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Effects of Conservation Tillage Integrated with *'Fanya Juus' Structure* on Soil Loss in Northern Ethiopia

By Habtamu Muche, Fantaw Yimer & Melesse Temesgen
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Abstract- In the Northern highlands of Ethiopia, surface runoff and soil loss have been identified as critical problems and the most limiting factors in agricultural production. Although different soil and water conservation mesures have been constructed by mobilizing the communities and resources, runoff has continued and put extra pressure on the structures. This study was initiated to investigate surface runoff and soil loss as affected by integration of conservation tillage with fanya juus' at plot level at Enerata kebele, East Gojjam Zone of Amhara Region. There were two tillage treatments (CT and TT) combined with newly constructed fanya juus with four replications. Runoff and soil loss were recorded at 38 rainfall event through three tied trenches within wheat (triticum vulgare) and tef (eragrostis tef) farm plots. Result showed that average runof f coefficients of 17.72% and 43.96% were recorded due to conservation tillage system from wheat and tef farm plots, respectevly. Thus, runoff coefficient induced 0.54 and 0.18 times reduced in soil loss from wheat and tef plots, respectively. Reduction of runoff volume and soil loss in the conservation tillage systems were attributed to retarded movement of water in the presence of invisible barriers in each furrow that are laid along the contour. The retarded movement of water resulted in increased infiltration and reduced soil loss. Overall, conservation tillage system has a paramount importance in reduction of soil loss while integrated with fanya juus' structures in cultivated lands.

Keywords: *conservation tillage, fanya juus, runoff, soil loss.*

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Habtamu Muche [α], Fantaw Yimer [σ] & Melesse Temesgen [ρ]

Abstract- In the Northern highlands of Ethiopia, surface runoff and soil loss have been identified as critical problems and the most limiting factors in agricultural production. Although different soil and water conservation mesures have been constructed by mobilizing the communities and resources, runoff has continued and put extra pressure on the structures. This study was initiated to investigate surface runoff and soil loss as affected by integration of conservation tillage with *fanya juus'* at plot level at Enerata kebele, East Gojjam Zone of Amhara Region. There were two tillage treatments (CT and TT) combined with newly constructed *fanya juus* with four replications. Runoff and soil loss were recorded at 38 rainfall event through three tied trenches within wheat (*triticum vulgare*) and tef (*eragrostis tef*) farm plots. Result showed that average runof f coefficients of 17.72% and 43.96% were recorded due to conservation tillage system from wheat and tef farm plots, respectevly. Thus, runoff coefficient induced 0.54 and 0.18 times reduced in soil loss from wheat and tef plots, respectively. Reduction of runoff volume and soil loss in the conservation tillage systems were attributed to retarded movement of water in the presence of invisible barriers in each furrow that are laid along the contour. The retarded movement of water resulted in increased infiltration and reduced soil loss. Overall, conservation tillage system has a paramount importance in reduction of soil loss while integrated with *fanya juus'* structures in cultivated lands.

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I. Introduction

Soil erosion remains a major threat to soil productivity, agricultural sustainability and rural livelihoods (Tengberg et al., 1997). Especially, it is so severe that there is nowhere in the world where erosion is more destructive to the environment than in the Ethiopian highlands(Dejene,1990; Admasse, 1995). Soil erosion by water represents a major threat to the long-term productivity of agriculture in the Ethiopian highlands (FAO, 1986; 1998). Erkossa et al. (2005 citing SCRP, 1987) repoted that annual soil loss in Ethiopia is estimated at between 1.5 and 3 billion (10^9) tones. Of this, 50% is lost from croplands where it may be as high as 296 t ha^{-1} on steep slopes. Estimates on soil erosion have shown some variabilities. Forexample, 7 t ha^{-1} y^{-1} (Nyssen, 2001) to more than 24 t ha^{-1} y^{-1} (Tamene, 2005); and 80 t ha^{-1} y^{-1} (Tekeste and Paul, 1989) were reported. FAO (1986), also estimated up to 130 t ha^{-1} y^{-1} from cropland and 35 t ha^{-1} y^{-1} averaged over all land use types in the highlands of Ethiopia. Similarly, Hurni (1993) reported from croplands 42 t ha^{-1} yr^{-1}; Herweg and Stillhardt (1999) 59-167 ton/ha, (Girmay *et al.,* 2009) 57 t ha^{-1} yr^{-1}; and (Shiferaw and Holden, 1999)179 t ha^{-1} yr^{-1}, indicated annual losses where soils are conventionally ploughed repeatedly, crop residue is removed completely at harvest leaving no soil cover and aftermath overgrazing of crop fields is common (Oicha 2010; Ayaya, 2011; 2012). Such practices have been intense in the northern and central part of the country, a region with a long history of human settlement where deforestation through land use changes have been practiced for many centuries. In the Ethiopian highlands, agriculture based on cultivation of cereals is thought to have occurred for at least 7000 years (Ehret, 1979).

Cultivation is practiced traditionally through cross plowing using an ard plow (*Maresha*), whose shape and structure have remained unchanged for thousands of years (Goe, 1990; Nyssen et al., 2000; Solomon et al., 2006). This simple wooden ox-drawn plow is well suited for tropical clayey soils because it breaks through hard, dry topsoils. It is also, however, 70 an instrument associated with tillage practices that lead to high rates of on-field erosion, particularly on steep slopes, and the development of a hard, infiltration limiting plow pan (Belay et al., 2013). This traditional maresha cannot permit contour plowing in consecutive tillage operations (Melesse *et al.,* 2008). Cross plowing through *maresha* increases surface runoff as a result of plowing-up and down-the slope.

The existing traditional tillage operation, though varied with crop type, induces erosion due to multiple passes with the maresha, without considering difference in topography, soil type and agro-climatic zone, has become the main factor of land degradation and loss of productivity in the Ethiopian highlands (Hurni and Perich, 1992; Hurni, 1993; Tulema et al., 2008). These repeated operations cause moist soil to move to the surface favoring water loss by evaporation, exposing the

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soil to both wind and water erosion (Astatke et al., 2003) and causing structural damage (Melesse et al., 2008). Soil erosion due to high tillage frequency and other soil management problems has seriously affected over 25% of the Ethiopian highlands (Kruger et al., 1996). Such detrimental effect of soil erosion and water stress can be improved to some extent by other management options like conservation tillage integrated with *fanna juu* structures. Small holder farmers have introduced the practice, of course, with the technical support by Development Agents, with the aim to improve soil properties, conserve moisture, reduce runoff and soil loss from their farm lands.

Physical soil conservation structures (SCS) have a paramount importance in decreasing surface runoff. However, in the present study area high rainfall intensity, and increased surface runoff have put extra pressure on the existing soil bund and fannya juu physical structures leading to structural damages, subsequent rill and gulley formations. Thus, it has brought some setbacks to the adoption of soil conservation structures in high rainfall areas 93 such as water loggings, inconveniences to the tradition of cross plowing and concerns about cropland taken up by the structures (Wood, 1990; AHI, 1997; Thomas et al., 1997; Habtamu, 2006).

Conservation tillage system may address the aforementioned problems by reducing surface runoff and improving the infiltration capacity of the soil. According to Melesse (2007; 2009), conservation tillage is a system that conserves water and soil while saving labor and traction needs. This study was undertaken to investigate the effects of conservation tillage integrated with *fanya juus* on runoff and soil loss at plot level in Choke Mountain region, Ethiopia. This type of monitoring is best suited to portraying soil erosion processes and soil disturbances on-site (Corner et al., 1996). On-site soil loss monitoring with runoff plots was found to be a suitable and useful approach as it clearly demonstrates site disturbances and,most importantly, the cause and effect linkages between interventions and impacts (Hartanto et al., 2003).

II. Materials and Methods

a) Study site

The study was carried out in Gozamen Woreda, East Gojjam Zone of Amhara National Regional State of Ethiopia. Enirata, the study site, is located 5 km from Debere Markos town in the North West direction (Fig.1). The altitude of the site ranges between 2380 and 2610m above mean sea level. The mean annual total rainfall and temperature are 1300 mm and 15oC, respectively. More than 75% of the annual rain is falling during the months from June to September (*kiremt* rainy season). Nitisols is the dominant soil type in the study area (Belay et al., 2013). These deep, weathered tropical soils are highly susceptible to erosion, and on cultivated lands using traditional methods the rate of soil loss can exceed the rate of soil generation by a factor of 4 to 10 (Hurni, 1988). This has been attributed in part to the prevalence of traditional 116 ox-drawn tillage systems that have been found to promote rapid erosion in the Ethiopian Highlands (Nyssen et al., 2000).

Tillage is exclusively carried out using the traditional tillage implement, *Maresha*. Plowing is done repeatedly before sowing, though, varies with crop types. According to the farmers' response, *teff* fields are plowed after five to seven passes, while other cereal crops required only three to four passes. However, such practice could vary in other parts of the country. Forexample, *teff* is cultivated with intensive seed bed preparations with 3–5 passes in semi-arid (Solomon et al., 2006; Melesse et al., 2008; 2009) and 5–8 passes in humid areas of the country (Fufa et al., 2001) using the ox-driven local maresha, aimed mainly to avoid weeds.

b) Experimental setup

Two tillage treatments (conservation tillage and traditional tillage) were cultivated with wheat and teff and replicated four times under eight experimental plots of 5m × 30m treated with *fanya juus* in a Randomized Complete Block Design (RCBD) to measure runoff and sediment loss (Fig 2a). The plots were fenced on the three sides with galvanized iron sheets inserted 20 cm into the ground while the remaining 15cm height above the surface. The fences covered the three sides while *fanya juus* bordered the lower sides of each plot, and then runoff and sediments come into the lower side of collection trench.

All plots were plowed using the traditional tillage implement (*Maresha*) during the first pass. During subsequent passes, two different tillage treatments were applied: conservation tillage (CT) and traditional tillage (TT). Conservation tillage was carried out using a winged sub137 soiler operated along the furrows made by the previous pass of the *Maresha* plow while traditional tillage involved cross plowing using *Maresha* (Melesse, 2007).

The design of trench and field layout were done after determining the surface 139 soil texture (clay loam), slope gradient (7-9%) and the highest rainfall intensity [85mm/day] of the study area from 2001-2010 (DMMS, 2010). The designed trench dimensions are presented in Fig 2b.

c) Data collection methods

Three small soil pits were excavated diagnonally at each experimental plot to collect both disturbed and undisturbed core soil samples from depths of 0–10, 10-20 and 20–30cm. For the determination of soil textural fractions and soil organic matter content, samples were collected from each depth. A total of 144 soil samples (2 treatments*2 crop types*4 replications*3 pits*3 depths)

were collected across all experimental plots. Similarly, additional independent undisturbed soil samples with cylindrical cores were taken for the determination of soil dry bulk density. A total of 48 infiltration measurements were taken (3 measurements*2 treatments*2 crop types*4 replicates) using double-ring infiltrometer (Bertrannd, 1965). The inner rings had diameters of 28, 30 and 32 cm and the outer rings 53, 55 and 57 cm. The rings were driven approximately 5 cm into the soil using a metal plate and sledge hammer. Water was filled to 20 cm above the soil surface. The rings were refilled to the 20 cm head level each time when the head approached 5 cm above the soil surface. Changes in water levels were recorded at time increments of 0, 1, 2, 5, 10, 15, 20, 30, 40 and 60 min for calculation of infiltration rate and cumulative infiltration (Fantaw et al., 2008).

Prior to soil physical and chemical analyses, all samples were air-dried at room temperature and passed through a 2 mm soil sieve. Soil textural fractions were determined by the hydrometer method after dispersion with sodium hexametaphosphate solution. SOC was determined according to the Walkley and Black method (Schnitzer, 1982). Soil dry bulk density was calculated by dividing the oven dry mass at 105 ^{0}C by the volume of the core. The data were then grouped and summarized according to the treatments (CT and TT).

From the 38 rainfall events induced runoff and soil losses in the lower part of each plot were also measured. The soil loss was measured both as trapped behind the *fanya juus* carried out by pegs and from the part leaving the experimental plot via trenches. Moreover, a sediment collection trough with three isolated parts (trenches) made of galvanized iron sheet were installed to measure the runoff and sediment leaving the plot. In the first trench most of the bed load trapped, while suspended sediments were obtained in all trenches. Twenty pipes were attached close to the top of the lower side of the first trench. One of these pipes was connected to the second trench. The second trench would thus take 5% of the volume from the first trench and pass on 10% of its volume to the third trench through one of the ten pipes attached close to the top of its lower side. The third trench thus collected and stored 0.5% of the daily direct runoff. Therefore, total daily runoff was weighted as the summation of the volumes of the three trenches: T1, T2 and T3.

However, total sediment was calculated as the sum of bed load and suspended load from the trenches. Bed load was carried out by depth measurements at four corners of the trenches and one at the center. Subsequently, the wetted bed load was air dried and weighted. One liter water sample was collected from all trenches for determination of suspended sediment concentration. The sampled water was analyzed using the filtration technique as shown Fig 3. All trenches were cleaned after taking the necessary measurements and made ready for subsequent measurements. Moreover, experimental plots were inspected after every rainfall event for any sign of failure. Statistical differences were tested using two-way analysis of variance (ANOVA) following the general linear model (GLM) procedure of SAS version 9.2. Tukey's honest significance difference (HSD) test was used for mean separation when the analysis of variance showed statistically significant differences ($p < 0.05$).

III. Results and Discussion

a) Soil properties

Excetpt the overall mean bulk density, other soil properties in this study (particle size distribution of sand, silt and clay) and soil organic matter didn't show any significant variations ($p>0.05$, Table 1) with tillage systems. The bulk density under the CT was found to be relatively lower attributed to the slightly higher SOM. Soil organic matter plays a significant role, no matter how big or small the variation is, in improving the soil bulk density.

Mean soil dry bulk density (Bd) under the traditional and conservation tillage systems were significantly different ($p=0.05$) and increased with depth (Table 1). Both the overall and top surface Bd were found to be lower (0.93g cm^{-3}) in soil under the conservation tillage than in the traditional tillage. The lower Bd in the surface soil could be attributed to the relatively higher soil organic matter contents, though not varied significantly across the treatments. Besides the relatively higher SOM contents, the lower over all mean Bd in soil under CT might be related to deep plowing effects which has disrupted the plow plan (Melesse *et al.*, 2008).

b) Water infiltration

Infiltration rate and cumulative infiltration values are presented in Table 2. Results showed that both the rate and cumulative infiltrations significantly ($p=0.01$) varied with respect to tillage systems. Both the infiltration rate and cumulative infiltration values were higher in the conservation tillage system as compared to the traditional tillage system (Table 204 2, Fig. 4). The lower infiltration rate in traditional tillage system may be attributed to the cultivation practice which shears and pulverizes the soil, reduces the macro-pore space and produces a discontinuity in pore space between the cultivated surface and the subsurface layer of the soil (Abdul-Megid et al., 1987; Broersma *et al.,* 1995; Fantaw *et al.,* 2008; Thierfelder and Wall, 2009).

c) Runoff

A significant difference in surface runoff was observed between the two tillage systems under the wheat farm but not in *teff* farm plots. This was due to effects of surface soil compaction resulting from animal trampling during broadcasting of *teff* seeds meant for firming seedbed for improved establishment of the small

seeded crop. The effect of animal trampling during sowing of *teff* on the reduction of water infiltration into the soil and increased surface runoff has been documented (Liisa, *et al*, 2004). The highest runoff depth under the traditional tillage was recorded on 27th August, 2010 which resulted in a 23.15mm runoff depth (out of 43.2mm rainfall), which was 54% more than the runoff under the conservation tillage system (Fig 5a). During the study period a total of 153.40 and 79.48mm of total runoff (out of 343.67mm total rainfall) has been recorded in the traditional tillage and conservation tillage systems, respectively. As both treatment plots were under similar conditions with soil type, slope and rainfall distribution, the difference in the depth of runoff generated was mainly attributed to the treatments used. Traditionally, tillage was carried out through cross ploughing of the up and down farming system that was noticeable for the highest runoff generated. The average soil depth of plowing with traditional tillage was 0.57 times lower than that of the corresponding tillage treatment. Repeated tillage at such shallow depth likely produces plow pans as has been found elsewhere in Ethiopia (Melesse *et al.,* 2008). Since the soil bulk density 227 (Table 1) was higher in the traditional ploughed plots, infiltration into the soil was not fast, which was further accelerated by the maximum runoff produced (Nyssen *et al.,* 2000).

On the other hand, average runoff coefficients of 33.5% and 17.7% were recorded in wheat farm plots under the traditional and conservation tillage treatments, respectively. This implied that the rest percentage of the rain was either infiltrated into the soil or lost as evaporation from depression storages or intercepted by plant leaf. The corresponding average runoff coefficient in *teff* farm plots under the traditional and conservation tillages were 50.07% and 43.96%, respectively. The average runoff coefficient was reduced by more than 50% due to the conservation tillage system as compared to the traditional ploughing on wheat farm plot.

The overall results of the present study showed reduced runoff depth and thereby reduced runoff coefficient in the conservation tillage systems compared to the traditional cultivation. Similar study conducted in Spain (De Alba *et al*., 2001) showed a 40% reduction in runoff volume due reduced tillage compared to traditional cultivation. Bonari *et al.* (1995) also reported a 55% reduction in runoff volume when compared to the traditional tillage on a clay soil.

d) Soil loss

Mean soil loss values were found to be significantly different with respect to the tillage systems. The highest sediment yield (bed load plus suspended sediment) from the isolated trenches was recorded in both treatments during the highest runoff periods. The overall result showed that bed load sediment yield was reduced by 47% and 18.42% under conservation tillage as compare to traditional tillage system on wheat and *teff* farm plots, respectively. Similarly, the overall result showed that suspended sediment in conservation tillage was 0.56 and 0.14 times lower than the traditional tillage system on wheat and teff farm plots, respectively.

The total sediment yield (TSY) was higher in the traditional ploughing as compared to conservation system and with a significant treatment effect (Fig. 7). On August 27 the highest daily TSY was recorded in the traditional tillage system which was 1735.21kg from a runoff event with a volume of 231.5m^3 per ha. On this event, the total sediment yield in the conservation tillage treatment was reduced by 57% (Fig. 6).

Unlike wheat fields, *teff* fields showed no significant difference in treatment effects on total sediment yield. This could be due to soil compaction from animal trampling during sowing of *teff* that could undermine treatment effects as compared to wheat farm plot. However, differences in total sediment yield due to tillage treatments were clearly noticeable at higher rainfall depth as observed in Fig 7.

Generally, sediment yield increase as runoff volume increases in both treatment plots throughout the study period. This trend was emanated from the rainfall amount and intensity, which detaches the soil aggregates and transport it easily by sheet erosion (Abiye *et al.,* 2002). Besides, contour ploughing retards the velocity of the water flowing and transported soil materials to the lower part of the plots. So, sediment yield was less in conservation tillage as compared to the traditional tillage system.

IV. Conclusions

In this study, integration of conservation tillage with *fanya juu* showed a significant reduction in soil erosion. This was due to reduction in runoff volume attributed to retarded movement of water in the presence of invisible barriers at each furrow laid along the contour. The retarded movement of water has increased infiltration and reduced soil loss. Enhancing the performance and adoption of soil conservation structure through the integration of conservation tillage systems will have a long term impact on reducing soil erosion and combating land degradation in the highlands of Ethiopia.

