effects of aqueous extracts from the plant residues on the germination of seeds of the two weeds are shown in Tables 1and 2. The % germination of *E. heterophylla* seeds in all the four treatments was retarded (Table 1). It was observed that germination of seeds of *E. heterophylla* were retarded mostly by the extract from the *C. cajan* stem as no germination occurred until 72hrs experimental time (Table1 D).The effects of the extracts on the % germination (Table 1 A-D) increased with increase in the concentration of the extracts. This tends to show that the effects of the extracts were concentration dependent.

In *Z. mays* root extract treated seeds of *E. heterophylla* (Table 1 A), results obtained at 144hrs experimental time revealed that while the % germination in the control was 54%, those of 5, 10, 15, 20 and 25g/ 200mL concentrations were 34%, 24%, 24%, 24% and 20% respectively. In *Z. mays* tassel extract treated seeds (Table 1 B), results obtained at 144hrs experimental time was 54% in the control, those of 5, 10, 15, 20 and 25g/mL concentration were 54%, 40%, 32%, 18% and 10% respectively. Likewise, the % germination of *E. hereophylla* seeds in the *C. cajan* leaves aqueous extracts treated seeds (Table 1 C) was 28% in the control which decreased to 10% in 25g/200mL concentration. Also, in the *C. cajan* stem aqueous extract treated seeds (Table 1 D), % germination was 36% in the control which decreased to 6% in 25g/200mL concentration.

The germination of *B. pilosa* seeds in the aqueous extracts of the four treatments were shown in Table 2. It was also observed that the aqueous extracts also brought a considerable inhibition in the germination of *B. pilosa* seeds. In *Z. mays* root extract treated seeds (Table 2 A), the % germination of *B. pilosa* seeds was 90% in the control experiment, those of 5, 10, 15, 20 and 25g/ 200mL were 74%, 52%, 48%, 32% and 32% respectively. In the *Z. mays* tassel extract treated seeds (Table 2 B), the % germination was 72% in the control which decreased to, 30% in 25g/200mL concentration. Likewise, the *C. cajan* leaf extract treated seeds (Table 2 C) had 90% germination in the control experiment which decreased to 46% in the in 25g/200mL concentration. In *C. cajan* stem extract treated seeds (Table 2 D), control experiment had 70% which decreased to 20% in 25g/200mL concentration. It was observed that extract from the *C. cajan* stem retarded the germination of *B. pilosa* seeds more than the others.

Statistical analysis($P< 0.05$) showed that there were significant differences in the % germination of extract treated seeds between 96 and 144hrs experimental time in all the treatments except the extract from the *Z. mays* tassel in *B. pilosa* treated seeds where no significant different was observed in extract treated seeds and the control at low extract concentrations.

The study lend credence to the previous assertions of Oyun (2006) who reported that aqueous extracts from *Gliricidia sepium* caused a prolong delay of maize seeds germination. Also, Aisha *et al*. (2010) and Monica *et al*. (2011) reported the aqueous extracts of *Ascarum europaeum* L. inhibited the germination and growth of *Lycopersicum esculentum*

b) Radicle Length

The effects of the aqueous extract of the plant residues on the radicle lengths of the two weeds are shown in Tables 3 and 4. The results showed that the four plant residues retarded the radicle lengths of the weeds. *E. heterophylla* seeds treated with aqueous extract of *C. cajan* stem were mostly retarded (Table 3 D). At 144hrs experimental time, the radical length in the control experiment was 2.38cm, those of 5, 10, 15, 20 and 25g/ 200mL concentrations were 0.93cm, 0,83cm, 0.72cm, 0.51cm and 0.29cm respectively. Likewise, *B. pilosa* seeds treated with extract from *C. cajan* stem resulted in more inhibition of the radicle lengths (Table 4 D). Radicle length in the control experiment was 1.52cm, those of 5, 10, 15, 20 and 25g/200mL extract concentrations were 1.25cm, 0.99cm, 0.92cm,0,83cm and 0.59cm respectively.

Statistical analysis ($P< 0.05$) revealed that there were significant differences in the radical lengths of

extract treated seeds between 72 and 144hrs experiment time in the three crop residues extracts except the extracts from *Z.mays* roots on radicle length on *B. pilosa* at the low extract concentrations (Table 4). The results obtained in this study corroborated the earlier assertions of Khan *et al.* (2011) who reported that litter from leaves and stem of *Rhazyastricta dence* significantly reduce the germination, radicle, plumule growth and number of roots of maize. Sisodia and Siddiqui (2010) reported that the radicle and plumule lengths of seedlings of test species were reduced significantly in response to the *C. bonplandianum* extracts.