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References Références Referencias

1. Abdul-Megid, A.H., Schuman, G.E. and Hart, R.H., 1987. Soil bulk density and water infiltration as affected by grazing systems. Journal of Range Management 40, 307 309.
2. Abiye, A., Jabbar, M., Mohamed-Saleem, M.A., Erkossa, T., 2002. Development and testing of low cost animal drawn minimum tillage implements: experience on Vertisols in Ethiopia. Agric. Mechanization Asia Africa Latin America 33, 290-302.
3. Admassie, Y. (1995) Twenty Years to Nowhere. Property Rights, Land Management and Conservation in Ethiopia. PhD thesis, Uppsala University, Sweden.
4. AHI, 1997. The African Highlands Initiative: Cultivating the future. Nairobi, Kenya. 17 p. Araya, T, W. M. Cornelis, J. Nyssen, B. Govaerts, H. Bauer, Tewodros Gebreegziabher, Tigist Oicha, D. Raes, K. D. Sayre, Mi t iku Haile & J. Deckers. (2011), Effects of conservation agriculture on runoff, soil loss and crop yield under rainfed conditions in Tigray, Northern Ethiopia. Soil Use and Management 27, 404–414.
5. Araya T., Wim M. Cornelis, Jan Nyssen, Bram Govaerts, Fekadu Getnet, Hans Bauer, Kassa Amare, Dirk Raes, Mitiku Haile, Jozef Deckers. (2012) Medium-term effects of conservation agriculture based cropping systems for sustainable soil and water management and crop productivity in the Ethiopian Highlands. Field Crops Research 132, 53–62.
6. Astatke A., Jabbar M. and Tanner D. 2003. Participatory conservation tillage research: an experience with minimum tillage on an Ethiopian highland Vertisol. Agriculture Ecosystem & Environment 95, 401- 415.
7. Belay, S., Benjamin F. and Mutlu O., 2013. Agroecosystem Analysis of the Choke Mountain Watersheds, Ethiopia. Journal of Sustainability 5, 592-616.
8. Bertrannd, A.R., 1965. Rate of water intake in the field. In: Black, C.A. (Ed.), Methods of Soil Analysis, Part I. American Society of Agronomy, Madison, WI, pp. 197–209.
9. Bonari, E., Mazzonzini, M., Peruzzi, A., and Ginanni, M., 1995. Soil erosion and nitrogen loss as affected by different tillage systems used for durum wheat cultivated in a hilly clayey soil. EC-Workshop II Experience with the applicability of no-tillage crop production in the West-European countries, Silsoe, May 15–17, 1995, pp.105–121.
10. Broersma, K., Robertson, J.A., and Chanasyk, D.S., 1995. effects of different cropping systems on soil water properties of a Boralf soil. Communication Soil Society 26,1795-1811.
11. Corner, R.A., Bassman, J.H., Moore, B.C., 1996. Monitoring timber harvest impacts on stream sedimentation: instream vs. upslope methods. Western J. Appl. For. 11 (1), 25–32.
12. DMMS (Debre Markos Meteorological Station). 2010. Meteorological data report from the Year 2001-2010. Meteorological Station at Debre-Markos, Ethiopia. (Unpublished Report).
13. De Alba, S., Lacasta, C., Benito, G., and Perez-Gonzalez, A., 2001. Influence of soil management on water erosion in a Mediterranean semiarid environment in Central Spain. In: World Congress on Conservation Agriculture, Madrid, Spain, pp. 158-165.
14. Dejene, A. (1990) Environment, Famine, and Politics in Ethiopia: A view from the village. Lynne Rienner Publishers, Inc.
15. Douglas, C.L., King, K.A., and Zuzel, J.F. 1998. Nitrogen and Phosphorus in the surface runoff and sediment from a wheat-pea Rotation in northern Oregon. Journal of Environmental quality, 27,1170-1177.
16. Ehret, C., 1979. On the antiquity of agriculture in Ethiopia. J. Afr.Hist. 2, 161–177.
17. Erkossa T., Stahr K. & Gaiser T., 2005. Effect of different methods of land preparation on runoff, soil and nutrient losses from a Vertisol in the Ethiopian highlands. Soil Use and Management 21, 253–259.
18. FAO, 1986. Ethiopian highland reclamation study: Ethiopia, Final Report, FAO, Rome, Italy.
19. FAO, 1998. Conventional tilling severely erodes the soil. New concepts for soil conservation required. Press release. Viewed 6/9: http://www.fao.org /waicent/ois/press_ne/presseng/1998/pren9842.htm
20. Fantaw, Y., Messing, I., Ledin, S, and Abdu, A., 2008. Effects of different land use types on infiltration capacity in a catchment in the high lands of Ethiopia. Soil Use and Management 24, 344-349.
21. Fufa, H., Tesfa, B., Hailu, T., Kibebew, A., Tiruneh, K., Aberra, D., Seyfu, K., 2001. Agronomy research in Tef. In: Hailu, T., Getachew, B., Mark, S. (Eds.), Narrowing the Rift. Tef Research and Development. Proceedings of the International Workshop on Tef Genetics and Improvement, Debre Zeit, Ethiopia, 16–19 October 2000, pp. 167–176.
22. Goe, M.R., 1990. Tillage with the traditional maresha in Ethiopian highlands. Tools and Tillage 6 (3), 127–156.
23. Girmay, G, Singh, BR, Nyssen, J and Borrose, T. 2009. Runoff and sediment-associated nutrient losses under different land uses in Tigray, Northern Ethiopia. Journal of Hydrology 376, 70-80.
24. Habtamu, E. 2006. Adoption of Physical Soil and Water Conservation Structures; MSc thesis, Addis Ababa University, Ethiopia, pp 65–66.

25. Hartanto, H., Prabhu, R., Widayat, A.S.E., Asdak, C., 2003. Factors affecting runoff and soil erosion: plot-level soil loss monitoring for assessing sustainability of forest management. Forest Ecology and Management 180, 361–374.
26. Herweg, K., and Stillhardt, B., 1999. The variability of soil erosion in the Highlands of Ethiopia and Eritrea. Research Report 42. Centre for Development and Environment. University of Berne.
27. Hurni, H., 1988. Degradation and conservation of the resources in the Ethiopian highlands. Mountain Research and Development 8, 123–130.
28. Hurni, H., 1993. Land degradation, famines and resource scenarios in Ethiopia. In: Pimentel, D. world soil erosion and conservation. Cambridge university press. Cambridge, pp. 27– 62.
29. Hurni, H., Perich, I., 1992. Towards a Tigray regional environmental and economic strategy. Development and Environment Reports No. 6. Group for Development and Environment (GDE). Institute of Geography. University of Berne, Switzerland.
30. Kruger H Berhanu F Yohannes G & Kefeni K 1996. Creating an inventory of indigenous soil and water conservation measures in Ethiopia. In: Sustaining the soil: indigenous soil and water conservation in Africa, eds C Reij I Scoones & C Toulmin, International Institute for Environment and Development Earthscan UK.
31. Liisa, P., Rainer, H and Markku, Y., 2004. Effects of trampling by cattle on the hydraulic and mechanical properties of soil. Soil and Tillage Research 82, 99-108.
32. Melesse, T., 2007. Conservation Tillage Systems and Water Productivity Implications for Smallholder Farmers in Semi-arid Ethiopia. PhD Thesis. Taylor & Francis/Balkema, Leiden, the Netherlands, pp. 9-16
33. Melesse, T., Rockstrom, J., Savenije, H.H.G., Hoogmoed, W.B., and Alemu, D., 2008. Determinants of tillage frequency among smallholder farmers in two semi-arid areas in Ethiopia. University Press, Cambridge. Physics and Chemistry of the Earth. 33, 183–191.
34. Melesse, T., Hoogmoed, W., Rockström, J., and Savenije, H., 2009. Conservation Tillage Implements for Smallholder farmers in Semi-arid Ethiopia. Soil and Tillage Research 104, 185–191.
35. Nyssen, J., Poesen, J. Mitiku, H., Moeyesons, J., and Deckers, J., 2000. Tillage erosion by the traditional plough of the Ethiopian Highlands. Soil and Tillage Research 57, 115-127.
36. Nyssen, J. 2001. Erosion processes and soil conservation in a tropical mountain catchment under threat of anthropogenic desertification: a case study from Northern Ethiopia, Ph.D. thesis, Katholieke University, Leuven, Belgium.
37. Oicha Tigist, Cornelis, Wim M., Verplancke Hubert , Nyssen Jan , Govaerts Bram , Behailu Mintesinot, Haile Mitiku , Deckers Jozef. 2010. Short-term effects of conservation agriculture on Vertisols under tef (Eragrostis tef (Zucc.) Trotter) in the northern Ethiopian highlands. Soil & Tillage Research 106, 294–302.
38. Schnitzer, M., 1982. Total carbon, organic matter, and carbon. In: Page, A.L., Miller, R.H., Keeney, D.R. (Eds.), Methods of Soil Analysis. Part 2, Agronomy Monograph, vol. 9, 2nd ed. American Society of Agronomy, Madison, WI, pp. 539–577.
39. SCRP (Soil Conservation Research Project) 1987. Soil conservation progress report. Ministry of Agriculture, PO Box 62347, Addis Ababa Ethiopia. Shiferaw, B and Holden, S. 1999. Soil Erosion and Smallholders' Conservation Decisions in the Highlands of Ethiopia. World Development 27(4), 739-752.
40. Solomon, G., Mouazen, A., Van Brussel, H., Ramon, H., Nyssen, J., Verplancke, H., Mintesinot, B., Deckers, J., De Baerdemaeker, J., 2006. Animal drawn tillage, the Ethiopian ard plough, maresha: a review. Soil Tillage Res. 89, 129–143.
41. Tamene, L. 2005. Reservoir siltation in the dry lands of northern Ethiopia: causes, source areas and management options, Ph.D. thesis, University of Bonn, Bonn, Germany.
42. Tekeste, G., and Paul, D. S., Soil and water conservation in Tigray, Ethiopia. Report of a Consultancy Visit to Tigray, University of Wageningen,Wageningen, The Netherlands,
43. Tengberg, A., Stocking, M.A., & DaVeiga, M., (1997). The impact of erosion on the productivity of a Ferralsol and a Cambisol in Santa Catarina, southern Brazil. Soil Use and Management 13, 90-96.
44. Thierfelder, C., and Wall, P.C., 2009. Effects of conservation agriculture techniques on infiltration and soil water content in Zambia and Zimbabwe. Soil and Tillage Research 105, 217–227.
45. Thomas, D.B., Erikson, A., Grunder, M., and Mburu, J., 1997. Soil and water conservation Manual for Kenya. Soil and Water Conservation Branch, Ministry of Agriculture, Livestock Development and Marketing. Republic of Kenya. Nairobi, pp 49- 55.
46. Tulema Balesh, Aune Jens B., Johnsen Fred H., Vanlauwe Bernard. 2008. The prospects of reduced tillage in tef (Eragrostis tef Zucca) in Gare Arera, West Shawa Zone of Oromiya, Ethiopia. Soil & Tillage Research 99, 58–65.
47. Wood, A., 1990. Natural resource management and rural development in Ethiopia. In: Pausewang, S., Cheru, F., Bruene, S., Chole, E., (Eds.), Ethiopia: Rural Development Options. Zed Books, London, pp 58.

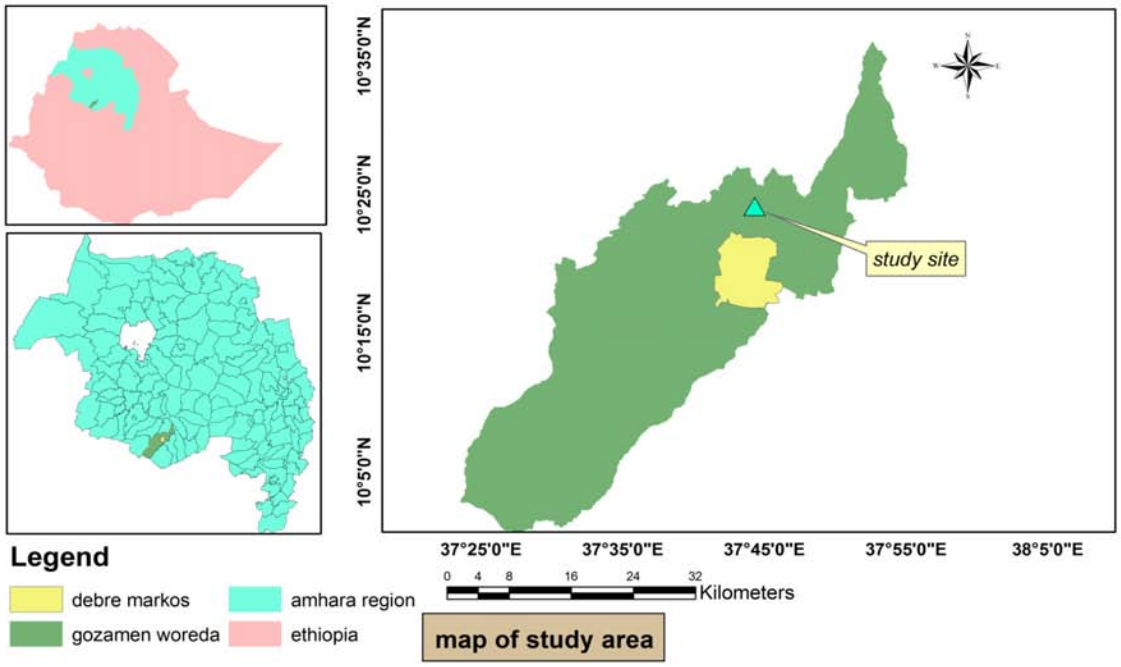

Figure 1 : Location map of the study area

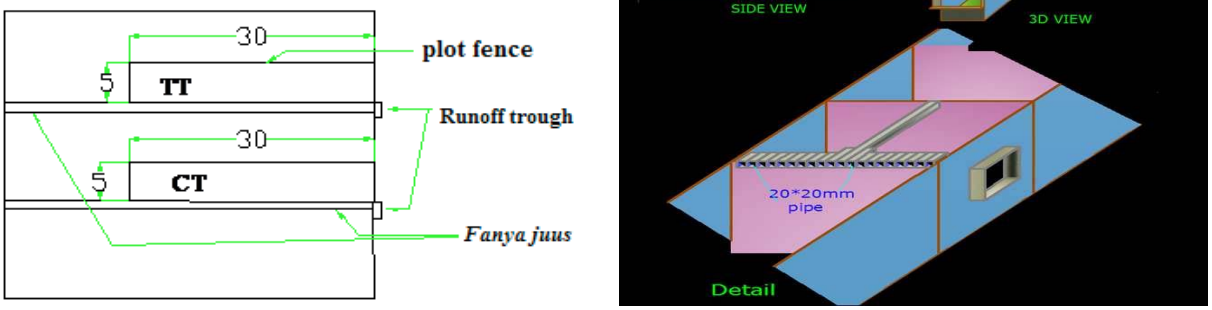

Figure 2 : Layout of a single replication (2a) and design of runoff and sediment collection trench (2b) collection trench

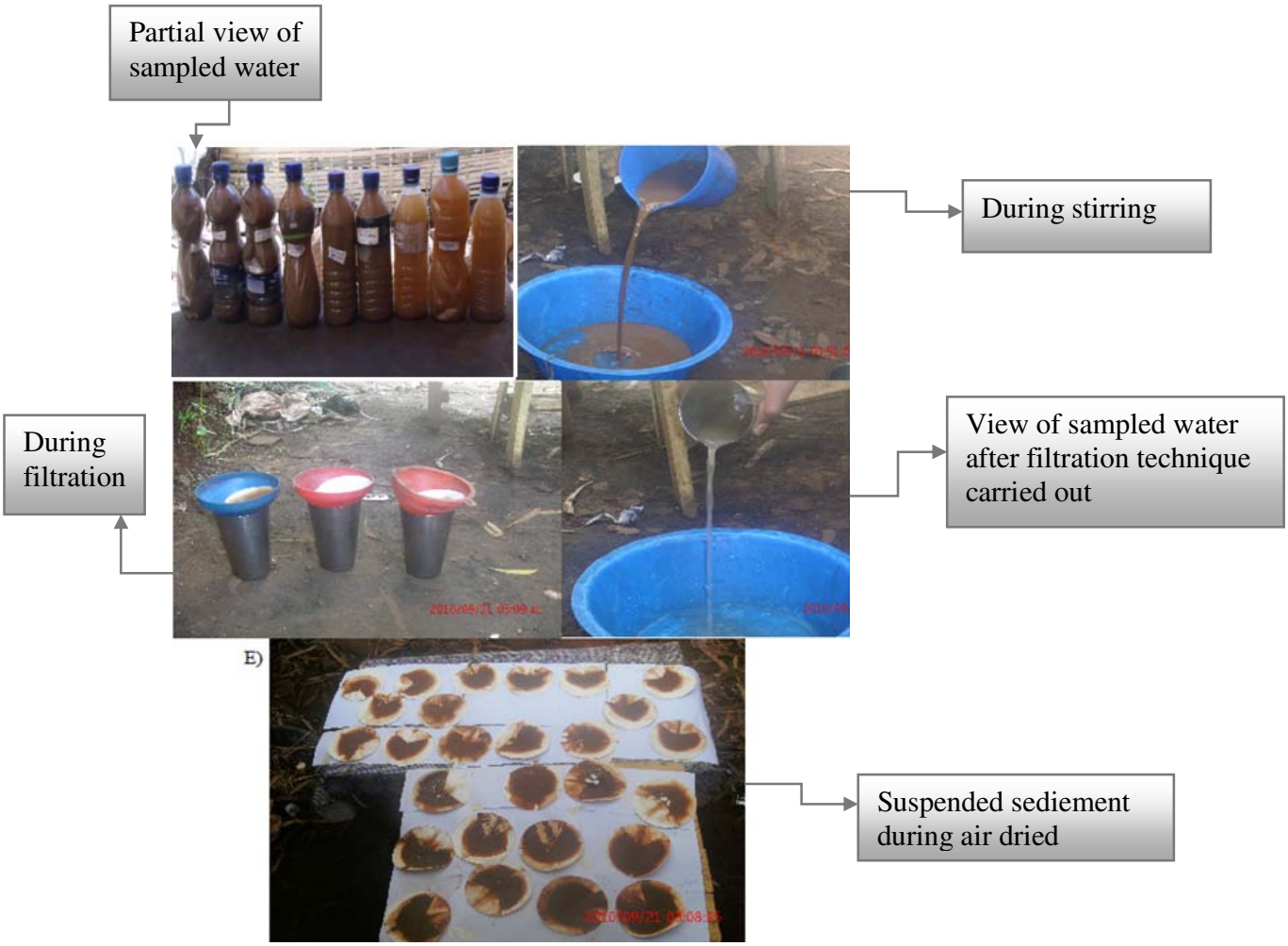

Figure 3 : Determination of suspended sediment

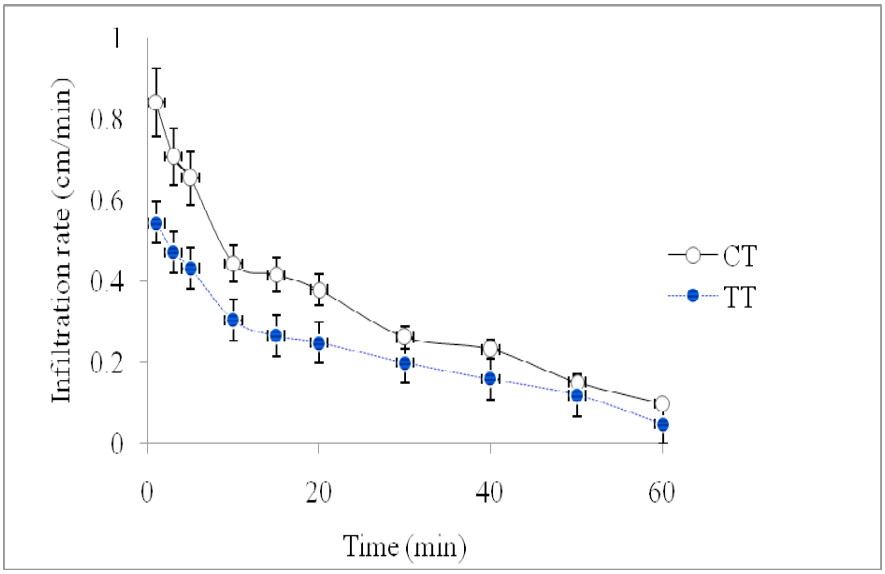

Figure 4 : Infiltration rate with tillage methods (CT= means conservation tillage using winged sub-soiler while TT is traditional tillage using *Maresha*) in the study area)