c) Plumuleat Length

The effects of aqueous extracts of plant residues on the plumule growth of the two weeds were shown in Tables 5 and 6.The results also showed that the four aqueous extracts of the plant residues retarded the plumule length of the two weeds. The results revealed that the plumule length of *E. heterophylla* seeds treated with the aqueous extracts from *Z. mays* root was 2.83cm at 144hrs experimental time in the control experiment. The plumule lengths of the 5, 10, 15, 20 and 25g/200mL extract concentrations were 1.99cm, 1.40cm, 1.30cm, 0.84cm and 0.64cm respectively (Table 5 A). Also in the *Z. mays* tassel extract treated seeds, the plumule length of *E. heterophylla* in the control was 2.23cm, those of 5, 10, 15, 20 and 25g/200mL concentrations were 1.79 cm.1.47cm, 0.91cm, 0.90cm and 0.81cm respectively (Table 5 B). It was observed that extracts from *C. cajan* stem retarded the plumule lengths of *E. heterophylla* mostly with 1.31cm in the control which decreased to 0.06cm in 25g/200mL concentration (Table 5 D).

The results also revealed that the plumule lengths of seedlings emerged from *B. pilosa* extract treated seeds were retarded by the aqueous extracts of the plant residues. In the *Z. mays* root extract treated seeds (Table 6 A), plumule length in the in the control experiment was 1.52cm. Those of 5, 10, 15, 20 and 25g/200mL concentrations were 1.20cm, 1.17cm, 1.06cm, 0.93cm and 0.38cm respectively. Also in the *C. cajan* stem extract treated seeds (Table 6 D) plumule length was 2.17cm in the control experiment which decreased to 1.03cm in 25g/200mL concentration.

Statistical analyses ($P< 0.05$) revealed that significant differences abound in results obtained from *E. heterophylla* seeds treated with the aqueous extracts of the residues, most especially at higher extract concentrations, between 96 and144hrs experimental time.The results obtained from this study were in accordance with the work of Seerjana *et al.* (2007) who reported that the leaf aqueous extracts of *Parthenium hysterophorus* L.exhibited significant inhibitory effects on seed germination and seedling growth of all test species in cruciferous species. Abu- Romman (2010) also noted that allelochemicals released into the surrounding might inhibited or retarded root or radicle and shoot or coleoptile of plants. Aisha *et. al.* (2010) and Yarnia *et. al.* (2009), Kaul and Bansal (2002) also demonstrated similar results in their studies.

In conclusion, the study revealed that the root and tassel of *Z. mays* contain some allelochemicals which might be responsible for the inhibitory effects exhibited on the two weeds examined in this study. According to Sanchez- Moreiras *et. al.* (2004), *Z. mays* tassels' allelopathy was attributed to hydroxamic acid. Also, An *et al.* (2003) and Alberto *et al.* (2012) reported that *Z. mays* root allelopathy contained 2, 4- dihydroxy-7-methoxy-2*H* -1, 4- benzoxazin-3(4*H*) – one (DIMBOA). Nulifer (2006) revealed the phenolic acid in *Cajanus cajan* to include ptotocatechic, p- hydroxyl benzoic acid. All these chemicals might be responsible for the retardation in the germination and the initial growth of the two weeds examined here. It is hereby recommended that there is need for further studies on the potentials of turning these crop residues from waste materials to wealth.

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Table1 : Effects of aqueous extracts of *Zea mays* (root and tassel) and *Cajanus cajan* (leaf and stem) on the germination of seeds of *E. heterophylla*

Extracts g/200mL	Experimental Time (Hrs)					
	24	48	72	96	120	144
A.						
Z. mays root 0	0a	8a	42a	54a	54a	54a
Z. mays root 5	0a	6a	24b	34b	34b	34b
Z. mays root 10	0a	4a	16b	24b	24b	24b
Z. mays root 15	0a	4a	16b	24b	24b	24b
Z. mays root 20	0a	2a	14b	24b	24b	24b
Z. mays root 25	0a	0a	10b	20b	20b	20b
B						
Z. mays tassel 0	0a	14a	30a	52a	54a	54a
Z. mays tassel 5	0a	10b	30a	38ab	42ab	54a
Z. mays tassel 10	0a	4b	18ab	32abc	36ab	40ab
Z. mays tassel 15	0a	2b	10b	24bc	32ab	32ab
Z. mays tassel 20	0a	2b	6b	18bc	18b	18b
Z. mays tassel 25	0a	0b	4b	10c	10b	10b
C						
C. cajan leaf 0	0a	12a	14a	18a	28a	28a
C. cajan leaf 5	0a	6a	12a	14a	18ab	18ab
C. cajan leaf10	0a	4a	10a	12a	14ab	14ab
C. cajan leaf 15	0a	2a	10a	12a	14ab	14ab
C. cajan leaf 20	0a	2a	8a	10a	12ab	14ab
C. cajan leaf 25	0a	2a	6a	10a	10b	10b
D						
C. cajan stem 0	0a	2a	14a	36a	36a	36a
C. cajan stem 5	0a	0b	10ab	16b	16b	16b
C. cajan stem 10	0a	0b	8ab	12b	16b	16b
C. cajan stem 15	0a	0b	8ab	8b	8b	8b
C. cajan stem 20	0a	0b	4ab	6b	6b	6b
C. cajan stem 25	0a	0b	0b	6b	6b	6b

Means followed by the same letter with the column for each treatment are not significantly different at (P< 0.05)

Table 2 : Effects of aqueous extracts of *Zea mays* (root and tassel) and *Cajanus cajan* (leaf and stem) on the germination of seeds of *B. pilosa*

Extracts g/200mL	Experimental Time (Hrs)					
	24	48	72	96	120	144
A.						
Z. mays root 0	0a	36a	82a	86a	90a	90a
Z. mays root 5	0a	20b	50b	66a	74a	74a
Z. mays root 10	0a	12b	32bc	40b	48b	52bc
Z. mays root 15	0a	12b	28c	38b	46b	48c
Z. mays root 20	0a	4b	20c	24b	32b	32c
Z. mays root 25	0a	4b	20c	24b	32b	32c
B						
Z. mays tassel 0	0a	32a	42a	50a	72a	72a
Z. mays tassel 5	0a	14b	42a	50a	72a	72a
Z. mays tassel 10	0a	9b	38a	46a	58ab	60ab
Z. mays tassel 15	0a	2b	34a	46a	50ab	58ab
Z. mays tassel 20	0a	0c	30a	32a	44bc	46bc
Z. mays tassel 25	0a	0c	22a	28a	30c	30c
C						
C. cajan leaf 0	0a	54a	64a	72a	72a	90a
C. cajan leaf 5	0a	14b	56ab	70ab	70ab	78ab
C. cajan leaf10	0a	10b	48ab	54abc	64abc	64abc
C. cajan leaf 15	0a	4b	32bc	40bc	64abc	64abc
C. cajan leaf 20	0a	2b	20c	40bc	62abc	62abc
C. cajan leaf 25	0a	0c	12c	28c	46c	46c
D						
C. cajan stem 0	0a	34a	14a	56a	64a	70a
C. cajan stem 5	0a	12b	10ab	36b	50ab	52ab
C. cajan stem 10	0a	6b	8ab	28b	34bc	46b
C. cajan stem 15	0a	6b	8ab	22b	28bc	34b
C. cajan stem 20	0a	4b	4ab	20b	20bc	28b
C. cajan stem 25	0a	0b	0b	14b	16c	20b

Means followed by the same letter with the column for each treatment are not significantly different at ($P < 0.05$)

Table 3 : Effects of aqueous extracts of *Zea mays* (root and tassel) and *Cajanus cajan* (leaf and stem) on the radicle length (cm) of *E. heterophylla*

Extracts g/200mL	Experimental Time (Hrs)					
	24	48	72	96	120	144
A.						
Z. mays root 0	0.00a	0.03a	0.64a	1.17a	2.00a	3.68a
Z. mays root 5	0.00a	0.00a	0.36b	1.01a	1.74ab	2.46b
Z. mays root 10	0.00a	0.00a	0.31bc	0.75ab	1.72ab	2.05bc
Z. mays root 15	0.00a	0.00a	0.19bcd	0.72ab	1.23c	1.69bcd
Z. mays root 20	0.00a	0.00a	0.06cd	0.33c	0.72cd	1.19cd
Z. mays root 25	0.00a	0.00a	0.00d	0.00c	0.41d	0.76d
B						
Z. mays tassel 0	0.00a	0.00a	0.33a	0.70a	0.89a	2.41a
Z. mays tassel 5	0.00a	0.00a	0.06a	0.27a	0.89a	1.16b
Z. mays tassel 10	0.00a	0.00a	0.06a	0.20a	0.77a	1.10b
Z. mays tassel 15	0.00a	0.00a	0.02a	0.17a	0.35a	0. 79b
Z. mays tassel 20	0.00a	0.00a	0.01a	0.15a	0.31a	0.78b
Z. mays tassel 25	0.00a	0.00a	0.00a	0.12a	0.21a	0.26b
C						
C. cajan leaf 0	0.00a	0.11a	0.58a	1.48a	2.13a	3.07a
C. cajan leaf 5	0.00a	0.10a	0.22ab	0.59b	1.16b	1.75b