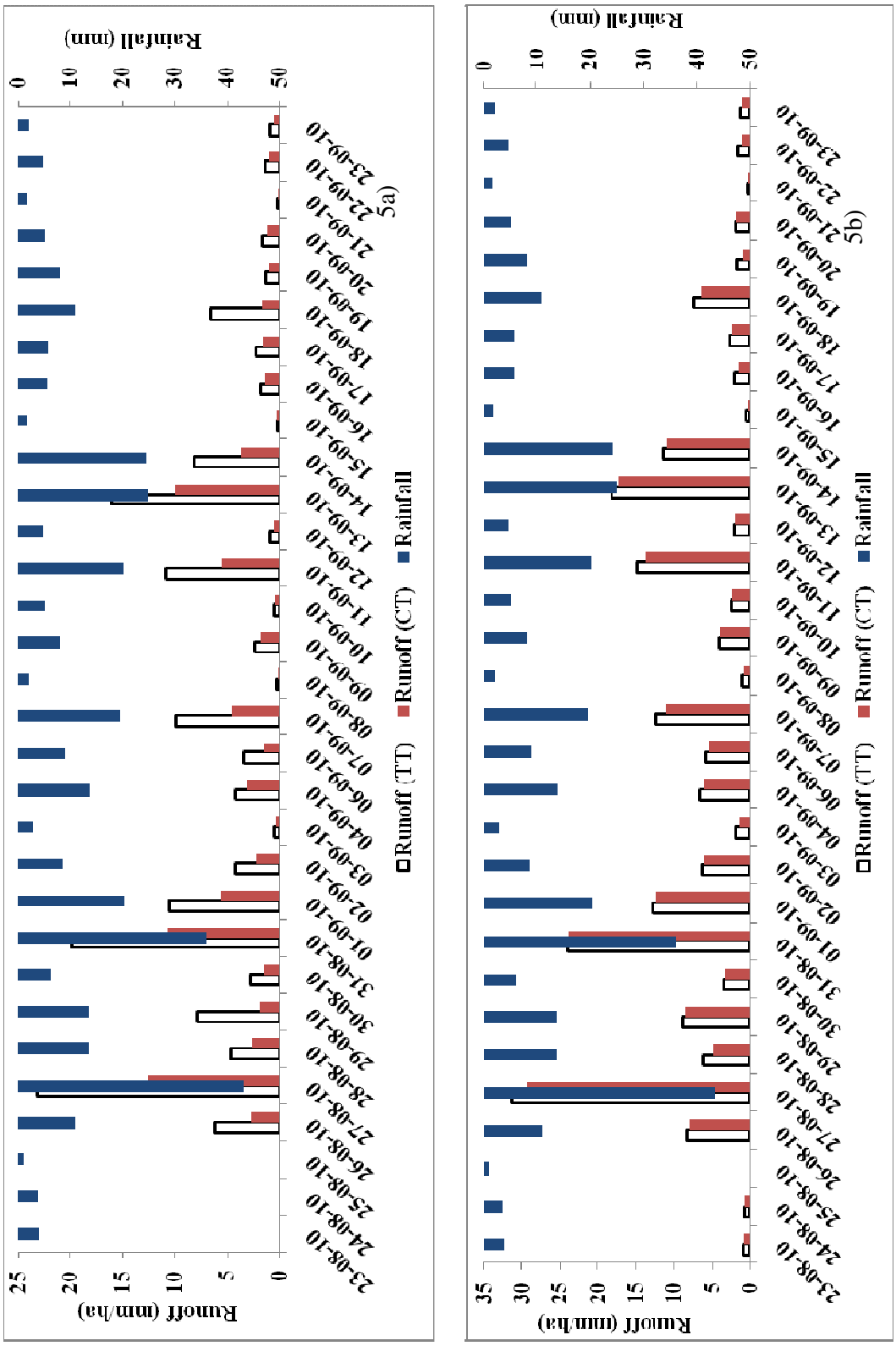

Figure 5 : Time series of measured daily rainfall and runoff results under wheat (5a) and tef (5b) crop respectively at experimental plot

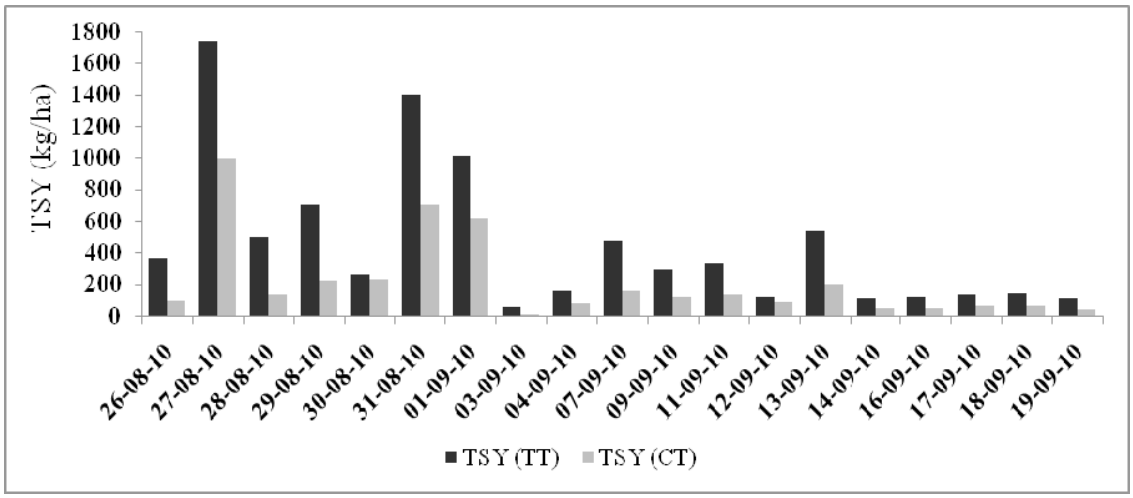

Figure 6 : Daily total sediment yields from the tradition and conservation tillage treatments on wheat farm plots

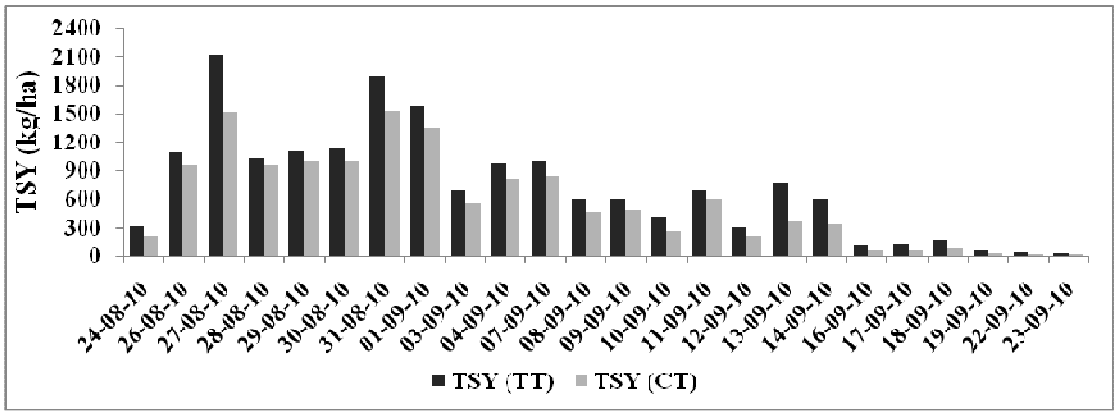

Figure 7 : Daily total sediment yield from the tradition and conservation tillage treatments *tef* farm plots

Table 1 : Summary of ANOVA results for particle size distribution (%), bulk density (Bd, g cm^{-3}), and soil organic matter (SOM, %) in relation to tillage systems and soil depths

Variables	Soil depth (cm)	Tillage system TT	CT
Sand	0 – 10	45.74±0.47	45.76±0.48
	10 – 20	50.17 ±0.93	50.00±0.91
	20 – 30	48.16 ±0.41	48.20±0.39
	Overall	48.02 ±0.6[a]	48.02±0.59[a]
Silt	0 – 10	32.16±0.70	32.10±0.71
	10 – 20	24.32±0.41	24.26±0.39
	20 – 30	16.11±0.43	16.18±0.41
	Overall	24.20±0.51[a]	24.18±0.50[a]
Clay	0 – 10	32.16±0.70	22.01±0.91
	10 – 20	24.32±0.41	25.75±0.81
	20 – 30	16.11±0.43	36.54±0.28
	Overall	24.20±0.51[a]	28.10±0.66[a]
Bd	0 – 10	0.98±0.005	0.93±0.005
	10 – 20	1.11±0.006	1.03±0.005

	20 – 30	1.13±0.005	1.12±0.003
	Overall	1.07±0.005[a]	1.03±0.043[b]
SOM	0 – 10	2.49±0.005	2.51±0.004
	10 – 20	2.11±0.005	2.11±0.006
	20 – 30	1.76±0.009	1.77±0.007
	Overall	2.12±0.006[a]	2.13±0.005[a]

Mean±SE followed by the same letter across the row are not significant (p=0.05) with respect to soil depths

Table 2 : Water infiltration rate (cm/min) and cumulative infiltration (cm) of soils as affected by tillage treatments integrated with graded *fanya juus* with time serious (mean± SE)

Time (min)	Infiltration rate (cm/min)		Cumulative infiltration (cm)	
	CT	TT	CT	TT
1	0.84±0.005[a]	0.55±0.006[b]	0.84±0.004[a]	0.55±0.006[b]
3	0.71±0.005[a]	0.47±0.005[b]	1.55±0.006[a]	1.05±0.006[b]
6	0.10±0.001[a]	0.05±0.004[b]	4.23±0.006[a]	2.72±0.006[b]
Over all	0.42±0.004[a]	0.28±0.004[b]	2.91±0.006[a]	1.935±0.006[b]

Mean±SE followed by the different letter across the row are significant (p=0.01) at each time series with respect to infiltration rate and cumulative infiltration

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A Survey on Knowledge, Attitude and Practices of Farmers on Management of Rodent Pests

By D Sudha Rani, Ch V Narasimha Rao & Y Suryanarayana

Abstract- A survey on Knowledge, Attitude and Practices (KAP) of 200 farmers on rodent pests and their management was conducted in West Godavari district of Andhra Pradesh, using a structured questionnaire to study the population ecology of rodents, their extent of damage and the various management practices commonly adopted by farmers to control them. The information on this survey is useful to formulate and design the Integrated Rodent Management (IRM) strategies or modules for effective rodent control. Farmers considered rodents as the main biological production constraint in paddy cultivation and estimated that they cause on an average of 10-15% yield losses in every season. Most of the farmers believe that, poison baiting could effectively control rodents, but majority of them were unaware of the dosages of rodenticide ingredients and also unaware of usage of bait stations as the effective rodent control practices. The survey revealed that, most of the farmers are with moderate level of knowledge (68 %) and practices (76 %) and also majority of them were categorized as secondary adopters (81%) basing on the analysis of farmers knowledge, practices and attitude attributes relating to rodent management respectively.

Keywords: *KAP analysis, Farmers perceptions, Rodents, Management.*

GJSFR-D Classification : *FOR Code: 070199*

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Abstract - A survey on Knowledge, Attitude and Practices (KAP) of 200 farmers on rodent pests and their management was conducted in West Godavari district of Andhra Pradesh, using a structured questionnaire to study the population ecology of rodents, their extent of damage and the various management practices commonly adopted by farmers to control them. The information on this survey is useful to formulate and design the Integrated Rodent Management (IRM) strategies or modules for effective rodent control. Farmers considered rodents as the main biological production constraint in paddy cultivation and estimated that they cause on an average of 10-15% yield losses in every season. Most of the farmers believe that, poison baiting could effectively control rodents, but majority of them were unaware of the dosages of rodenticide ingredients and also unaware of usage of bait stations as the effective rodent control practices. The survey revealed that, most of the farmers are with moderate level of knowledge (68 %) and practices (76 %) and also majority of them were categorized as secondary adopters (81%) basing on the analysis of farmers knowledge, practices and attitude attributes relating to rodent management respectively. A lack of proper knowledge in adopting current recommended rodent management practices and lack of farmer's community approach appeared to be the main constraint in rodent management. Hence, to make the farmers as innovators with high levels of knowledge and skills in practices relating to rodent control, there is an urgent need of organizing training programmes to farmers and pesticide dealers. Field demonstrations, farmer's interactions and developing united action among the farmers is essential for planning effective rodent control in larger stretches of land.

Keywords: KAP analysis, Farmers perceptions, Rodents, Management.

I. Introduction

Rodents are one of the most important non insect pests of agricultural crops. Many Rodent species damage various crops throughout the crop growth period and there by causes significant yield losses. Among the field crops, rice is one of the most vulnerable crops to rodents. In rice production, rodents cause 0.44 to 60 percent tiller damage which accounts for 5-10 % of total grain yield losses in pre harvested rice (Parshad *et al.*, 2007). In addition to tiller damage they also hoard ripened panicles inside their burrows. The rodent outbreaks are more common in rice growing delta areas of Andhra Pradesh and sometimes crop suffers even 80-100 percent tiller damage (Rangareddy, 1994). The Godavari delta of Andhra Pradesh state in southern India is considered as a part of the 'Rice bowl of India' with rice being the integral component of agricultural activities in this region (Gururaj *et al.,* 2004). The cropping pattern mostly adopted in this region is rice-rice-pulses/fallow with two rice cropping patterns in Kharif (June/July to November/December) and Rabi (December to April) seasons.

The farmers choose various management practices that can meet their objectives, based on their knowledge, belief and attitude on any pest damage and control. Recommendations based on existing farmer practices also would increase the likelihood of farmer's adoption (Palis *et al*., 2008). So, an understanding of the factors that affect the farmer's knowledge, attitude and practices (KAP) is essential for designing effective management strategies or modifying the existing ones for optimum benefit (Litsinger *et al*., 1980; Escalada, 1985; Sivakumar et al., 1997 and Gururaj *et al.,* 2004). The KAP studies are highly focused attitudes and practices in response to a specific evaluations that measure changes in human knowledge, intervention, usually outreach, demonstration or education. These studies relating to social surveys may cover a wide range of social values and activities, gathering important data pertaining to the factors influencing the problem and its management. Hence, the present survey was conducted in West Godavari region of Andhra Pradesh to analyze the farmer's knowledge, attitude and practices (KAP) on rodent pests and their management. This information aids in developing Integrated Rodent Management (IRM) strategies.

II. Materials and Methods

A farmer's survey was carried out in West Godavari district of Andhra Pradesh during 2010-11 on the knowledge, attitude and practices (KAP) of farmers on rodent pests and their management. The knowledge possessed by the community refers to the understanding of the topic, attitude refers to the feeling towards the subject as well as any preconceived ideas they possess and practices refers to the ways in which they utilize their knowledge and attitude for the management. The present survey is an attempt to study,

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understand, judge and analyze the farmer's knowledge, attitude and skills in practices of rodent management which are most essential for designing IRM strategies. A total of 200 farmers in Eluru, Tadepalligudem, Nalagerla, Chintalapudi, Peravali, Penugonda, Penumantra, Palakol, Bhimavaram, Undi and Narasapuram Mandals of West Godavari were randomly selected from nearly 45 villages. Farmers were interviewed individually by a structured questionnaire in local language (Telugu) by Scientists of AINP on Rodent Control, Andhra Pradesh Rice Research Institute and Regional Agricultural Research Station, Maruteru, West Godavari. The questionnaire was prepared basing on previous questionnaires relating to rodent pest management that were developed by Sang et al., 2003, Sudarmaji *et al.,* 2003, Makundi *et al*., 2005 and Brown *et al.,* 2008. The questionnaire consists of three sections viz., knowledge, attitude and practices (KAP) adopted by farmers on rodent pests and their management. A total of 27 statements (questions) were prepared to analyze the KAP of farmers on rodent management and the statements (attributes) scoring a four point likeret scale for their responses was recorded (Table 1). Depending on response scores, farmers level of knowledge and practices were categorized as low, moderate and high (Table 2.) and farmer's attitudes were categorized as innovators, primary adopters, secondary adopters and laggards (Table 3). The data collected were appropriately coded using the spreadsheet programme EXCEL, cross tabulation and frequency distribution (Mean) were employed for data analysis.

III. Results and Discussions

The farmer's survey in West Godavari district of Andhra Pradesh revealed the information that, farming is the main occupation for 84.7 % of the people with a mean age of 46.6 years. The average farm holding size is 4.7 acres. Most of the farmers, opined that rodents are one of the main biological constraint in paddy cultivation, since it is a detrimental pest causing an average of 10-15% yield losses every season and thereby increasing the cost of cultivation.

a) Farmer's Knowledge

Farmer's knowledge was analyzed by different attributes and their responses were scored. Farmer's gave a mixed response for rodent control practices adopted by them. Only 20% of the farmers have the knowledge of using all the control measures viz., traps, catching and poison baits. Sixty percent of the farmers opined that, poison baiting is the best whereas 10% of the farmers responded for traps as the best and another 10% for catching the rodents as the best rodent control practices (Fig 1).

Regarding knowledge on choice of rodenticides, 70% of the farmers expressed that acute poisons are the best and the other 30% opted that anticoagulants are the best rodenticide. Only 20% of the farmers were correctly aware of the dosage of poison bait ingredients whereas, 80 % of them were unaware of the dosage, which is the primary reason for showing the rodenticide ineffectiveness in the management (Table4).

Only 32 % of farmers have scored below fifty percent and 68 % of farmers have scored 50 to 80% regarding knowledge attributes relating to rodent pests and their management and hence, they were categorized as farmers with low and moderate levels of knowledge respectively. None of the farmers have scored above 80% (Fig 2). From this survey, it was revealed that majority of the farmers (68%) are with moderate level of knowledge on rodent pests and their management.

b) Farmer's Attitude

Farmer's attitudes was analyzed and judged based on their responses to eight statements. In response to initiation of the rodent control practices, 8% of the farmers initiated after reading news paper, 14% after training, 22% by looking at others, 12% based on village meeting, 12% after demonstrations, 22% on the advice of pesticide dealers, 4% following T.V. advertisement and 6% based on radio broad cast (Fig 3.)

Majority of the farmers (68%) attitude is that rat control should be adopted by the farmers alone, whereas 32% opined that Government has to involve actively in controlling rodents. Regarding purchasing rodent poison, only 30% were interested in purchasing, while 40% were not willing to purchase and 30% were interested to take from others (Table 5).

On an average only 12% of the farmers were primary adopters scoring 80-90 % and 7% of the farmers were laggards scoring below 40 percent and majority of the farmers (81%) were secondary adopters scoring 40-80 % in levels of attitudes on rodent pests and their management. None of the farmers were innovators (Fig 4).

c) Farmer's Practices

The skills and practices of the farmers were judged by posing nine different questions relating to practices adopted by them in rodent pest management. It was observed that for the use of poison baits, 20% of the farmers were applying bait as loose while 70% of the farmers were applying in burrows (rat holes) and only 10% of the farmers were adopting bait stations for placing poison bait. Towards the maintenance of safety precautions, only 20% of the farmers were taking precautions while working with rodents but 80 % of the farmers were not adopting them. It was clearly judged that all the farmers (100 %) were killing the trapped rodents (Table 6).

From the overall responses of the farmers with respect to practices adopted by them in rodent pest

management, it was observed that, 24% of the farmers are with low levels of skills and practices scoring below 50 % and majority of the farmers (76 %) were with moderate level of skills and practices in rodent management operations scoring 50-80 percent in the practice attributes pertaining to rodent management and none of the farmers were found with high level of skills and practices in rodent management (Fig 5).

Similar KAP studies on rodent pests and management were made by Joshi et al., 2000, at Ifugao, Philippines, Makundi *et al.,* 2005 at Tanzania and Ethiopia, Brown et al., 2008 at Myanmar and Alexander M S *et al.,* 2011, at Luzon, Phillippines. From the present study it was emphasized that, most of the farmers opined the rodents as major biological constraint in paddy cultivation and cause on an average of 10-15% yield losses. This is in consistent with the findings of farmers KAP analysis on rodent management by Brown *et al.,* 2008 at Myanmar who concluded that, farmers consider rodents as the major problem and estimated that they caused 13% yield loss. Majority of the farmers (68%) viewed that rodent management can be done effectively on community basis by working all the farmers together. Shuyler, 1972; Morin *et al.,* 2003 and Brown and Khamphoukeo, 2007 also stated that to gain as much benefit as possible in rodent management, the farmers should be encouraged to work together on a community scale. In the present survey it was analyzed that most of the respondents (60 %) opined that use of poison baiting is best method of rodent control, which is similar to the survey finding of Makundi *et al.,* 2005 at Tanzania and Ethiopia regions. Among the rodenticides choice, 70% of the farmers felt that acute poisons are more effective than the anticoagulants. This was due to quick action of acute poisons than less toxic chronic rodenticides (Alexander *et al*., 2011). Maximum respondents (80%) are unaware of the dosages of rodenticide ingredients and apply less than the recommended concentrations. As a consequence these rodenticides effectiveness is very limited on rodent control. The same findings were earlier reported by West *et al.,* 1975, Buckle, 1999 and Hoque and Sanchez, 2008.

From the entire KAP survey it was analyzed that, most of the farmers of West Godavari district, Andhra Pradesh are with moderate level of knowledge and skills in practices and also majority of them are secondary adopters. Further, it was also emphasized from the present study, that there is no difference in farmer's knowledge, attitude and practices in response to the common attribute *'Adoption of rodent control practices'*. Hence, guidance to farmers on sustainable and effective use of existing rodent control methods through training programmes to farmers and pesticide dealers is of utmost importance. Field demonstrations, farmer's interactions and promoting community actions is need of the hour to motivate the farmers and make them as innovators with high level of knowledge and practices in rodent pests and their management.

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References Références Referencias

1. Alexander M S, Colin V P, Singleton G R and Ravindra C J 2011. Knowledge, attitudes and practices of farmers on rodent pests and their management in the lowlands of the Sierra Madre Biodiversity Corridor, Philippines. *Crop protection,* 30 (2) : 147-154.
2. Brown P R and Khamphoukeo K 2007. Farmers' knowledge, attitudes, and practices with respect to rodent management in the upland and lowland farming systems of the Lao People's *Democratic RepublicIntegrative Zoology* 2 : 165-173.
3. Brown P R, Nyunt Yee, Singleton G R, Kenney A J, Nyo Me Htwe, Myo Myint and Than Aye. 2008. Farmers'knowledge, attitudes, and practices for rodent management in Myanmar. *International Journal of Pest Management,* 54(1): 69 – 76.
4. Buckle A P 1999. Rodenticides – their role in rodent pest management in tropical agriculture. In: *Ecologically-based management of rodent pests*. (eds. GR Singleton, LA Hinds, H. Leirs, Z. Zhang), Pp 163-177.
5. Escalada M M 1985. *Baseline survey of rice farmers' knowledge, attitudes and practices of integrated pest control*(Western Leyte): Final report of the project *'Inter Country Programme on Integrated Pest Control (Rice)',* funded by the United Nations Food and Agriculture Organization (FAO), Rome, Italy.
6. Gururaj Katti, Pasalu I C , Rao P R M, Varma N R G, Krishnaiah K, Escalada M M and Heong K L 2004.Farmers Perceptions, Knowledge and Practices Related to Integrated Pest Management in High ProductionSystems of Rice in South India-A Case Study. *Indian Journal of Plant Protection* 32 (2) : 11-16.
7. Hoque M M and Sanchez F F 2008. Development of rodent management in the Philippines from 1966 to 1988.In *'Philippine rats: ecology and management'*.(eds G. R. Singleton, R. C. Joshi and L. S. Sebastian.) Pp 9–23. (*Philippine Rice Research Institute: Nueva Ecija, Philippines*.)
8. Joshi R C, Matchoc O R O, Bahatan R G and Dela Peńa F A 2000. Farmers' knowledge, attitudes and practices of rice crop and pest management at

Ifugao Rice Terraces, *Philippines. International Journal of Pest Management* 46 : 43–48.
9. Litsinger J A, E C Price and R T Herrera 1980. Small farmer pest control practices for rainfed rice, cornand grain legumes in the Philippine provinces. *Philippine Entomologist* 5 : 65-86.
10. Makundi R H, Bekele A, Leirs H, Massawe A W, Rwamugira W, Mulungu L S 2005. Farmer's perceptions or rodents as crop pests: knowledge, attitudes and practices in rodent pest management in Tanzania and Ethiopia. *Belgian Journal of Zoology* 135 (Suppl.), 153–157.
11. Morin S R, Palis F G, Chien H V, Chi T N, Magsumbol M and Papas A 2003. A sociological perspective to the community based trap barrier system. In: Singleton GR, Hinds LA, Krebs CJ, Spratt DM, editors.Rats, mice and people: rodent biology and management. Canberra: *Australian Centre for International Agricultural Research.* Pp 380-388.
12. Palis F G, Singleton G R and Flor R J 2008. Humans outsmarting rodents: adoption and impact of ecologicallybased rodent management in Asia. In *'Philippine rats:* ecology *and management'*. (Eds G R Singleton, R C Joshi and L S Sebastian.) Pp. 127–141. (*Philippine Rice Research Institute:* Nueva Ecija, Philippines.).
13. Parshad V R, Neena Singla, Kocher D K and Rajinder Kaur 2007. The Lesser bandicoot rat *Bandicota bengalensis lens is* Gray and Hardwicke. *Technical Bulletin* No.14, ICAR, New Delhi.
14. Rangareddy A 1994. Rodent management in cereal crops with reference to rice. Paper presented to the *Apex LevelRodent Control Training*. ICAR, NEH Complex, Barapani, Shillong 24-26 Oct. 1994, Pp 86-92.
15. Sang P M, Huan N H, Escalada M M and Heong K L 2003. Farmers' beliefs and practices in rat management in the Mekong Delta, Vietnam. In: Singleton GR, Hinds L A, Krebs C J, Spratt D M, editors. Rats, miceand people: Rodent biology and management. ACIAR Monograph 96. *Australian Centre for Internation-al Agricultural Research*, Canberra. Pp 426-430.
16. Sivakumar S D, S R Subramanian, S Suresh and M Gopalan 1997. Pest management practices of rice *farmers In* Tamil Nadu, India. In: *Pest management of rice farmersin Asia* (eds. K. L. Heong and M.M.Escalada). *International Rice Research Institute, Manila, Philippines.*
17. Shuyler H R 1972. Rodents in tropics. Their effects and control. *PANS* 18: 445-456.
18. Sudarmaji, Singleton GR, Herawati NA, Djatiharti A, Rahmini (2003). Farmers' Perceptions and practices in rat management in West Java, Indonesia. In: Singleton G R, Hinds L A, Krebs C J, Spratt D M, eds. Rats,Mice and People: *Rodent Biology and Management*. ACIAR Monograph 96. *Australian Centre for International Agricultural Research*, Canberra, Pp 389–94.
19. West R R, Fall M W and Libay J L 1975. Field trial of multiple baiting with zinc phosphide to protect growing rice from damage by rats (Rattus rattus mindanensis). *In: Proceedings 3rd Annual Scientific Meeting. CropProtection Society of the Philippines*. Pp 143-147.

Table 1 : Questionnaire for KAP analysis of farmers on rodent pests and their management

Name of the farmer: Age: Acreage :		Name of the Village: Mandal : District:			
	Attributes	Response with score in Parenthesis			
a.	Knowledge				
1	Rats made damage	No(1);	Less(2);	Moderate(3);	More(4)
2	Rats make damage in	Fields (3);	Houses (3);	Both (4);	
3	Rats move more in	Day time (1);	Night time (3);	Evenings (4);	
4	Rats transmit diseases	Yes (4);	No (1);	Do not know(1)	
5	Rats damage is more by	Big Rats (4);	Small Rats (2);	Both (2);	
6	Rats are controlled by	Cats (2); Poison baits (2);	Traps (2); Mixing all (4)	Catching (2);	
7	Rats can be killed effectively by	Acute Poisons (3);	Anticoagulants (4)		
8	Awareness on dosage	Aware (4);	Unaware (2)		
9	Do you know about bait stations	Yes (4);	No (1)		
10	Do you know about bait materials	Yes (4);	No (1)		

	b. Attitude			
11	Rats can be controlled	Yes (4);	No (1)	
12	Rats can be effectively controlled by	Cats (2); Poison baits (2).	Traps (2); Using different methods (4);	Catching (2);
13	Rat control is to be done by	Farmers(4);	Government (0)	
14	Rat control is done after	Training (3); Demonstrations (2); T V Advertisement (4)	Looking at Others (2); Pesticide retailers advise (4); Radio broadcast (4)	Village meetings (2); Reading News paper (2);
15	Using traps is	Effective (4)	Ineffective (0)	
16	Will you purchase Rat poison	Yes (4);	No (1);	Take from others (3)
17	Do you use poison baits if effective	Yes (4);	No (1);	
18	Do you purchase them	Yes (4);	No (0);	Take from others (3)
	c. Practices			
19	Rats are killed by	Catching(2) ; Poison baits(2) ;	Cats (2) ; Combinations(4)	Traps(2) ;
20	Poison used	Acute (3);	Chronic (4)	
21	How it is applied	Loose (2);	Packed (3);	Bait stations (4)
22	Place of application	Field bunds (1);	Rat holes (3);	Bait stations (4)
23	Time of application	Morning (1);	Midday (1);	Evening(4); Night (1)
24	Dead Rats are	Thrown out (1);	Buried (4)	
25	Rats in traps are	Released outside (0);	Killed (4)	
26	Safety precautions	Taken (4);	Not taken (1)	
27	Poison obtained from	Others (2);	Purchased (4)	

Table 2 : Categorization of farmers based on level of knowledge and practices

Score percent	Category
Less than 50 percent	Low
50-80 percent	Moderate
More than 80 percent	High

Table 3 : Categorization of farmers based on level of attitude

Score percent	Category
More than 90	Innovators
80-90	Primary adopters
40-80	Secondary adopters
Less than 40	Laggards

Table 4 : Farmer's response to knowledge attributes relating to rodent pests and their management

Knowledge attributes	Percent response of farmers in parenthesis			
Rats made damage	No (0);	Less (10);	Moderate(40);	More (50)
Rats make damage in	Fields (60);	Houses (10);	Both (30);	
Rats move more in	Day time (0);	Night time (70);	Evenings (30);	
Rats transmit diseases	Yes (10);	No (30);	Do not know(60)	
Rats damage is more by	Big Rats (50);	Small Rats (10);	Both (40);	
Rats are controlled by	Cats (0); Poison baits (60);	Traps (10); Mixing all (20)	Catching (10);	
Rats can be killed effectively by	Acute Poisons (70);	Anticoagulants (30)		
Awareness on dosage	Aware (20);	Unaware (80)		
Do you know about bait stations	Yes (20);	No (80)		
Do you know about bait materials	Yes (60);	No (40)		

Table 5 : Farmer's response to attitude attributes relating to rodent pests and their management

Attitude attributes		Percent response of farmers in parenthesis		
1	Rats can be controlled	Yes (67);	No (33)	
2	Rats can be effectively controlled by	Cats (0); Poison baits (60).	Traps (10); Using different methods (20);	Catching (10);
3	Rat control is to be done by	Farmers(68);	Government (32)	
4	Rat control is done after	Reading News paper (8); Village meetings (12); Advertisement (4)	Training (14); Demonstrations (12); Radio broadcast (6)	Looking at Others (22); Pesticide retailers advise(22); T V
5	Using traps is	Effective (60)	Ineffective (40)	
6	Will you purchase Rat poison	Yes (30);	No (40);	Take from others (30)
7	Do you use poison baits if effective	Yes (20);	No (80);	
8	Do you purchase them	Yes (30);	No (80);	Take from others (10)

Table 6 : Farmer's response to practice attributes relating to rodent pests and their management

Practice attributes	Percent response of farmers in parenthesis			
Rats are killed by	Catching(10) ; Poison baits (60) ;	Cats (0) ; Combinations(20)	Traps(10) ;	
Poison used	Acute (70);	Chronic (30)		
How it is applied	Loose (20);	Packed (70);	Bait stations (10)	
Place of application	Field bunds (10);	Rat holes (80);	Bait stations (10)	
Time of application	Morning (5);	Midday (5);	Evening (85	Night (5)
Dead Rats are	Thrown out (20);	Buried (80)		
Rats in traps are	Released outside (0);	Killed (100)		
Safety precautions	Taken (20);	Not taken (80)		
Poison obtained from	Others (70);	Purchased (30)		