C. cajan leaf10	0.00a	0.06ab	0.18ab	0.29b	0.49b	0.68bc
C. cajan leaf 15	0.00a	0.03ab	0.09b	0.29b	0.46b	0.63bc
C. cajan leaf 20	0.00a	0.00b	o.o2b	0.20b	0.29b	0.52c
C. cajan leaf 25	0.00a	0.00b	0.01b	0.16b	0.28b	0.35c
D						
C. cajan stem 0	0.00a	0.00a	0.69a	1.61a	1.95a	2.38a
C. cajan stem 5	0.00a	0.00a	0.17b	0.59b	0.88ab	0.93b
C. cajan stem 10	0.00a	0.00a	0.08b	0.48b	0.75b	0.83b
C. cajan stem 15	0.00a	0.00a	0.02b	0.43b	0.61b	0.72b
C. cajan stem 20	0.00a	0.00a	0.00b	0.28b	0.40b	0.51b
C. cajan stem 25	0.00a	0.00a	0.00b	0.17b	0.25b	0.29b

Means followed by the same letter with the column for each treatment are not significantly different at (P< 0.05)

Table 4 : Effects of aqueous extracts of *Zea mays* (root and tassel) and *Cajanus cajan* (leaf and stem) *on the radicle length of B. pilosa*

Extracts g/200mL	Experimental Time (Hrs)					
	24	48	72	96	120	144
A.						
Z. mays root 0	0.00a	0.52a	0.79a	1.02a	1.48a	1.89a
Z. mays root 5	0.00a	0.15b	0.46b	0.75ab	1.18ab	1.85a
Z. mays root 10	0.00a	0.09bc	0.40b	0.69ab	1.00b	1.86a
Z. mays root 15	0.00a	0.03c	0.36bc	0.50bc	0.86b	1.77a
Z. mays root 20	0.00a	0.02c	0.21bc	0.43bc	0.81bc	0.50b
Z. mays root 25	0.00a	0.01c	0.09c	0.22c	0.37c	0.47b
B						
Z. mays tassel 0	0.00a	0.95a	0.32a	0.95a	1.42a	2.20a
Z. mays tassel 5	0.00a	0.07ab	0.22ab	0.56b	1.21ab	2.11ab
Z. mays tassel 10	0.00a	0.02bc	0.16b	0.54b	1.11ab	1.77ab
Z. mays tassel 15	0.00a	0.00c	0.09bc	0.42bc	0.99ab	1.70ab
Z. mays tassel 20	0.00a	0.00c	0.08bc	0.32bc	0.89ab	1.59ab
Z. mays tassel 25	0.00a	0.00c	0.00c	0.17c	0.72b	1.29b
C						
C. cajan leaf 0	0.00a	0.20a	0.41a	0.95a	1.27a	1.89a
C. cajan leaf 5	0.00a	0.19a	0.26b	0.86ab	1.23ab	1.63ab
C. cajan leaf10	0.00a	0.15a	0.11c	0.61abc	0.99abc	1.41ab
C. cajan leaf 15	0.00a	0.10b	0.05c	0.54bc	0.98abc	1.39ab
C. cajan leaf 20	0.00a	0.00b	0.04c	0.32c	0.79bc	1.32ab
C. cajan leaf 25	0.00a	0.00b	0.02c	0.24c	0.59c	1.05b
D						
C. cajan stem 0	0.00	0.00a	0.42a	0.76a	1.05a	1.52a
C. cajan stem 5	0.00a	0.00a	0.23ab	0.67ab	0.98a	1.25ab
C. cajan stem 10	0.00a	0.00a	0.12b	0.39bc	0.69ab	0.99ab
C. cajan stem 15	0.00a	0.00a	0.10b	0.31cd	0.64ab	0.92ab
C. cajan stem 20	0.00a	0.00a	0.01b	0.25cd	0.55ab	0.83ab
C. cajan stem 25	0.00a	0.00a	0.00b	0.04d	0.39b	0.59b

Means followed by the same letter with the column for each treatment are not significantly different at (P< 0.05)

Table 5 : Effects of aqueous extracts of *Zea mays* (root and tassel) and *Cajanus cajan* (leaf and stem) on the plumule length (cm) of *E. heterophylla*