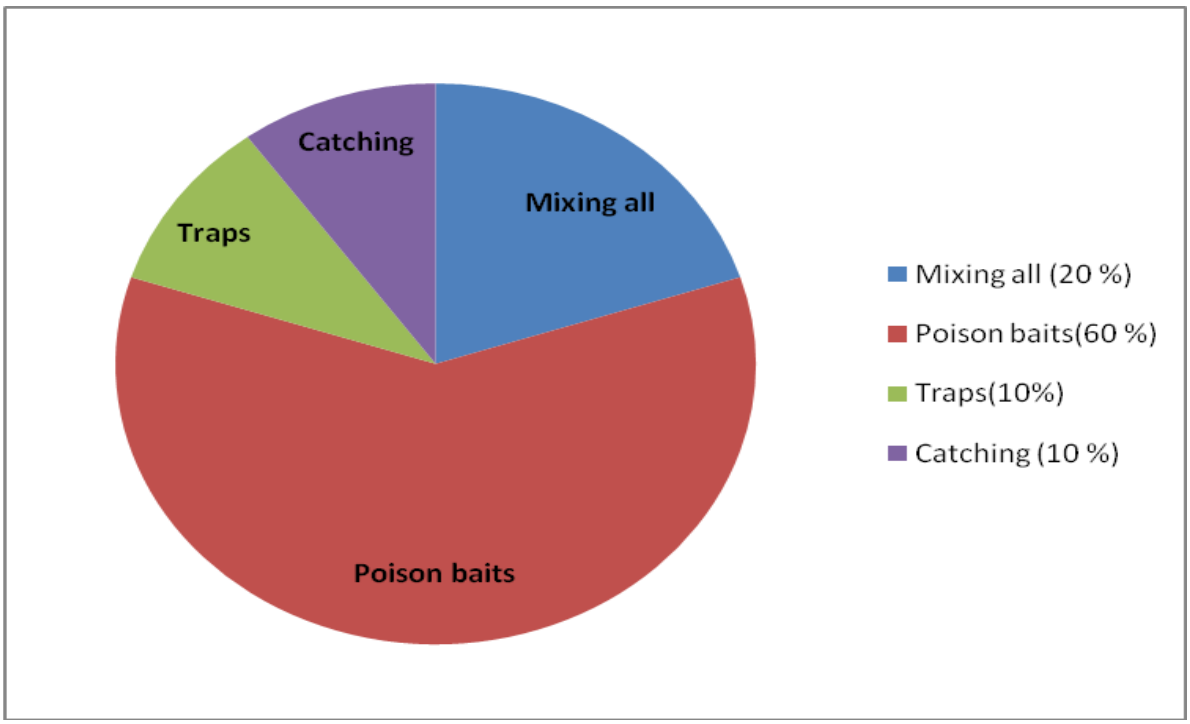

Figure 1 : Farmer's knowledge relating to adoption of rodent control practices

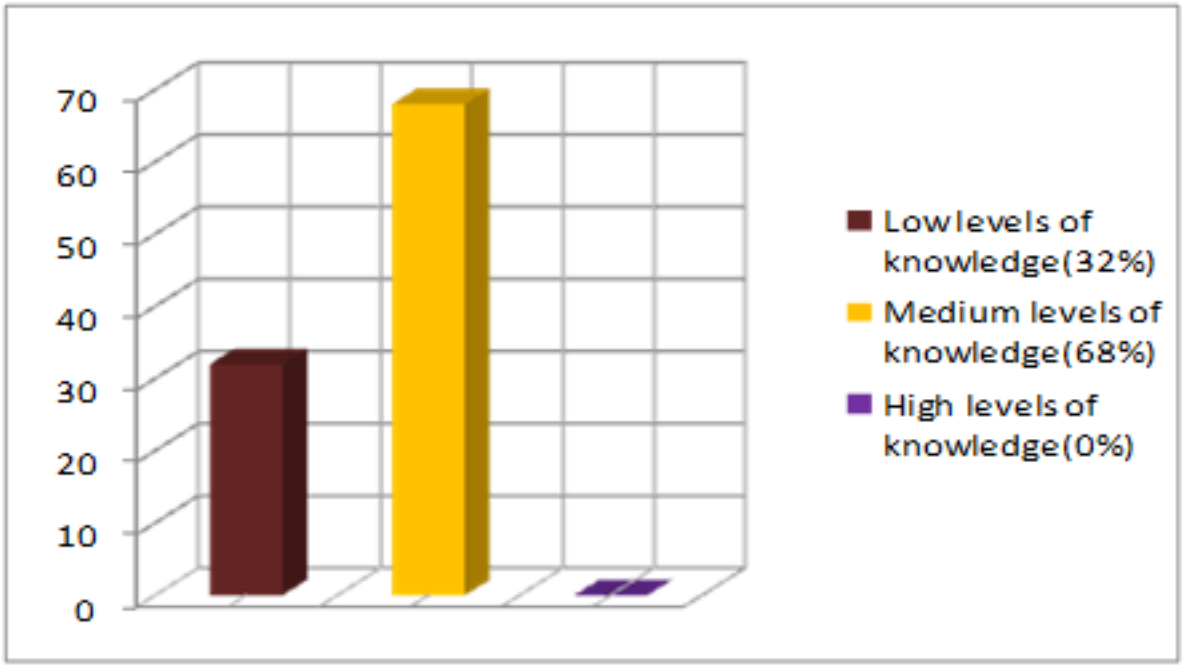

Figure 2 : Percent level of farmer's knowledge on rodent pest management

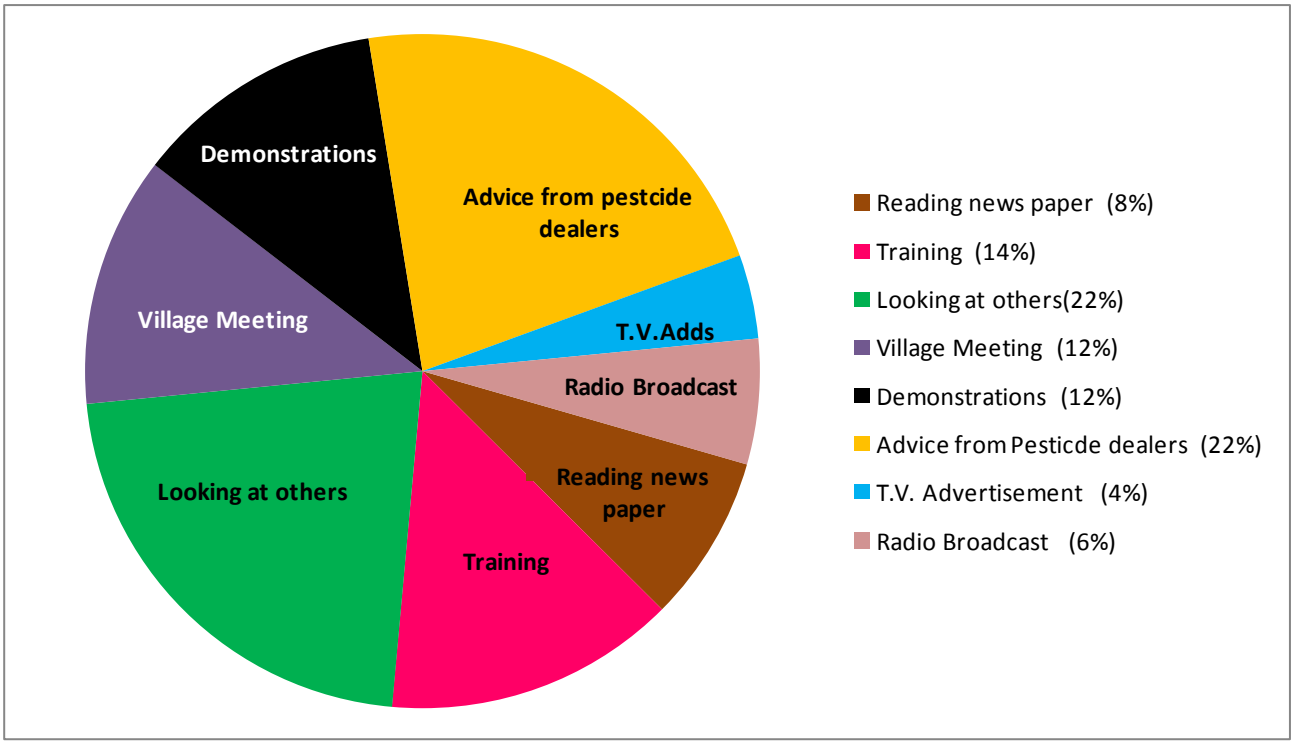

Figure 3 : Farmer's attitude for initiating rodent control practices

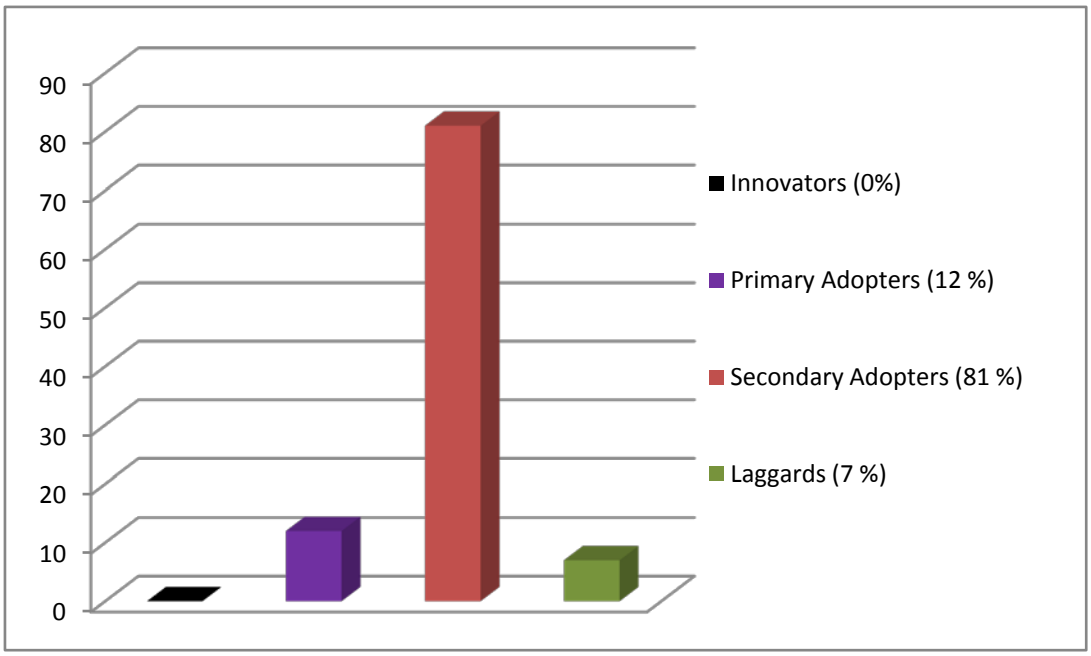

Figure 4 : Percent levels of farmer's attitude on rodent pest management

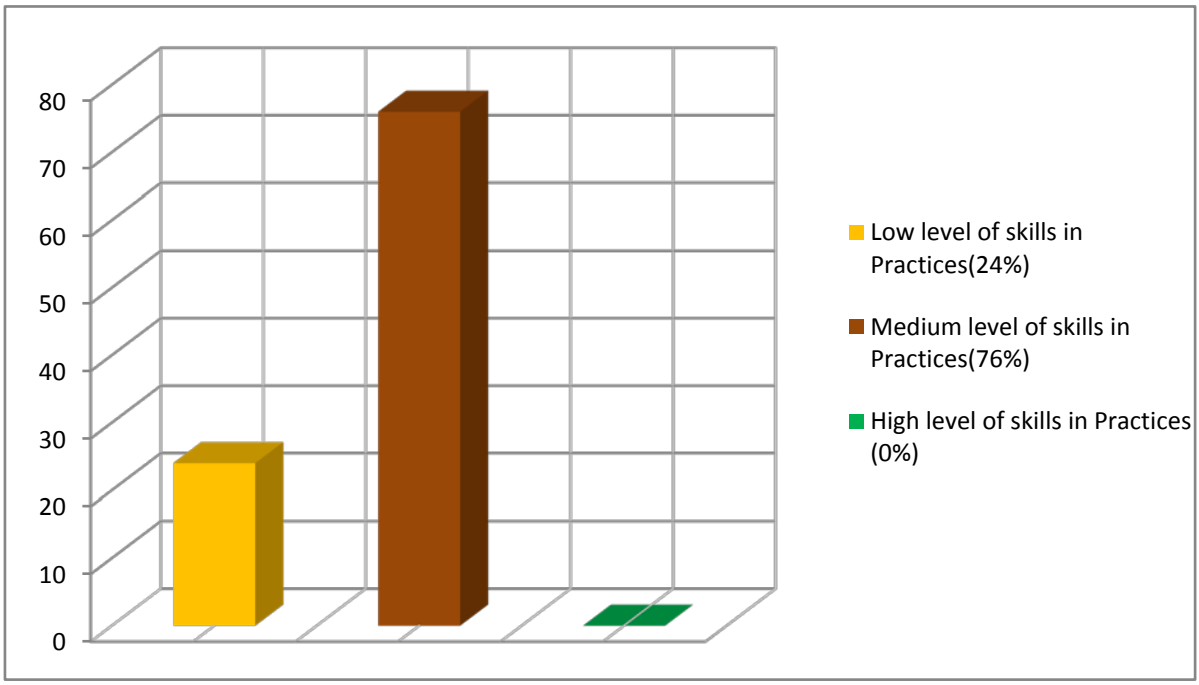

Figure 5 : Percent levels of farmer's Practice on rodent pest management

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Physicochemical Quality and Consumption Pattern of Milk at Smallholder Urban Dairy Farms in Jimma Town of Oromia Regional State, Ethiopia

By D. Belay & G. P. J. Janssens
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Abstract- This study was conducted to evaluate physicochemical quality and consumption pattern of milk at smallholder urban dairy farms in Jimma town of Oromia Regional State, Ethiopia. A total of 54 smallholder dairy farming households were randomly selected and interviewed with pre-tested, structured questionnaire. The results revealed that the mean fat, protein, lactose and solids-not-fat (SNF) content were 4.38 ± 0.06, 2.96 ± 0.01, 4.34 ± 0.13 and 7.79 ± 0.60, respectively. The organoleptic characteristics of the raw milk samples were more or less similar except milk from two farms which showed off-flavour (in 10% milk sample). The mean daily milk production was 36.43±32.74 kg per household. The study revealed that most (98.1%) of the respondents consume milk and processed milk products as a major part of their diet. Fresh whole milk was the most widely consumed dairy product (35.2%) and consumption of processed milk products was low. Farm household average daily per capita milk consumption was 215.38 milliliter (ml). The major dairy products produced and consumed by the respondents were naturally fermented whole milk (ergo), butter (Kibe), butter milk (Arera), cottage cheese (ayib), whey (aguat) and ghee (nitir kibe).

Keywords: *consumption; Jimma; milk; organoleptic; Physicochemical; urban dairy.*

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D. Belay [α] & G. P. J. Janssens [σ]

Abstract- This study was conducted to evaluate physicochemical quality and consumption pattern of milk at smallholder urban dairy farms in Jimma town of Oromia Regional State, Ethiopia. A total of 54 smallholder dairy farming households were randomly selected and interviewed with pre-tested, structured questionnaire. The results revealed that the mean fat, protein, lactose and solids-not-fat (SNF) content were 4.38 ± 0.06, 2.96 ± 0.01, 4.34 ± 0.13 and 7.79 ± 0.60, respectively. The organoleptic characteristics of the raw milk samples were more or less similar except milk from two farms which showed off-flavour (in 10% milk sample). The mean daily milk production was 36.43±32.74 kg per household. The study revealed that most (98.1%) of the respondents consume milk and processed milk products as a major part of their diet. Fresh whole milk was the most widely consumed dairy product (35.2%) and consumption of processed milk products was low. Farm household average daily per capita milk consumption was 215.38 milliliter (ml). The major dairy products produced and consumed by the respondents were naturally fermented whole milk (*ergo*), butter (*Kibe*), butter milk (*Arera*), cottage cheese (*ayib*), whey (*aguat*) and ghee (*nitir kibe*).

Keywords: consumption; Jimma; milk; organoleptic; Physicochemical; urban dairy.

I. Intoduction

Population growth, increasing urbanization and rising incomes are predicted to double the demand for, and production of, livestock and livestock products in the developing countries over the next 20 years (Delgado et al., 1999).

Per capita food consumption of animal products continues to increase both in developing and developed countries, as well as in countries in transition, as a result of increasing average per capita real income (Popkin and Du, 2003; Speedy, 2003). Projections indicate a large increase in demand for dairy products, particularly in developing countries including sub-Saharan Africa (Delgado et al., 1999).

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Ethiopia holds the largest cattle population in Africa estimated at about 53.4 million heads of cattle (CSA, 2011), of which 10 million is dairy cows yielding 3.2 billion kg per year, with national average milk yield per cow per day of 1.54 kg for indigenous cows (CSA, 2008). Despite the large dairy cattle population of Ethiopia, the total national milk production remains among the lowest in the world and even by African standard. Milk and milk products are economical important farm commodities and dairy farming is an investment option for smallholder farmers in Ethiopia (Tsehay, 2001) and dairy products form part of the diet of many Ethiopians.

Milk is considered as nature's single most complete food (O'Mahony, 1988) and is definitely one of the most valuable and regularly consumed foods. Milk is a complex mixture of fats, proteins, carbohydrates, minerals, vitamins and other miscellaneous constituents dispersed in water (Harding, 1999). According to Byron et al. (1974), the average composition of milk are water (87.20%), protein (3.50%), fat (3.70%), lactose (4.90%), ash (0.70%) and dry matter (12.80%). Milk should have normal composition, not adulterated and produced under hygienic condition (Chamberlian, 1990).

The compositional and organoleptic properties of tropical milk products may differ from similar products manufactured in cool temperate climates (ILCA, 1992). According to O'Connor (1994), the chemical quality of milk is may be ascertained by measuring its content of fat, protein and total solids, which is affected by genetic and environmental factors. Breed, feeding, individuality within the breed, stage of lactation, age, health and interval between milking are among the factors responsible for variation in milk composition of cows (Zelalem et al. 2004; O'Connor, 1994).

In the study area demand for cow milk is rapidly increasing because of population growth, increases in per capita intake, changes in consumption pattern and economic expansion of the urban residents. However, there is little information available on the chemical composition and microbial quality of raw milk in Ethiopia (Zelalem and Faye, 2006; Eyasu and Fekadu, 2000). In the study area there are hardly any studies on

consumption pattern of dairy products. To this end, the need to understand milk physicochemical composition and consumption pattern under urban dairy systems is important for meeting the demand for consumers. Therefore the aim of this study was to investigate the physicochemical characteristics and farm household consumption pattern of milk and its products at urban dairy farms in Jimma town of Oromia Regional State, Ethiopia.

II. Materials and Methods

The study was carried out in Jimma town of Oromia Regional State, south western Ethiopian. Jimma town is located at 355km south-western of Addis Ababa, capital of Ethiopia, having a latitude of 7°41′N and longitude of 36°50′E and an elevation of 1704 meters above sea level. The area is characterized by a humid tropical climate of heavy annual rainfall that ranges from 1200-2000 mm. About 70% of the total annual rainfall is received during wet season, which lasts from the end of May to early September. The area has a relatively higher temperature of about 25°C-30°C from January to April, and a minimum temperature of 7°C-12°C during the months of October to December (OPEDJZ, 2002).

a) Sampling procedure

A simple random sampling technique was used to select the households for the purpose of this study, and a total of 54 urban smallholder dairy farmers were randomly selected to be interviewed. Information on number of dairy farmers was obtained from official records maintained by the Jimma city multipurpose dairy development private limited company and Office of Urban Agriculture Development for Jimma town. The total sample size represented about 55% of the total number of smallholder urban dairy farmers actively participating in dairy farming. Before the formal interview a preliminary visit was made to locate the farms, and to give a brief description to each respondent on research objectives and potential benefits of involving in this research.

b) Data collection

A single-visit-multiple-subject formal survey technique (ILCA, 1990) was used to collect data through face-to-face interviews, conducted in the local language by the researcher using a pre-tested, structured questionnaire. The questionnaire included information on household characteristics, milk production, consumption, processing and marketing, traditional milk processing materials and major constraints to production and marketing of milk. The questionnaire was administered by the researcher, who had a sound knowledge of *Afaan Oromo* and *Amharic* local languages spoken by the dairy farmers in the study area.

c) Collection and transportation of raw milk sample

Raw milk samples were collected from 20 different urban dairy farms located in Jimma town. The farms were selected randomly for physical and chemical quality examination of raw milk. About 250 ml of raw milk samples were collected from morning bulk tank at each farm after thorough mixing, and the samples for physical parameters were transported to the laboratory using ice containing box maintaining sterile condition.

d) Physical examination of the samples

Organoleptic test of raw milk was performed visually, lingually and nasally with the help of a panel of expert to determine color, flavor and texture. The organoleptic quality of raw milk from each farm was evaluated by a panel of experts with the help of appearance, smell, taste and texture characteristics as per standard score card (ISO, 1995). Specific gravity of the raw milk samples was determined using lactometer.

e) Analyses of chemical composition of raw milk

Chemical composition of milk samples were analysed at farm level using the Julie C5 Automatic analyzer (Scope Electric, Razgrad, Bulgaria) to determine milk fat, protein, lactose and solids-not-fat (SNF).

f) Data analysis

Data obtained were analyzed using Microsoft Excel spreadsheet and the procedure of Statistical Package for Social Sciences software version 16.0 computer programs. Descriptive statistics such as means, frequency distribution and percentages were used to summarize the data.

III. Results and Discussion

a) Socio-economic household characteristics

Results of the analyses showed that the average age of the respondents was 51.26±10.99 years. Average family size was 6.02±2.52 per household. The observed family size was lower than the findings by (Asaminew and Eyasu, 2009) who reported average family size of 8.2 and 7.2 in Bahir Dar zuria and Mecha districts, respectively. The majority (35.5%) of the respondents had college level education, while 24.1 % and 7.4% had senior secondary school and university level education, respectively. The respondents with college and university level education (42.6%) were higher than the report by (Yousuf, 2003) who indicated 24% respondents in Harar milk shed had higher education. The study observed that dairy farming was mainly a male domain (75.9%) whereas only 24.1% were women. Similar observations have been reported in Addis Ababa milk shed by (Azage, 2004).

b) Physical quality of raw milk

Physical characteristic of raw milk samples collected at Jimma dairy farms are shown in Table 2. Of

all the raw milk samples tested, the majority (75%) had yellow white, while 10% had white color. Among the milk samples, the highest percentage (75%) had normal flavor, while 10% of the sample had off-flavor indicating three farms fed their lactating cows with "atella"-liquid by-product of local beer breweries before milking. The entire panel of experts indicated that the off-flavor is the odor of "atella" in three of the farms. The majority (85%) of the milk samples had normal texture (free flowing liquid), while three milk samples had thin texture, which might be due to high percentage of water, type of feed consumed prior to milking or breed of the milking cows maintained by the farms. In addition, adulteration of milk is a common practice in some of the dairy farms elsewhere in Ethiopia. The mean specific gravity of raw milk samples collected from urban dairy farms in this study was 1.027 ± 0.00, ranging from 1.023 to 1.030. The result of the present study was slightly lower than the values of specific gravity of 1.030 reported by Alganesh et al. (2007) in eastern Wollega, Ethiopia. The normal specific gravity of milk ranges from 1.028 to 1.033 (FAO, 1988). Higher milk specific gravity of about 1.035 and lower than normal value (1.020) are indicative of fat skimming off and the addition of water (O'Connor, 1994).

Table 1 : Physical quality of raw milk samples collected from urban dairy farms, Jimma, Ethiopia

Physical Parameters	Number of samples	Quality	Percentage
Color	15	Normal	75
	3	Light white	15
	2	White	10
Flavor	15	Normal	75
	3	Sweat	15
	2	Off-flavor	10
Texture	17	Normal	85
	3	Thin	15
Specific gravity, mean ±SD	1.27 0.00		

SD=standard deviation

c) *Chemical composition of raw milk*

Table 2 shows that the mean fat, protein, lactose and solids-not-fat (SNF) content of the raw milk samples were 4.38 ± 0.06, 2.96 ± 0.01, 4.34 ± 0.13 and 7.79 ± 0.60, respectively. The mean values of fat and protein in this study were lower than the Ethiopian Standard (ES, 2009) value of 4.5% and 3.20%, respectively. However, fat and protein values obtained in the present study were within the accepted range of 2.5 to 6.0% and 2.9 to 5.0% for fat and protein respectively (O'Connor, 1994). All the chemical composition values of raw milk observed in the present study were higher than the earlier findings of Veronique et al. (2013), who reported fat, protein, lactose and solids-not-fat (SNF) values of 4.36, 2.65, 3.96 and 7.22, respectively in urban dairy farms in Jimma. However, the results of the values of fat and SNF obtained in the current study were lower than the findings of Alganesh et.al. (2007), who reported 6.05% fat and 8.22% SNF, and also lower than the previous report of Zelalem et al. (2004) who indicated 5.43 and 8.43% of fat and SNF, respectively. The variation in milk composition values between the current and previous findings may be due to breed, nutritional status and health of cows, particularly that of udder health.

Table 2 : Chemical composition of raw milk of crossbreed dairy cows in urban dairy farms, Jimma, Ethiopia

Parameter	Minimum	Maximum	Mean ± SD
Fat (%)	4.34	4.43	4.38±0.06
Protein (%)	3.17	3.25	3.21±0.06
Lactose (%)	4.25	4.43	4.34±0.13
SNF (%)	7.35	8.24	7.79±0.63

d) *Milk production and utilization*

Milk production and utilization in the study area is shown in Tables 2. Average milk production per household per day was 36.43±32.74 kg and ranged between 6 to 130 kg. The observed variation in milk production per household might be due to difference in number of lactating cows, exotic blood level, and standard of feeding and general management practices.

The average milk production per farm per day in this study was higher than the findings of (Sintayehu *et al*., 2008) who observed average production of 10.21±1.59 to 15.90±2.36 kg per day in urban farms in southern Ethiopia. The study revealed that 31.91±28.86 kg of the total milk produced is sold, 3.34±4.67 fed to calves, 1.30±0.63 used for family consumption and the remaining 0.84±1.92 was retained for home processing. The study revealed that the largest volume of the total milk produced was for sale to generate income.

Table 3 : Milk production and utilization at urban dairy farms, Jimma, Ethiopia

Parameter	Mean ± SD	Minimum	Maximum
Milk production /farm/day	36.43±32.74	0	130
Milk fed to calf/ farm/day	3.34±4.67	0	20
Milk for home consumption/farm/day	1.30±0.63	0	3
Milk for processing/farm/day	0.84±1.92	0	10
Milk for sale/farm/day	31.92±28.68	0	128

SD= standard deviation

e) Household consumption of milk and milk products

Table 3 shows consumption pattern of milk and milk products at farm household. Almost all the respondents consume dairy products, which vary from household to household depending on the amount of milk produced and the need to generate income. The majority (98.1%) of the respondents reported that they consume fresh whole milk and processed milk products as a major part of their diet at household level. On average 1.30±0.63 liter of the total milk produced per farm per day was consumed at home. The milk and milk products consumed at farm household were fresh whole milk (*wetet*), Ethiopian naturally fermented milk (*ergo*), butter milk (*Arera*), local cheese (*Ayib*-soft curd-type cottage cheese), local butter (*Kibe*) and local ghee (*Niter kibe*-a product obtained after most of the moisture content is removed by cooking at high temperature for its long shelf-life). Similar findings were reported by (Zelalem, 1999) in the central highland of Ethiopia. According to Azage and Alemu (1998) in Addis Ababa, of the total milk production 10% is left for home consumption.

Fresh whole milk (FWM) was the most frequently consumed (35.2%), while 37% of the farms households consumed both FWM and fermented milk (*ergo*), and the remaining 24.1% consumed FWM and all types of milk products, except whey (*Aguat)*. All of the respondents indicated that whey (*Aguat)* is not consumed by farm household family. However, it was fed by animals, and in few cases it is consumed by farm workers. This is in agreement with the results of (Zelalem, 1999) who indicated that at Debre Zeit, Holetta and Selale areas whey is not consumed by household.

The study observed that of the total milk consumed by household, children below age of ten years consume the lion share. The majority (59.3%) of the respondents stated that the demand for milk and dairy products is affected by seasonal fall of demand. Long fasting season and fasting days when the Orthodox Christians abstain from consuming dairy products for more than 250 days per year was reported to be the main reason for decreased demand for consumption of dairy products. This result is in line with previous findings of (Sintayehu *et al*., 2008; Yitay *et al*., 2008).

Table 4 : Household consumption pattern of milk and milk products at urban dairy farms, Jimma, Ethiopia

Variable	Percent of the respondents
Is milk consumed at home?	
Yes	98.1
No	1.9
Types of milk and milk products consumed	
Fresh whole milk	35.2
Sour milk, cottage cheese and butter	1.9
Fresh milk and sour milk	37.0
Fresh milk, sour milk, cheese and butter	25.9

Forms of milk consumption	
Raw fresh whole milk	3.7
Boil before consumption	92.6
Raw and boiled	3.7
Factors affecting household milk consumption	
Fasting season	59.3
Dry season	1.9

f) Farm household per capita milk availability

Table 4 reveals that respondents in the study area produce about 1967 kg of milk per day. Of the total milk produced per day, 3.56% was retained for home consumption. From this study, it was estimated that the farm household average per capita per day availability of milk was 215.38 milliliter (ml). This was in excess of the average national per capita per day milk consumption of 44.44 ml or annual per capita milk consumption of 16 kg (Saxena, 1997). The results showed that dairy farmers' family members consume more milk per day than the national average. However, it was lower than the Indian Council of Medical Research (ICMR) recommendation of a minimum need of 250 ml of milk per capita per day (Singh, 1999). From this study it was observed that an increase in milk production will enable more amount of milk available for family consumption.

Table 5 : Household's estimated per capita consumption of milk at urban dairy farms, Jimma, Ethiopia

Parameters	N
Number of dairy farms	54
Total family size of the respondents	325
Milk retained for home consumption per day, liter	70
Per capita availability of milk per day, ml	215.38

N= number

III. Conclusion

Generally, it can be concluded that the physical and chemical quality of raw milk collected at Jimma town dairy farms almost meets the accepted standards. Milk and milk products are produced and consumed by the farm household on regular bases, being raw whole milk the most widely consumed dairy product. Regular inspection of the physicochemical quality of raw milk produced by smallholder dairy farmers in the study area needs to be conducted to maintain the standard quality of milk composition.

IV. Acknowledgements

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References Références Referencias

1. Alganesh, T., L.N. Ofodle and B. Fekadu, 2007. Microbial quality and chemical composition of raw whole milk from Horro cattle in East wollega, Ethiopia. Available on: www.ajol.info/index.php /ejesc/article/download/41995/9160 (Accessed on 30-05-2014).
2. Asaminew, T., S. Eyasu, 2009. Smallholder dairy system and emergency of dairy cooperatives in Bahir dar Zuria and Mecha Woredas, northern, Ethiopia. *World Journal of Dairy and Food Sciences* 4, 185-192.
3. Azage, T., 2004. Urban livestock production and gender in Addis Ababa, UA-Magazine, 4, 30-31. Proc. 14th Annual Conference of the Ethiopian Society of Animal production (ESAP). September 5-7, 2006. Addis Ababa, Ethiopia.
4. Azage, T., G.W. Alemu, 1998. Prospects for per-urban dairy development in Ethiopia. In: ESAP (Ethiopian Society of Animal Production), fifth national conference of Ethiopian Society of Animal Production, Addis Ababa, Ethiopia, 15-17 May 1997. ESAP, Addis Ababa, Ethiopia. pp. 28-39.
5. CSA, 2008. Statistical Abstract 2007. Central Statistical Authority, Addis Ababa, Ethiopia.
6. Chamberlian, A., 1990. An introduction to Animal Husbandry in the Tropics (4th Ed.) John Wiley and Sons Inc. New York. pp 758
7. CSA, 2011. Agricultural Sample Survey. Central Statistical Authority. Survey Report on Livestock and

Livestock Characteristics (Private Peasant Holding. Volume II. Addis Ababa, Ethiopia, pp. 9-26.
8. Ethiopian Standard (ES), 2009, Unprocessed whole/raw cow milk specification. 2nd ed., 2009, ES 3460-2009.
9. Eyasu, S., B. Fekadu, 2000. Microbiological quality of raw and pasteurlised goat milk. Livestock production and environment. Implication for sustainable livelihoods In: *Proceedings of the seventh Annual of the Ethiopian Society of Animal Production, pp 410-418, 26-27, May, 1999, Addis Ababa, Ethiopia.*
10. Food and Agriculture Organization (FAO), 1990. The Technology of Traditional Milk Products in Developing Countries. *Animal production and Health Paper. No. 85*. Food and Agriculture Organization of the United Nations. Rome, Italy.
11. Harding, F., 1990. Milk quality. Chapman and Hall Food Science Book. First Ed. Aspen publishers, Incorporated Gaithersburg, Maryland (Harding, F. Ed.): 3-23.
12. International Livestock Center for Africa (ILCA, 1990. Livestock systems research manual. No. 12, section 1. Working document. ILCA. Addis Ababa, Ethiopia.
13. International Livestock Center for Africa (ILCA), 1992. ILCA Annual Report and Program Highlights. ILCA, Addis Ababa, Ethiopia.
14. International Organization for Standardization (ISO), 1995. Recommendation of the meeting of the ISO of meat and meat products. ISO/TC-34/SC.6. The Netherlands. pp. 10-18.
15. Lemma, F., 2004. Assessment of butter quality and butter making efficiency of new churns compared to smallholders' butter making techniques in East Shoa zone of Oromia, Ethiopia. MSc Thesis, Alemaya University. Ethiopia.
16. O'Connor, C.B., 1994. Rural dairy technology. ILRI training manual No. 1. (International Livestock Research Institute), Addis Ababa, Ethiopia.
17. O'Mahony, F., 1988. Rural dairy technology: Experiences in Ethiopia. ILCA Manual No. 4. Dairy Technology Unit, pp 3, 8., International Livestock Center for Africa International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia, Addis Ababa, Ethiopia.
18. Office of Planning and Economic Development for Jimma Zone (OPEDJZ), 2002. Statistical Abstract. Jimma, Oromia, Ethiopia. 161pp.
19. Popkin, B., S. Du, 2003. Dynamics of the nutrition transition toward the animal foods sector in China and its implications: a worried perspective. *J. Nutr*. 133, 3896-3904.
20. Saxena, M.M., B.G. Katpatal, and H.S. Pandey, 1997. Study of milk constituents and their yield in Holstein–Friesian cows. *Indian Journal of Animal Production and Management* 13, 127–130.
21. Singh, R., 1999. Smallholder dairy farming initiatives: success and failure of milk cooperatives in the HKH. Paper presented at the International Symposium on *Livestock in Mountain/Highland production systems: Research and Development Challenges into the next Millennium* held in Pokhara, Nepal from 7-10 December, 1999.
22. Sintayehu, Y., B. Fekadu, T. Azage and G.M. Berhanu, 2008. Dairy production, processing and marketing systems of Shashemene–Dilla area, South Ethiopia. IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 9, ILRI (International Livestock Research Institute), Nairobi, Kenya. 62 pp.
23. Speedy, A. W., 2003. Global production and consumption of animal source foods. *J. Nutr.* 133, 4048-4053.
24. Tsehay, R., 2001. Small-scale milk marketing and processing in Ethiopia. In: Proceedings of the South. Workshop on smallholder milk production and marketing constraints and opportunities. March 12-16. Anand, India.
25. Yitaye, A., W. Zollitsch, M. Wurzinge and T. Azage, 2008. Characterization and analysis of the urban and peri-urban dairy production systems in the North western Ethiopian highlands. PhD thesis. BOKU – University of Natural Resources and Applied Life Sciences, Vienna, Austria.
26. Yousuf, K.M., 2003. Certain aspects of the dairy systems in the Harar milk shed, Eastern Ethiopia. PhD thesis, University of the Free State Bloemfontein, South Africa.
27. Zelalem, Y., 1999. Smallholder Milk Production Systems and Processing Techniques in the Central Highlands of Ethiopia. MSc thesis. Swedish University of Agricultural Sciences, Uppsala.
28. Zelalem, Y. and B. Faye, 2006, Handling and microbial quality of raw and pasteurized cows' milk and Ergo-Fermented milk collected from different shops and producers in central highlands of Ethiopia. *Eth. J. Anim. Prod.* 6: 67-82.
29. Zelalem, Y., G. Yohannes, H. Gizachew, G.W. Alemu and D. Sendros, 2004. Major milk chemical composition and feed dry matter intake of multiparous Boran cows as affected by level of milk production under bucket feeding and partial suckling calf rearing methods. Proceedings of the 11th annual conference of the Ethiopian Society of Animal Production (ESAP) held in Addis Ababa, Ethiopia, August 28-30, 2003, pp. 397-402.

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Study on the Occurrence of External and Gastrointestinal Parasites and Sub-clinical Mastitis on Crossbred Dairy Cows under Different Feeding and Management Conditions in the Central Highlands of Ethiopia

By Tamirat Siyoum, Mesfin Dejene & Zewdie Wondatir
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Abstract- On-farm intervention strategies based on feeding and general management practice including hygiene and sanitation towards on the reduction of occurrence of external and gastrointestinal parasites and sub clinical mastitis on cross breed lactating dairy cows was conducted during the dry season in West Shewa Zone, central Ethiopia. A total of 34 cows in early to mid lactation with an average body weight of 369.29 ±38.58 kg were selected based on parity, milk yield, days in milk, body weight and health status and assigned in to two groups; 17 cows of one group were maintained as farmers' usual practice (control diet = T_0), and the rest 17 were supplemented with urea-molasses multi-nutrient block (UMMB) together with a concentrate mixture (55% wheat bran, 43 % linseed cake and 2% salt) in natural pasture hay based diet under stall feeding condition (intervention diet = T_1). Moreover, the udder and associated hygienic condition of cows in T_1 group were implemented by farmers as per the advice and follow up of the researchers and veterinarians. The study showed that, the prevalence of gastrointestinal parasites (41.2%), external parasites (ticks) (47.1%) and sub clinical mastitis (47.1%) in the T_0 group was significantly ($P<0.05$) higher compared with cows managed under T_1 group. The nematode parasite (strongylus sp) was the only parasite group encountered in both treatment groups.

Keywords: *crossbred, feeding regime, mastitis, parasites, prevalence.*

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Study on the Occurrence of External and Gastrointestinal Parasites and Sub-clinical Mastitis on Crossbred Dairy Cows under Different Feeding and Management Conditions in the Central Highlands of Ethiopia

Tamirat Siyoum [α], Mesfin Dejene [σ] & Zewdie Wondatir [ρ]

Abstract- On-farm intervention strategies based on feeding and general management practice including hygiene and sanitation towards on the reduction of occurrence of external and gastrointestinal parasites and sub clinical mastitis on cross breed lactating dairy cows was conducted during the dry season in West Shewa Zone, central Ethiopia. A total of 34 cows in early to mid lactation with an average body weight of 369.29 ±38.58 kg were selected based on parity, milk yield, days in milk, body weight and health status and assigned in to two groups; 17 cows of one group were maintained as farmers' usual practice (control diet = T_0), and the rest 17 were supplemented with urea-molasses multi-nutrient block (UMMB) together with a concentrate mixture (55% wheat bran, 43 % linseed cake and 2% salt) in natural pasture hay based diet under stall feeding condition (intervention diet = T_1). Moreover, the udder and associated hygienic condition of cows in T_1 group were implemented by farmers as per the advice and follow up of the researchers and veterinarians. The study showed that, the prevalence of gastrointestinal parasites (41.2%), external parasites (ticks) (47.1%) and sub clinical mastitis (47.1%) in the T_0 group was significantly ($P<0.05$) higher compared with cows managed under T_1 group. The nematode parasite (*strongylus* sp) was the only parasite group encountered in both treatment groups. The mean EPG count observed under T_0 group was 120.8, which is markedly higher ($P<0.05$) compared to cows managed in T_1 group. This study revealed that the prevalence of external and gastrointestinal parasites as well as sub clinical mastitis was higher in cows kept under T_0 than the T_1 group. Hence, the improved nutritional intervention along with relative good hygienic and feeding management conditions practiced in T_1 group significantly reduced the occurrence of external and gastrointestinal parasites as well as sub clinical mastitis.

Keywords: crossbred, feeding regime, mastitis, parasites, prevalence.

I. Introduction

In Ethiopia, from arthropod parasites, ticks are the most important ones and economic loss incurred when they infest livestock particularly, cattle is enormous (Feseha, 1983). They also cause damage to hide and skins and reduce milk and wool production. reduce overall productivity of animals and increase susceptibility to other diseases (De Castro, 1997). About 60 species of ticks belonging to the genus *Amblyomma, Boophilus Haemaphysalis* and *Hyalomma* have been recorded in the country (Mekonnen *et al*., 2001) and of these 33 are known to be most common and important parasites of livestock (Pegram *et al*., 1981).

In sub-Saharan Africa in general and in Ethiopia in particular, gastrointestinal parasite infections have enormous impact both on small- and large-scale farmers, but their impact is greater due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and parasite species (Fikru *et al*., 2006). They cause losses through lowered fertility, reduced work capacity, involuntary culling, a reduction in feed intake and lower weight gains, lower milk production, high treatment costs and mortality in heavily parasitized animals (Lebbie *et al*. 1994). The genera of helminthes parasites involved, species, and the severity of infection also vary considerably depending on local environmental conditions, such as humidity, temperature, rainfall, vegetation, and management practices (Teklye, 1991).

On the other hand, mastitis is also one of the most complex diseases of dairy cows that generally involve interplay between management practices and infectious agents, having different causes, degrees of intensity, and variations in duration and residual effects (Harmon 1994). It causes significant losses to the dairy industry and affects milk hygienic and sanitary features (Singh and Sigh., 1994 and Harmon, 1994).

However, information regarding prevention strategies like management and feeding intervention towards different diseases under smallholder dairy farms in peri-urban areas is scarce. Hence, this study was intended to evaluate the intervention strategy towards the control of the occurrence of external and gastrointestinal parasites and sub clinical mastitis on crossbred dairy cattle.

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II. Material and Methods

a) Study Areas

On-farm study was conducted in West Shewa Zone of Oromia Region, Ethiopia. The area has bimodal rainfall pattern, with a short rainy period from February to April and a long rainy season from mid June to September. The annual temperature and rainfall ranges from 18°C to 24°C and 1000 to 1100 mm, respectively.

b) Sampling and Treatment Arrangements

A total of 17 household heads each having two lactating crossbred dairy cows were selected. Accordingly a total of 34 cows in early to mid lactation with an average body weight of 369.3 ±38.6 kg were purposively assigned into two feeding management treatment groups (each with 17 cows). This experiment was superimposed on a feeding trial conducted to evaluate the performance of crossbred dairy cows under traditional feeding and improved feeding practices. The feeding management treatments were intervention diet (T1) and the control which is farmers' feeding practice (T_0). The intervention diet consisted of urea-molasses multi-nutrient block (UMMB) prepared from 37% molasses, 25 % wheat bran, 15 % linseed cake, 10 % urea, 5 % cement, 5% lime, and 3 % salt and natural pasture hay as a basal diet. However, the control groups (T_0) were fed according to the farmer's feeding practice with varying proportions of traditional homemade concentrate mixtures in a free grazing condition. Improved health interventions follow up were made only for cows assigned in the intervention diet (T1).