Extracts g/200mL	Experimental Time (Hrs)					
	24	48	72	96	120	144
A.						
Z. mays root 0	0.00a	0.00a	0.08a	0.49a	1.27a	2.83a
Z. mays root 5	0.00a	0.00a	0.05a	0.42a	1.23a	1.99ab
Z. mays root 10	0.00a	0.00a	0.04a	0.37a	1.01ab	1.40bc
Z. mays root 15	0.00a	0.00a	0.02a	0.35a	0.78ab	1.30bc
Z. mays root 20	0.00a	0.00a	0.00a	0.28ab	0.53bc	0.84c
Z. mays root 25	0.00a	0.00a	0.00a	0.00b	0.36c	0.64c
B						
Z. mays tassel 0	0.00a	0.00a	0.10a	0.80a	1.48a	2.23a
Z. mays tassel 5	0.00a	0.00a	0.05a	0.60a	0.90ab	1.79a
Z. mays tassel 10	0.00a	0.00a	0.00a	0.38ab	0.74ab	1.47a
Z. mays tassel 15	0.00a	0.00a	0.00a	0.01b	0.48ab	0. 91b
Z. mays tassel 20	0.00a	0.00a	0.00a	0.01b	0.30b	0.90b
Z. mays tassel 25	0.00a	0.00a	0.00a	0.00b	0.21b	0.81b
C						
C. cajan leaf 0	0.00a	0.00a	0.07a	0.73a	1.53a	2.26a
C. cajan leaf 5	0.00a	0.00a	0.06a	0.61a	1.36a	2.02b
C. cajan leaf10	0.00a	0.00a	0.05a	0.26a	0.90a	1.47b
C. cajan leaf 15	0.00a	0.00a	0.00a	0.25a	0.90a	1.40b
C. cajan leaf 20	0.00a	0.00a	0.00a	0.17a	0.58b	0.98b
C. cajan leaf 25	0.00a	0.00a	0.00a	0.08b	0.48b	0.63b
D						
C. cajan stem 0	0.00a	0.00a	0.15a	0.62a	1.03a	1.31a
C. cajan stem 5	0.00a	0.00a	0.01b	0.21ab	0.45ab	0.53b
C. cajan stem 10	0.00a	0.00a	0.00b	0.06b	0.12b	0.16b
C. cajan stem 15	0.00a	0.00a	0.00b	0.04b	0.08b	0.12b
C. cajan stem 20	0.00a	0.00a	0.00b	0.03b	0.07b	0.10b
C. cajan stem 25	0.00a	0.00a	0.00b	0.03b	0.05b	0.06b

Means followed by the same letter with the column for each treatment are not significantly different at (P< 0.05)

Table 6 : Effects of aqueous extracts of *Zea mays* (root and tassel) and *Cajanus cajan* (leaf and stem) on the plumule length of *B. pilosa*

Extracts g/200mL	Experimental Time (Hrs)					
	24	48	72	96	120	144
A.						
Z. mays root 0	0.00a	0.45a	0.69a	0.91a	1.09a	1.52a
Z. mays root 5	0.00a	0.00b	0.28b	0.56b	0.88ab	1.20ab
Z. mays root 10	0.00a	0.00b	0.12bc	0.51bc	0.83ab	1.17ab
Z. mays root 15	0.00a	0.00b	0.09bc	0.38bc	0.67bc	1.06ab
Z. mays root 20	0.00a	0.00b	0.03c	0.33bc	0.53bc	0.93b
Z. mays root 25	0.00a	0.00b	0.00c	0.18c	0.27c	0.38c
B						
Z. mays tassel 0	0.00a	0.00a	0.54a	0.87a	1.45a	1.96a
Z. mays tassel 5	0.00a	0.00a	0.32ab	0.66ab	1.04ab	1.83a
Z. mays tassel 10	0.00a	0.00a	0.21bc	0.45bc	0.95ab	1.32a
Z. mays tassel 15	0.00a	0.00a	0.02c	0.34bc	0.60b	1.17ab
Z. mays tassel 20	0.00a	0.00a	0.00c	0.23c	0.52b	1.01b
Z. mays tassel 25	0.00a	0.00a	0.00c	0.06c	0.45b	0.87b

C						
C. cajan leaf 0	0.00a	0.00a	0.49a	0.67a	0.89a	1.23a
C. cajan leaf 5	0.00a	0.00a	0.21b	0.86ab	0.79a	1.20a
C. cajan leaf10	0.00a	0.00a	0.04c	0.61abc	0.58ab	1.02ab
C. cajan leaf 15	0.00a	0.00a	0.01c	0.54bc	0.58ab	0.91ab
C. cajan leaf 20	0.00a	0.00a	0.00c	0.32c	0.38b	0.82ab
C. cajan leaf 25	0.00a	0.00a	0.00c	0.24c	0.02b	0.60b
D						
C. cajan stem 0	0.00a	0.12a	0.74a	1.19a	1.65a	2.17a
C. cajan stem 5	0.00a	0.04b	0.31b	1.05a	1.55a	1.97ab
C. cajan stem 10	0.00a	0.04b	0.28b	0.93ab	1.31a	1.55ab
C. cajan stem 15	0.00a	0.03b	0.15b	0.74ab	1.03a	1.37ab
C. cajan stem 20	0.00a	0.00b	0.08b	0.39b	0.98a	1.31ab
C. cajan stem 25	0.00a	0.00b	0.06b	0.37b	0.79a	1.03b

Means followed by the same letter with the column for each treatment are not significantly different at ($P < 0.05$)

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We shall provide you intimation regarding launching of e-version of journal of your stream time to time.This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.

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As FARSS, you will be given a renowned, secure and free professional email address with 100 GB of space e.g. johnhall@globaljournals.org. This will include Webmail, Spam Assassin, Email Forwarders,Auto-Responders, Email Delivery Route tracing, etc.

The FARSS will be eligible for a free application of standardization of their researches. Standardization of research will be subject to acceptability within stipulated norms as the next step after publishing in a journal. We shall depute a team of specialized research professionals who will render their services for elevating your researches to next higher level, which is worldwide open standardization.

The FARSS member can apply for grading and certification of standards of their educational and Institutional Degrees to Open Association of Research, Society U.S.A.
Once you are designated as FARSS, you may send us a scanned copy of all of your credentials. OARS will verify, grade and certify them. This will be based on your academic records, quality of research papers published by you, and some more criteria. After certification of all your credentials by OARS, they will be published on your Fellow Profile link on website https://associationofresearch.org which will be helpful to upgrade the dignity.

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The ' MARSS ' title is accorded to a selected professional after the approval of the Editor-in-Chief / Editorial Board Members/Dean.

The "MARSS" is a dignified ornament which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., MARSS or William Walldroff, M.S., MARSS.

MARSS accrediting is an honor. It authenticates your research activities. After becoming MARSS, you can add 'MARSS' title with your name as you use this recognition as additional suffix to your status. This will definitely enhance and add more value and repute to your name. You may use it on your professional Counseling Materials such as CV, Resume, Visiting Card and Name Plate etc.

The following benefitscan be availed by you only for next three years from the date of certification.

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As MARSS, you will be given a renowned, secure and free professional email address with 30 GB of space e.g. johnhall@globaljournals.org. This will include Webmail, Spam Assassin, Email Forwarders,Auto-Responders, Email Delivery Route tracing, etc.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time.This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.

The MARSS member can apply for approval, grading and certification of standards of their educational and Institutional Degrees to Open Association of Research, Society U.S.A.

Once you are designated as MARSS, you may send us a scanned copy of all of your credentials. OARS will verify, grade and certify them. This will be based on your academic records, quality of research papers published by you, and some more criteria.

It is mandatory to read all terms and conditions carefully.

AUXILIARY MEMBERSHIPS

Institutional Fellow of Global Journals Incorporation (USA)-OARS (USA)

Global Journals Incorporation (USA) is accredited by Open Association of Research Society, U.S.A (OARS) and in turn, affiliates research institutions as "Institutional Fellow of Open Association of Research Society" (IFOARS).

The "FARSC" is a dignified title which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., FARSC or William Walldroff, M.S., FARSC.

The IFOARS institution is entitled to form a Board comprised of one Chairperson and three to five board members preferably from different streams. The Board will be recognized as "Institutional Board of Open Association of Research Society"-(IBOARS).

The Institute will be entitled to following benefits:

The IBOARS can initially review research papers of their institute and recommend them to publish with respective journal of Global Journals. It can also review the papers of other institutions after obtaining our consent. The second review will be done by peer reviewer of Global Journals Incorporation (USA) The Board is at liberty to appoint a peer reviewer with the approval of chairperson after consulting us.

The author fees of such paper may be waived off up to 40%.

The Global Journals Incorporation (USA) at its discretion can also refer double blind peer reviewed paper at their end to the board for the verification and to get recommendation for final stage of acceptance of publication.

The IBOARS can organize symposium/seminar/conference in their country on behalf of Global Journals Incorporation (USA)-OARS (USA). The terms and conditions can be discussed separately.

The Board can also play vital role by exploring and giving valuable suggestions regarding the Standards of "Open Association of Research Society, U.S.A (OARS)" so that proper amendment can take place for the benefit of entire research community. We shall provide details of particular standard only on receipt of request from the Board.

The board members can also join us as Individual Fellow with 40% discount on total fees applicable to Individual Fellow. They will be entitled to avail all the benefits as declared. Please visit Individual Fellow-sub menu of GlobalJournals.org to have more relevant details.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time. This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.

After nomination of your institution as "Institutional Fellow" and constantly functioning successfully for one year, we can consider giving recognition to your institute to function as Regional/Zonal office on our behalf.
The board can also take up the additional allied activities for betterment after our consultation.