Information on parity, body weight, milk yield, days in milk and health status was gathered before the commencement of the experiment. All animals in the two treatment groups were also initially checked for any external parasite infestation, gastrointestinal parasite and mastitis infection through clinical and laboratory examinations. Animals with positive results were treated before the commencement of the experiment. Data was collected through a pre-designed data recording sheet regarding the health, hygiene and housing condition of the animals. The data were recorded over a period of 171 days with the use of trained enumerators. Field visits were carried out every two weeks to monitor the data collection and overall management of the animals.

c) Tick Collection and Identification

Tick collection and identification were made according to Walker *et al*. (2003).The entire body surfaces of the cattle were examined every day and the ticks were collected by hand picking. Then, they were placed in a clean glass test tube plugged with cotton wool and brought to the veterinary laboratory of Holetta Agricultural Research Center for identification purpose.

d) Fecal Sample Collection and Examination

Fecal sample collection and examination was performed according to standard techniques and procedures given by Jorgen and Brian (1994). Fecal samples were collected from the rectum of the animal on monthly bases. Each sample was clearly labeled and was packed and dispatched in a cool box for laboratory examination. Simple test tube floatation and sedimentation technique were used for parasites' eggs separation and McMaster counting technique was employed to determine the number of eggs per gram of feces.

e) Milk Sample Collection

Milk sample from all animals were collected on monthly bases. Prior to quarter sampling, the teat ends were cleaned and rubbed with cotton moistened in 70 % alcohol. Initial streams of milk were discarded and approximately 5 ml of milk collected into 10-ml polythene tubes kept in ice. California mastitis test (CMT) was performed according to Quinn *et al.* (1994). Similarly portion of each quarter milk sample was inspected for clots, discoloration or wateriness before adding the CMT reagent. The CMT reagent (DeLaval, Wroclaw, Poland) method was used along with the physical examinations and the test was carried out as described by Schalm and Noorlander, (1957). Reactions were graded 1, 2, 3, 4, or 5.

f) Statistical Analysis

Data analysis was performed using Statistical Package for Social Sciences (SPSS) Ver. 15.0. T-test was used to compare treatment means.

III. Results

The study revealed that the prevalence of gastrointestinal parasite, external parasites (ticks) and sub clinical mastitis were 41.2%, 47.1% and 47.1%, respectively in the control group (Table 1). On the other hand lower prevalence was observed for cows in the T1 group. There was also significant ($P<0.05$) difference observed for the mean EPG value between the cows managed under the control (120.8) and intervention diets (17.5).

Table 1 : Proportion (%) of prevalence of external and gastrointestinal parasites and sub clinical mastitis

Disease type	Prevalence in T_1 (n = 17)	Mean EPG	Prevalence in T_0 (n = 17)	Mean EPG
Gastrointestinal parasite infection	17.6[b]	17.5	41.2[a]	120.8
External parasite infestation	5.8[b]		47.1[a]	
Mastitis	29.4[b]		47.1[a]	

[a-b] *means with different superscripts in the same row are significantly different (P<0.05), EPG = eggs per gram of feces*

Among the gastrointestinal parasites, *Strongylus sp.* was the only nematode parasite group encountered in T_1 group (16.7%) while 33.3% of them were observed in the control group (Table 2). The highest proportion of *Boophilus species* (41.7%) was observed for cows managed in the control diet. Similarly, about 25% *Amblyomma species* were also noted in the same treatment.

Table 2 : Types of parasites encountered and their proportion

Gastrointestinal parasites			Ticks		
Parasite name	T_1 group (%)	T_0 group (%)	Ticks species	T_1 group (%)	T_0 group (%)
Strongylus sp.	16.7	33.3	*Boophilus* sp	0	41.2
Haemonchus sp.	0	8.3			
Ostertagia sp.	0	16.7	*Amblyomma* sp	8.3	25
Mixed *(Haemonchus* and *Cooperia)* spps.	0	8.3			

T_1= intervention diet, T_0 =control diet

IV. Discussion

In the present study, high prevalence of gastrointestinal parasites in T_0 groups might be attributed to the free grazing management which was supposed to be responsible for the re-infection of gastrointestinal parasites. Bliss, *et al*. (1982) indicated that, changes in weather, nutrition, management, immune status of the animals and the extent of exposure of each animal affect the type of parasites present. These factors could also determine the number and type of parasite present in the body of the animal. Moreover, each type of parasite species has different mode of life in the animal body and in the external environment.

Joost *et al*. (2000) reported a prevalence rate of 64% for gastrointestinal nematode on adult dairy cattle, which is higher than the current finding in the control group. The same report also has shown that the recovered nematodes were *Ostertagia* sp. *Trichostrongylus* sp. *Oesophagostomum* sp, *Haemonchus* sp. and *Cooperia* sp.which are in agreement with the current finding particularly for *Haemonchus sp*. and *Cooperia sp.* However, the present finding did not agree with the work of Fikru *et al.* (2006) who reported a prevalence of 69.6% for gastrointestinal parasites in western Oromia, Ethiopia. High prevalence of ticks encountered for cows received T_0 diet group might be due to re-infestation during free grazing. A similar report by Abdul *et al*. (2007) indicated about 20.4% ticks prevalence on cattle grazing in the field. Moreover, the contemporary finding for cows received T_0 group is in accordance with the work of Belew and Mekonnen (2011), who reported about 45.4% of prevalence of ticks infestation on dairy cattle kept under extensive farming system at Holeta and its surroundings.

High prevalence of sub clinical mastitis in the T_0 group might be related to poor follow up, advice and lack of training to farmers on the hygiene and sanitation of the udder. The prevalence rate obtained for cows in T_0 groups is in line with the report of Hafiz *et al*. (2005), who obtained 46.7% prevalence of sub clinical mastitis. On the other hand, Workineh *et al*. (2002) cited by Almaw *et al*. (2006) indicated that, the prevalence of clinical and sub clinical mastitis in Ethiopia ranges from 1.2 to 21.5% and 19 to 46.6%, respectively where most of these studies were carried out in Addis Ababa and its surroundings.

V. Conclusion

The prevalence of mastitis and parasites was higher in the control groups than the treatment groups. Improved feeding practice including better management and hygiene condition between the two groups is considered to have positive effect on controlling disease prevalence.

VI. Recommendations

Farmers should be aware of delivering a proper feeding management, housing and health care to their animals. Animal health care extension service should be well organized to support small holder peri-urban dairy farmers.

References Références Referencias

1. Abdul, M., Zabita, K., Bashir, A.,and Abdullah. (2007): Prevalence and identification of ixodid tick genera in frontier region Peshawar. *Journal of Agricultural and Biological Science* VOL. 2, NO. 1.
2. Almaw, G., W. Molla and A. Melaku. (2006): Prevalence of bovine sub clinical mastitis in Gondar town and surrounding areas, Ethiopia. Faculty of Veterinary Medicine, University of Gondar, Ethiopia
3. Belew, T. and Mekonnen, A. (2011): Distribution of Ixodid Ticks on Cattle in and Around Holeta Town, Ethiopia: Global Veterinaria 7 (6): 527-531. College of Agriculture and Veterinary Medicine, Jimma University, P.O. Box 307, Jimma, Ethiopia.
4. Bliss D.H., R.M. Jones, D.R. Condor. (1982): Epidemiology and control of gastrointestinal parasitism in lactating, grazing adult dairy cows using a morantel sustained release bolus. *Vet Rec*.
5. De Castro, J. J. (1997): Sustainable ticks and tick-borne disease control in livestock improvement in developing countries. *Vet*. *Parasitol*. 71: 69-76.
6. Feseha, G. (1983): Notes on tick species and tick born disease of domestic animals in Ethiopia. FVM, AAU, Debre Zeit, Ethiopia.
7. Fikru, R., Teshale, S., Reta, D. and Yosef, K. (2006): Epidemiology of Gastrointestinal Parasites of Ruminants in Western Oromia, Ethiopia. Intern J Appl Res Vet Med • Vol. 4, No. 1.
8. Hafiz, A. B., Zafar, I., Abdul, J., Zahid, A. and Riasat, A. (2005): Sub-clinical bovine mastitis in attock district of punjab (Pakistan) *International journal of agriculture & biology*.1560–8530/2005/07–6–1034–1035.
9. Harmon, R. (1994): Symposium: Mastitis and genetic evaluation for somatic cell count. J. Dairy Science. 77: 2103 -2112.
10. Jorgen, H. and Brian p. (1994):The epidemiology, diagnosis and control of helminth parasites of ruminants. A hand book. ILRAD. International laboratory for research, Nirobi, Kenya. pp. 53-80.
11. Joost, A., Edwin,C., Pierre, D., Fred, H.M.B., Jozef, B. 2000. Nematode parasitism in adult dairy cows in Belgium. Veterinary Parasitology, Volume 90 issue 1-2, PP.83-92
12. Lebbie, SHB., Rey, B. and Irungu, EK. (1994): Small ruminant research and Development in Africa. Proceedings of the Second Biennial Conference of the African Small Ruminant Research Network. *ILCA*.1-5.
13. Mekonnen, S., Hussein, I. and Bedane, B. (2001): The distribution of ixodid ticks (Acari: Ixodidae) in central Ethiopia. *Onderstepoort J Vet Res*. 68(4):243-51.
14. Quinn PJ., Carter ME., Markey B. and Carter, GR. (1999): Clinical Veterinary Microbiology. Wolf publishing, London, England: 327-344.
15. Schalm, O. and Noorlander, D. (1957): Experiments and Observations leading to development of California Mastitis Test. *J. Ameri. Vet. Med. Assoc*. 130, 199 - 204,
16. Singh, J. and Singh, B. (1994): A study on economic losses due to mastitis in India. *Indian J. Dairy Sci*. 4: 265-272, SPSS (Statistical Package for Social Sciences). (2006): Ver.15.
17. Teklye, B. (1991): Epidemiology of endoparasites of small ruminants in sub-Saharan Africa. Proceedings of Fourth National Livestock Improvement Conference. Addis Ababa, Ethiopia; 13-15 November: 7-11.*Veterinary Parasitology* 90 (1-2) 3-92. Washington DC, 1589pp
18. Walker, A. R., Boutiour, A., Camicas, J. L., Strada-Peňa, A., Horak, I. G., Latif, A. A. Pegram, R.G., and Preston, P. M. (2003): Ticks of domestic animals in Africa. A guide to identification of species, Pp. 3-210.

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Effect of Different Crop Residues on Growth and Flowering of Dahlia *dahliahortensis* under Agro- Climatic Conditions of Layyah

By Abdul Kareem, Shafqatsaeed, Shoaibur Rehman & Muhammad Aslamkhan
University of Agriculture, Afghanistan

Abstract- This research was conducted to assess the growth performance of dahlia on various crop residues as potting media. Pot research was conducted by transplanting 20 days old seedlings on different crop residues, including, Silt as control, FYM+Silt (1:3), FYM+Silt (1:3) cockscomb and FYM+Silt (1:3) Maize crop residues as treatment. Completely Randomized Designs (RCBD) was applied to test the significance and compared means of treatments. Data was recorded for different parameters including plant height (cm), total number of leaf, total number of branches, total number of flower, fresh weight(g), dry weight (g), total bulbs, bulb diameter, flower diameter. All the results were statistically significant and the results related with plant growth indices indicated that the maximum values for plant height (39.33cm), total number leaves (53)total flowers (4.66), fresh weight(g) (76.03),dry weight (g) (14.00), bulb diameter (8.33) flower diameter (11.66) were found in slit. The combination of Slit + FYM and crop residues has little effect on all the parameters studies.

Keywords: *dahlia, crop residues, silt, maize, FYM, cockscomb.*

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Effect of Different Crop Residues on Growth and Flowering of Dahlia *dahliahortensis* under Agro-Climatic Conditions of Layyah

Abdul Kareem [α], Shafqatsaeed [σ], Shoaibur Rehman [ρ] & Muhammad Aslamkhan [ω]

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Keywords: dahlia, crop residues, silt, maize, FYM, cockscomb.

I. Introduction

Dahlias are a diverse and popular class of plants grown for winter flowers in beds or containers in Pakistan. Cultivars are available in a wide range of plant heights, colors, and flower forms to suit almost every need and have been used as bedding plants, garden plants, and cut flowers for many years.

Growing media plays an important role in the growth and productivity of plants by providing them nutrition, anchoring and providing minerals to plants. A good growing medium would anchorage and support to the plant, serves as source for nutrients and water, allowing oxygen to diffusion to the root zoon and permit exchange of gases between the roots and external atmosphere (Argo, 1998 and Abad et al., 2002).

Soil mixes are the most important potting Medias for the quality production of cut flowers in floriculture. In the last few years, floriculrist and nursery men have been very concerned about potting mixes. Research suggested that peat has been replaced satisfactorily with some organic waste materials in container media including wood fiber and bark, coconut coir, and compost etc. Sewage sludge from municipal wastewater has extensively been used as soil base growing medium (Vendrame et al., 2005). Peat and natural soil are the most used growing media for the container growing of ornamental plants. Peat is widely used for potted plant production in nurseries and accounts a significant portion of the potted material used to grow plants (Marfa et al., 2002; Ribeiro et al., 2007).

Different types of waste materials offer a potential alternate for peat in horticulture production. There is a continuous attention in using various agricultural crop residues byproducts as nutritional source for plants because of rising consciousness of environmental issues, including the need for managing and making use of bulk quantities of agricultural waste (Grigatti, 2008; Riaz et al., 2008). In recent years, researchers have shown an interest in reducing the use of crop residues as growing media in pot production (Abad et al., 2001; Khan et al., 2012).

Crop residues play important roles in nutrient cycling, erosion control and the maintenance of favorable soil physical properties (Pichot et al., 1981;Power et al., 1986; Bationo and Mokwunye, 1991; Unger et al., 1991). They protect the soil surface from wind and water erosion, provide favorable seedbed conditions and conserve soil water. The magnitude of the beneficial effects associated with returning crop residues to fields depends on the quantity and quality of the residue, the subsequent crop to be grown, edaphic factors, topography, climate and soil management.

Crop residues retained on the surfaces provide soil and water conservation benefits. These resultsare benefited mainly from their naturalpresence that moderated the forces of wind as well as water; reducing the potential for erosion (Usman et al., 2012).Conservation of water resources is of supreme importance for nourishing crop productivity. Most benefits from residues include greater soil organic matter concentrations, moderation of soil temperature and increased biological activity, all of which are also important for crop production (Kashihara et al., 2011).

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The present research project focused, in particular, flower size, flower quality, to increase its aesthetic beautification in Pakistan by using different crop residues as media.

II. Materials and Methods

This experiment was carried out on crop residues as growing media, to evaluate their effects on dahlia growth and flowering parameters in College of Agriculture Bahadur sub-campus BZU Multan during winter 2013. Dahlia seeds were purchased from a well reputed seed agency and seedlings were raised in the pots containing silt. 20 days old seedlings were planted in pots. The experiment was performed in the pots under field conditions. A Completely Randomized Designs (RCBD) was established, including Silt as control FYM+Silt (1:3), FYM+Silt (1:3) Maize crop residues and FYM+Silt (1:3) Cockscomb, effects on dahlia flowers agronomic traits. The residues were obtained from freshly harvested crops of maize and cockscomb in the pots, each treatment comprised of five pots in each replicate and repeated thrice with 3 plants each pot. Observations on each plant were made and their averages were taken for plant height (cm), total number of leaves, total number of branches, total number of flower, fresh weight (g), and dry weight (g) total number of bulbs, bulb diameter and flower diameter. All the parameter was recorded at blooming stage.

The data were statistically evaluated by analysis of variance according to a RCBD and means were calculated using the program Statistica. Differences between the treatments were determined using LSD test.

III. Results and Discussions

a) Plant Height (cm)

Each treatment produced varying heights in response. Treatment consisting of Silt resulted in maximum plant height 49.33 cm followed by FYM+Silt40.66 cm and Maize residues 34.66 cm while, 26.66 plant heights was observed in Cockscomb residues. The performance of cockscomb residues was not satisfactory as it resulted in minimum plant height 34.66 cm from Table 1. Results have indicated that silt have better qualitative and quantitative effects on plant height as compared to the crop residues. This may be due to excessive nutrients in crop residues which may reduce the crop productivity. These results are in line with the studies of (Fred et al.,1997) where they noted that chrysanthemum showed maximum plant height when it was grown in compost mixes. Our findings are also in agreement with (Yusef, 1997) who reported that growing of flowers on organic manures had the best effects on growth of annual flowers like petunia (*Petunia hybrida* L.), snapdragon (*Antirrhinum majus* L.) and marigold (*Tageteserecta* L.) and increased plant height, number of flowers and flower diameter.

b) Total Number of Leaves

Table 1indicated that the maximum number of leaves 53.00 were counted in control (Silt) followed by (FYM+Silt) and crop residues Maize and cockscomb producing 32.33, 31.33 and 19.00 leaves and were statistically at par each other. These results indicate that silt has nutritional balance for maximum number of leaves whereas crop residues have malnutrition effects on number of leaves production. These findingswere supported by the findings of (Raiz et al., 2008). They also counted more number of leaves in mixture of leaf compost.

c) Total Number of Branches

Comparison of means regarding total number of branches produced in different crop residues showed that Maize residues (14.66) and silt (13.33) produced almost same number of branches followed by (FYM+Silt) and cockscomb residues having 10.00 number of branches However, control is at par with maize residues whereas (FYM+Silt) is at par cockscomb residues. The possible reason may due moisture and organic matter status of different crop residues. These finds are in accordance with the results of (Riaz et al.,2008) who recorded highest number of branches in coconut medium when it was combined with silt + leaf manure.

d) Total Number of Flowers

Means comparison of crop residual effect regarding number of flowers depicted same number of flowers in each treatments, which mean that all the treatment have same effect or no effect on total number of flowers. This can correlated with genetic factor of the crop.

e) Flower Diameter (cm)

Comparison of different potting media showed that silts has maximum flower diameter (11.66 cm) followed by (FYM+Silt) having 10.33 cm and Maize residues (9.00 cm) flower diameter and were statistical at par. However, cockscombs produced (7.66 cm) with minimum flower diameter. These results are in comparison to the findings of (Tailin et al.,2003) who also obtained highest flower diameter of Dahlia in leaf manure + sand as media.

f) Plant Fresh Weight/Dry Weight (g)

Plants with maximum increase in fresh weights showed the nutrient rich growing media. Analysis of fresh weight of plant showed highly significant positive results. Maximum increase in fresh weight was found in plant (76.03 g) in control followed by (FYM+Silt) and maize residues with 49.33 and 39.33 g. On the other hand, plants grown cockscombs residues presented

marked reduction fresh weight (25.76 g) (Table. 1). A significant positive increase (14.00 g) in dry weight of plant was recorded in Silt. While, decrease in dry weight in (FYM+Silt), Maize Cockscomb which was statistically at par with each other at 8.10, 6.96 and 6.76 g.

g) Total Number of Bulbs

The results for total number of bulbs were statistically significant but plants produce same number bulbs (1.66) and statistically at par with each other. These conditions indicate genetic make of plant has significant role in number of bulbs production.

h) Bulb Diameter

Bulb size was increased with silt (control). Maximum bulbdiameter was observed (8.3 cm) in silt medium and minimum bulbs size was recorded in all crop residues (5cm) and were statistically at par. This increase in diameter is concerned with nutritional status of slits as well its porosity. Same results were found in gladiolus crop (Kareem et al., 2013).