The following entitlements are applicable to individual Fellows:

Open Association of Research Society, U.S.A (OARS) By-laws states that an individual Fellow may use the designations as applicable, or the corresponding initials. The Credentials of individual Fellow and Associate designations signify that the individual has gained knowledge of the fundamental concepts. One is magnanimous and proficient in an expertise course covering the professional code of conduct, and follows recognized standards of practice.

Open Association of Research Society (US)/ Global Journals Incorporation (USA), as described in Corporate Statements, are educational, research publishing and professional membership organizations. Achieving our individual Fellow or Associate status is based mainly on meeting stated educational research requirements.

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We shall provide print version of 12 issues of any three journals [as per your requirement] out of our 38 journals worth $ 2376 USD.

Other:

The individual Fellow and Associate designations accredited by Open Association of Research Society (US) credentials signify guarantees following achievements:

- The professional accredited with Fellow honor, is entitled to various benefits viz. name, fame, honor, regular flow of income, secured bright future, social status etc.

- In addition to above, if one is single author, then entitled to 40% discount on publishing research paper and can get 10%discount if one is co-author or main author among group of authors.
- The Fellow can organize symposium/seminar/conference on behalf of Global Journals Incorporation (USA) and he/she can also attend the same organized by other institutes on behalf of Global Journals.
- The Fellow can become member of Editorial Board Member after completing 3yrs.
- The Fellow can earn 60% of sales proceeds from the sale of reference/review books/literature/publishing of research paper.
- Fellow can also join as paid peer reviewer and earn 15% remuneration of author charges and can also get an opportunity to join as member of the Editorial Board of Global Journals Incorporation (USA)
- • This individual has learned the basic methods of applying those concepts and techniques to common challenging situations. This individual has further demonstrated an in–depth understanding of the application of suitable techniques to a particular area of research practice.

Note :

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- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
- In case of "Difference of Opinion [if any]" among the Board members, our decision will be final and binding to everyone.

"

Process of submission of Research Paper

The Area or field of specialization may or may not be of any category as mentioned in 'Scope of Journal' menu of the GlobalJournals.org website. There are 37 Research Journal categorized with Six parental Journals GJCST, GJMR, GJRE, GJMBR, GJSFR, GJHSS. For Authors should prefer the mentioned categories. There are three widely used systems UDC, DDC and LCC. The details are available as 'Knowledge Abstract' at Home page. The major advantage of this coding is that, the research work will be exposed to and shared with all over the world as we are being abstracted and indexed worldwide.

The paper should be in proper format. The format can be downloaded from first page of 'Author Guideline' Menu. The Author is expected to follow the general rules as mentioned in this menu. The paper should be written in MS-Word Format (*.DOC,*.DOCX).

The Author can submit the paper either online or offline. The authors should prefer online submission.Online Submission: There are three ways to submit your paper:

(A) (I) First, register yourself using top right corner of Home page then Login. If you are already registered, then login using your username and password.

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(III) Click 'Submit Manuscript'. Fill required information and Upload the paper.

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You can use your own standard format also.
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1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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Scope

The Global Journals Inc. (US) welcome the submission of original paper, review paper, survey article relevant to the all the streams of Philosophy and knowledge. The Global Journals Inc. (US) is parental platform for Global Journal of Computer Science and Technology, Researches in Engineering, Medical Research, Science Frontier Research, Human Social Science, Management, and Business organization. The choice of specific field can be done otherwise as following in Abstracting and Indexing Page on this Website. As the all Global

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The Global Journals Inc. (US) follows the definition of authorship set up by the Global Academy of Research and Development. According to the Global Academy of R&D authorship, criteria must be based on:

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2) Drafting the paper and revising it critically regarding important academic content.

3) Final approval of the version of the paper to be published.

All authors should have been credited according to their appropriate contribution in research activity and preparing paper. Contributors who do not match the criteria as authors may be mentioned under Acknowledgement.

Acknowledgements: Contributors to the research other than authors credited should be mentioned under acknowledgement. The specifications of the source of funding for the research if appropriate can be included. Suppliers of resources may be mentioned along with address.

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Manuscript submission is a systematic procedure and little preparation is required beyond having all parts of your manuscript in a given format and a computer with an Internet connection and a Web browser. Full help and instructions are provided on-screen. As an author, you will be prompted for login and manuscript details as Field of Paper and then to upload your manuscript file(s) according to the instructions.

To avoid postal delays, all transaction is preferred by e-mail. A finished manuscript submission is confirmed by e-mail immediately and your paper enters the editorial process with no postal delays. When a conclusion is made about the publication of your paper by our Editorial Board, revisions can be submitted online with the same procedure, with an occasion to view and respond to all comments.

Complete support for both authors and co-author is provided.

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Based on potential and nature, the manuscript can be categorized under the following heads:

Original research paper: Such papers are reports of high-level significant original research work.

Review papers: These are concise, significant but helpful and decisive topics for young researchers.

Research articles: These are handled with small investigation and applications

Research letters: The letters are small and concise comments on previously published matters.

5.STRUCTURE AND FORMAT OF MANUSCRIPT

The recommended size of original research paper is less than seven thousand words, review papers fewer than seven thousands words also.Preparation of research paper or how to write research paper, are major hurdle, while writing manuscript. The research articles and research letters should be fewer than three thousand words, the structure original research paper; sometime review paper should be as follows:

Papers: These are reports of significant research (typically less than 7000 words equivalent, including tables, figures, references), and comprise:

(a)Title should be relevant and commensurate with the theme of the paper.

(b) A brief Summary, "Abstract" (less than 150 words) containing the major results and conclusions.

(c) Up to ten keywords, that precisely identifies the paper's subject, purpose, and focus.

(d) An Introduction, giving necessary background excluding subheadings; objectives must be clearly declared.

(e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition; sources of information must be given and numerical methods must be specified by reference, unless non-standard.

(f) Results should be presented concisely, by well-designed tables and/or figures; the same data may not be used in both; suitable statistical data should be given. All data must be obtained with attention to numerical detail in the planning stage. As reproduced design has been recognized to be important to experiments for a considerable time, the Editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un-refereed;

(g) Discussion should cover the implications and consequences, not just recapitulating the results; conclusions should be summarizing.

(h) Brief Acknowledgements.

(i) References in the proper form.

Authors should very cautiously consider the preparation of papers to ensure that they communicate efficiently. Papers are much more likely to be accepted, if they are cautiously designed and laid out, contain few or no errors, are summarizing, and be conventional to the approach and instructions. They will in addition, be published with much less delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and to make suggestions to improve briefness.

It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

Format

Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.

Standard Usage, Abbreviations, and Units: Spelling and hyphenation should be conventional to The Concise Oxford English Dictionary. Statistics and measurements should at all times be given in figures, e.g. 16 min, except for when the number begins a sentence. When the number does not refer to a unit of measurement it should be spelt in full unless, it is 160 or greater.

Abbreviations supposed to be used carefully. The abbreviated name or expression is supposed to be cited in full at first usage, followed by the conventional abbreviation in parentheses.

Metric SI units are supposed to generally be used excluding where they conflict with current practice or are confusing. For illustration, 1.4 l rather than 1.4 × 10-3 m3, or 4 mm somewhat than 4 × 10-3 m. Chemical formula and solutions must identify the form used, e.g. anhydrous or hydrated, and the concentration must be in clearly defined units. Common species names should be followed by underlines at the first mention. For following use the generic name should be constricted to a single letter, if it is clear.

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All manuscripts submitted to Global Journals Inc. (US), ought to include:

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Optimizing Abstract for Search Engines

Many researchers searching for information online will use search engines such as Google, Yahoo or similar. By optimizing your paper for search engines, you will amplify the chance of someone finding it. This in turn will make it more likely to be viewed and/or cited in a further work. Global Journals Inc. (US) have compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals Inc. (US) homepage at the judgment of the Editorial Board.

The Editorial Board and Global Journals Inc. (US) recommend that, citation of online-published papers and other material should be done via a DOI (digital object identifier). If an author cites anything, which does not have a DOI, they run the risk of the cited material not being noticeable.

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Figures: Figures are supposed to be submitted as separate files. Always take in a citation in the text for each figure using Arabic numbers, e.g. Fig. 4. Artwork must be submitted online in electronic form by e-mailing them.

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Before start writing a good quality Computer Science Research Paper, let us first understand what is Computer Science Research Paper? So, Computer Science Research Paper is the paper which is written by professionals or scientists who are associated to Computer Science and Information Technology, or doing research study in these areas. If you are novel to this field then you can consult about this field from your supervisor or guide.

TECHNIQUES FOR WRITING A GOOD QUALITY RESEARCH PAPER:

1. Choosing the topic: In most cases, the topic is searched by the interest of author but it can be also suggested by the guides. You can have several topics and then you can judge that in which topic or subject you are finding yourself most comfortable. This can be done by asking several questions to yourself, like Will I be able to carry our search in this area? Will I find all necessary recourses to accomplish the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

2. Evaluators are human: First thing to remember that evaluators are also human being. They are not only meant for rejecting a paper. They are here to evaluate your paper. So, present your Best.

3. Think Like Evaluators: If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

4. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

5. Ask your Guides: If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

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7. Use right software: Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

8. Use the Internet for help: An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

9. Use and get big pictures: Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

10. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

13. Have backups: When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

14. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

15. Use of direct quotes: When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. Pick a good study spot: To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

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- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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