References Références Referencias

1. Abad M, Noguera P, Puchades R, Maquieira A &Noguera V (2002). Physico-chemical and chemical properties of some coconut dusts for use as a peat substitute for containerized ornamental plants. *Biores.Technol* 82:241-245.
2. Argo WR (1998). Root medium chemical properties. *Horticultural Technology* 8 846-894.
3. Bationo A &Mokwunye AU (1991) Role of manures and crop residues in alleviating soil fertility constraints to crop production, with special reference to the Sahelian and Sudanian zones of West Africa. *Fertilizer Research* 29: 117-125.
4. Fred DR, Harris MG, Roger W & Richard WS (1997).Plant growth in Potting media using compost.Horticulture Research Note.Department of Horticulture College of tropical Agriculture and Human Resources University of Hawaii at Manco.
5. Grigatti M (2008). Growth and nutritional status of bedding plants on compost-based growing media. *ActaHorticulturae* 779: 607-614.
6. Kareem A, Muhammad AK, Shoib UR &Irfan A (2013). Different Corm Sizes Affect Performance of Gladiolus grandifloruscvs. Red Majesty and Early Yellow.*Advances in Zoology and Botany* 1(4): 86-91.
7. Kashihara Y, Shinoda K, Murata N, Araki H & Hoshino Y (2011). Evaluation of the horticultural traits of genus Alstroemeria and genus Bomarea (Alstroemeriaceae).*Turkish Journal of Botany* 3: 239-245.
8. Khan Z, Tiyagi SA, Mahmood I &Rizvi R (2012).Effects of N fertilisation, organic matter, and biofertilisers on the growth and yield of chilli in relation to management of plant-parasitic nematodes.*Turkish Journal of Botany* 36: 73-81.
9. Marfa O, Lemarie F, Caceres R, Giuffrida F & Guerin V (2002).Relationships between growing media fertility percolate composition and fertigation strategy in peat-substitute. *ScientiaHorticulturae* 94: 309-321.
10. Pichot J, Sedogo MP, Poulain JF &Arrivets J (1981). Evolution de la fertilité d'un sol ferrugineux tropical sous l'influence de fumuresminéralesetorganiques. *AgronomieTropicale* 36: 122-133.
11. Power JF, Doran JW & Wilhelm WW (1986). Uptake of nitrogen from soil, fertilizer and crop residues by no-till corn and soybeans.*Soil Science Society of America Journal* 50: 137-142.
12. Riaz A, Arshad M, Younis A, Raza A &Hameed M (2008). Effect of diff erent growing media on the growth and flowering of Zinnia elegans cv. Blue Point. *Pakistan Journal of Botany* 40: 1579-1585.
13. Ribeiro HM, Romero AM, Pereira H, Borges P, Cabral F &Vaconcelos E (2007). Evaluation of a compost obtained from forestry wastes and solid phase of pig slurry as a substrate for seedlings production. *Bioresource Technology* 98: 3294-3297.
14. Tailin Z, Bailin S, Qixia Q &Renjuan J (2003). Cultivation experiments on several kinds of herbaceous flowers. *Zhejiang Forestry College*, 20(1): 108-110.
15. Unger PW (1978). Straw-mulch rate effect on soil water storage and sorghum yield.*Soil Science Society of America Journal* 42: 486-491.
16. Usman T, Shoaib R, Muhammad AK, Adnan Y, Muhammad Y & Muhammad A (2012). Agricultural and municipal waste as potting media components for the growth and flowering of Dahlia hortensis 'Figaro' *Turkish Journal of Botany* 36: 378-385
17. Vendrame AW, Maguire I & Moore KK (2005. Growth of selected bedding plants as effected by different by different compost percentages. *Florida State Hort. Soc* 18:368-371.
18. Yusef SSA (1997). Influence of organic and inorganic fertilization on the growth of some annual flowers. *Agric. Res. Center King Saud Univ* 70:5-21.

Table 1 : Effect of different crop residues on flowering and bulb formation of dahlia.

Media (1:3)	Plant height (cm)	Total leaf	Total branches	Total flower	Fresh Weight(g)	Dry weight (g)	Total bulbs	Bulb diameter	Flower diameter
Control									
Silt	49.33A	53.00 A	13.33AB	4.66 A	76.03 A	14.00 A	1.66 A	8.33 A	11.66 A
Crop Residues									
FYM+Silt	40.66 B	32.33 B	10.00 B	4.33 A	49.33 B	8.10 B	1.66 A	5.00 B	10.33AB
Maize (FYM+Silt)	34.66 B	31.33 B	14.66 A	4.33 A	39.33 B	6.96 B	1.66 A	5.66 B	9.00 AB
Cockscomb (FYM+Silt)	26.66 C	19.00 C	10.66 B	4.00 A	25.76 C	6.76 B	1.66 A	5.00 B	7.66 B

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Effect of Rural- Urban Labour Migration on Rural Household Livelihoods and Rural Environment in Delta State, Nigeria

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Abstract- There has been increasing research interest in rural migration in recent times. Rural migration is the movement of people from one geographical location to another. The rural areas are the banks of the world's natural resources such as land and forests which house timber forest and non-timber resources. This study was carried out to ascertain the effect of rural-urban migration on household livelihoods and rural environment in Delta State, Nigeria. It assesses a conceptual framework involving rural household livelihoods as an integrative mediating factor between rural-urban labour migration and the rural environment of Delta State, Nigeria. Data were collected through household surveys and key informant interviews from six villages. The results reject the null hypothesis that labour-migrant and non-labour-migrant households do not differ significantly in livelihood activities, including agricultural production, agricultural technology use, income and consumption, and resource use and management. Implications for future environmental outcomes of rural labour emigration and the related natural resource management and policy in rural push areas are discussed.

Keywords: *rural-urban migration, migrant households, non-migrant, households, rural push areas, rural environment, rural livelihoods.*

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Albert Ukaro Ofuoku[α] & Emerhi, E. A. [σ]

Abstract- There has been increasing research interest in rural migration in recent times. Rural migration is the movement of people from one geographical location to another. The rural areas are the banks of the world's natural resources such as land and forests which house timber forest and non-timber resources. This study was carried out to ascertain the effect of rural-urban migration on household livelihoods and rural environment in Delta State, Nigeria. It assesses a conceptual framework involving rural household livelihoods as an integrative mediating factor between rural-urban labour migration and the rural environment of Delta State, Nigeria. Data were collected through household surveys and key informant interviews from six villages. The results reject the null hypothesis that labour-migrant and non-labour-migrant households do not differ significantly in livelihood activities, including agricultural production, agricultural technology use, income and consumption, and resource use and management. Implications for future environmental outcomes of rural labour emigration and the related natural resource management and policy in rural push areas are discussed.

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I. Introduction

Migration, according to Ekong (2003), is the movement of people from one geographical location to another either on a temporary or permanent basis. Labour migration therefore, refers to the movement of labour from one geographical location to another temporarily or permanently. It is commonly observed all over the world that rural-urban migration is the dominant pattern of internal migration (Ofuoku and Chukwuji, 2012). There was boom in agriculture in years past, but when Nigeria gained independence, there came the oil boom. This boom resulted to rapid urbanization which was prompted by the influx of oil exploring and servicing companies in the Niger Delta Region in which the study area is located. With the oil boom, most educated and non-formally educated youth abandoned farming and farm related activities to work in the oil exploring and servicing companies and ministries. That was what led to loss of labour, by the agricultural sector, to other occupations through rural-urban movements of people.

Ekong (2003) observes that it is difficult to strictly pin-point the causes of migration, since causation connotes absoluteness whereas it is usually difficult to cite this or that variable as the absolute cause of an individual's decision to relocate. It is therefore more scientific to refer to the correlates of migration factors that are systematically related to the phenomenon of migration without necessarily proving causation (Ekong, 2003). Most investigations of rural-urban migration tend to infer that people primarily move for economic reasons, and the need to escape from adverse social and physical conditions. Von Braun (2004) asserts that people tend to be pulled to areas of prosperity and pushed from areas of decline.

Migrants do not typically represent a random sample of the total population (Tadaro, 1976). Most rural-urban migrants are young, formally educated, less risk-averse and more oriented towards achievement and have good network of relationships in other places than does the general population in the source-migration area. Adewale (2005) suggests that rural-urban migration negatively impacts on the quality of rural life, especially when such migrants move away with their needed productivity into the urban areas. Migration of young adults from the rural to urban areas places a greater burden on the farming household, he further stated. This is attributed to the fact that farmers spend more time to cover the same area of land-than when he or she had the assistance of the migrant, thereby depriving himself of leisure time and involvement in social activities (Ofuoku and Chukwuji, 2012) and may consequently decide to reduce the farm size to the one he or she can manage.

However, there is a general agreement in many literature that migration and remittances from migrants reduce rural poverty and raise rural household living standards. According to Taylor and Mora (2006");Schmook and Radel (2008);Wouterse and Taylor (2008), migrant households that receive remittances from migrants members have higher income and consumption levels than non-migrant households. This is further butteressed by Adams (2006) ; Airola (2007) who show that migrant households with remittances tend to spend more than

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non-migrant households on durable goods and productive activities.

Several studies that investigated the impact of migration on agricultural technology use by rural households show that labour scarcity prompted by rural abandonment of traditional labour-intensive agricultural technologies by migrant households as demonstrated by Zimmerer (1993) and, according to Black (1993) discourages the adoption of new agricultural innovations. However, Oberai and Bilsborrow (1984) assert that migration results to technological improvement in rural areas when remittances from migrants are invested in more modern technologies. They further argue that the stimulating effects of new ideas and knowledge brought back by migrants also contribute to improvement in technology in rural areas. Mendola (2008) found that migrant households tend to use new farming innovations to improve agricultural production than non-migrant households.

The rural areas house most of the natural resources in the world. These natural resources include land and forests. Rural-urban migration involves human population and human population has relationships with the environment. Owing to the afore mentioned facts, rural-urban migration and its relationship to the rural environment have led to increasing interest in recent studies on population-environment linkages (Bilsborrow, 2002; Carr, 2009). Qin (2010) observes that in the long running debate on the relationships between population and the environment, early simplistic opinions about negative linear relationships between population growth and the natural environment have been discarded and replaced by a more complex mediating variable framework (Jolly, 1994; Mackeller, *et al*, 1998). According to Qin (2010), this approach incorporates socio-economic, institutional, technological, and cultural contextual factors which change the relationships between population and environmental changes. He further stated that the mediating variable perspective is especially important in studying the specific systems by which migration affects the environment. Pichon (1997); Perz (2003) opine that migrants distinguish themselves from non-migrants with respect to resource use behaviour, resource extraction technologies, and knowledge of local ecosystems in rural areas of destination. Accorading to Bilsborrow (2002), though it is often claimed that settlement of agricultural migrants in environmentally sensitive areas like the rainforests and swamp forests leads to serious deforestation and environmental degradation, some researches, according to Cassels *et al* (2005), found that environmental degradation is not particularly associated with migrant households.

The relationships between migration and the environment are always complex. Since this is so, a precision oriented study needs comparing the biophysical situation pre and post migration. The challenge here is that such records and information are not usually available in developing countries, especially in the rural areas. However, Qin suggests that a reasonable and efficient investigation strategy of differentiating environmental impacts of migration is to compare migrant households or migrants with non-migrant households or non-migrants in relation to activities that have important environmental consequences, such as resource use behaviour and resource extraction technologies. This approach have been used by Browder (1995), Sierra (1999), Perez (2003) to assess the effects of migration on the environment in the Pull area. In contrast, according to Qin (2010), there have been few studies examining the impacts of migration on the environment in the push area.

A lot of literature on the social and economic impacts of migration on rural areas are available. Qin (2010) states that comparing migrant households and non-migrant households regarding agricultural production, use of agricultural technologies, and income consumption is a common approach to studying the impacts of migration on rural people's life. Considering the environmental outcomes of these variables, this line of investigation may have direct implications for future environmental consequences of migration in rural migrant-source areas. However, such linkages have been considered by few studies in the recent past. Factors such as agricultural practices, incomes and assets, and patterns of consumption are critical to the process of rural dwellers' livelihood. Carney (1998) conceptualizes livelihood to comprise of the capabilities, natural, physical, human, financial and social assets; and activities needed for a means of living. Migration is regarded as one of the most important livelihood strategies among rural dwellers, when the environment and natural resources are included in the context as well as in capital assets, strategies and outcomes of livelihoods. According to Sheerbinin *et al* (2008) the linkage between changes in rural household population and the environment is an important area of population-environment study that is in vogue. The household or family is likewise the basic unit of analysis in rural livelihood system. For this reason, the household forms an appropriate level of analysis for a study on the effect of migration on livelihoods and the environment. Qin (2010) suggests that rural household livelihoods can be conceptualized as an integrative mediating factor into the migration and environment model.

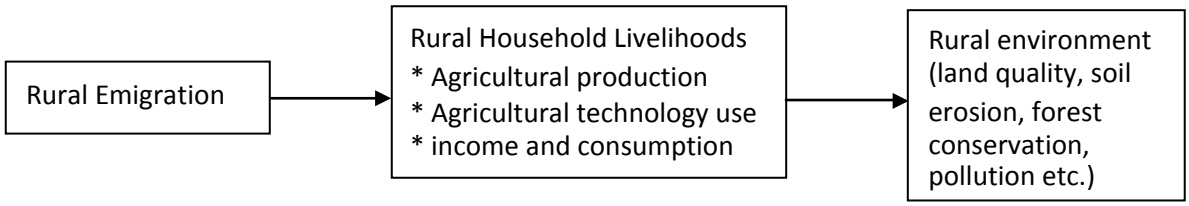

Figure 1 : Conceptual Framework for Effects of Rural Emigration on the Rural Environment, Adapted from Qin (2000)

II. Conceptual Framework

The effects of rural emigration on rural environment are made possible by intervening variables of agricultural technology use, income and consumption, and resource use and management (Qin, 2010). On the advent of rural emigration, at this household level, agricultural production is reduced as a result of shortage of labour. However, rural emigration may lead to adoption of labour saving agricultural technologies to replace lost labour and enhance production. Remittances from emigrants are channeled into the purchase of agricultural innovations and emigrants also bring back home, knowledge and ideas that promote agricultural productivity. Remittances from migrants to households are expected to enhance households' incomes and consumption levels. This may reduce the farm size and magnitude of farming activities and expansion. It may also lead to abandonment of some farmed areas.

Ideas and knowledge acquired and transmitted to rural households promote better resource use and management. With reduced agricultural activities and farm sizes, use of modern technologies, dependence on remittances and better use and management of resources, the rural environment is impacted as consequence of the new status of rural household livelihoods. The land quality is improved and erosion is prevented and reduced and forests reserved while previously abandoned areas regenerate to reafforest. With this re-afforestation, rural pollution is reduced progressively.

III. Objectives of the Study

This study was carried out in Delta State to ascertain the effect of rural-urban labour migration on household livelihoods and rural environment. Specifically, this study sought to:

- compare socio-demographic variables of labour migrant and non-labour migrant households;
- determine the differences between labour migrant and non-labour migrant households.
- ascertain the differences among labour migrant, local off-farm work households, and farming households.

Hypothesis (H0): there is no significant difference between households with respect to agricultural production, agricultural technology use, income and consumption, and resource use and management.

IV. Method

a) Study area

Delta State is located in the Niger Delta Region of Nigeria. It lies betweem longitude 5^0.00 and $6^0$45' east of the Greenwich meridian and latitude $5^0$00 and $6^0$30 north of the equator (see figure 2). The state consists of 25 local government areas (see figure 3) with a population of 2,570,181 people (NPC, 1993).

The state is naturally demarcated into South, Central and North Agro-ecological zones based on the vegetation cover by the Delta State Agricultural Development Programme, the major agricultural extension agency of the state.

In the past 30-35 years, Nigeria witnessed a mass exodus of labour migrants from rural to urban areas. It is estimated that 80% of rural dwellers in Nigeria are employed in agricultural activities (Abbass, 2009). Wage labour is predominantly in use in the Nigerian urban areas with 50% acquired through rural-urban migration (Abbass, 2009). Delta State is in the forests and derived savannah vegetation belts characterized by ecological problems such as deforestation, diminishing land fertility and soil erosion. Delta State is an important study area for examining the effects of rural-urban migration on the rural environment because of the extent ecological stress and high rates of rural-urban labour migration that take place.

b) Sampling and sample size

Two-stage process was used to select the study communities. First, based on the ecological zoning if Delta State, the three agro-ecological zones were considered (Delta South, Central and North Agro-ecological Zones).

In the second stage, two rural communities from each agro-ecological was poor positively selected while considering two criteria: (i) high level/rate of rural-urban labour migration; and (ii) existence of abundant farmland and forests. These two criteria highlight the linkage between rural labour emigration and the rural environment, and therefore can enhance comprehending how rural-urban labour migration relates to conservation of were natural resource. In this process, six (6) villages were selected. These villages included Utagba-Uno and Ossisa (Delta North Agro-econlogical zone), Ugborhe and Boboroku (Delta Central Agro-

ecological zone), and Agadabri and Kiagboda (Delta South Agro-ecological zone). The basic attributes of these 6 study villages are summized in Table 1, which shoes variations in labour migration rates, income levels and natural resources endowments. These communities combine to provide a representative sample of all the rural areas in Delta State.

A total of 60 key informants were selected using stratified random sampling to include village leaders, teachers, resident elders, forestry staff and agricultural extension workers. This was done to represent the broad interests and perspectives in the study communities. In each community, stratified random sampling of labour migrant and non-labour migrant households was done from a list of all households provided by village leaders. Finally, households were randomly selected from each category. A total of 480 households were finally selected. However, a total of 475 questionnaires could be retrieved, (238 labour migrant household heads and 237 non-labour migrant households.

Table 1 : General Attributes of Study Communities

Study Villages	Number of households	Population	Number of labour migrants	Per Capita annual	Farmland size(ha Income(N)	Forested landsize (ha)
Utagba-Uno (Ndokwa West LGA)	234	1,712	581	5,500	1,620	2,880
Ossisa (Ndokwa East LGA)	215	1,976	723	3,100	1,815	5,590
Boboroku (Ethiope East LGA)	299	2,121	806	4,300	2,090	7,480
Ugborhe (Sapele LGA)	183	2,316	814	4,350	2,289	7,690
Agadabri (Patani LGA)	143	1,022	300	2,200	1,020	3,259
Kiagbodo (Burutu LGA)	168	1,130	250	2,250	1,182	5,980

Note: 150.00 = Us $1.00 at the time of survey (2012)
Source: Community Development Communities of Study Communities

c) Data Collection

A combination of multiple research methods was used. This was necessitated by the complex nature of population-environment relationships. Quantitative and qualitative methods were combined through mixed-methods approach for this study as used by Tashakkori and Teddlie (1998), Qin (2010) in their studies. A structural context of this study was provided by analysis of secondary socio-economic and biophysical data sourced from Federal Bureau of statistics, Ministries of Environment, Environmental protection agencies and Forestry Departments at the state and federal levels of government in Delta State. Key informant interviews were carried out before and during rural household surveys to get information about rural livelihood experiences to guide the development of the questionnaire used for the study. These interviews also provided a contextualized backdrop for the analysis of the collected data. All the interviews were taped, transcribed and qualitatively analyzed to identify common themes (Dunn, 2000; Qin, 2010).

It was observed that the non-labour-migrant households were not a homogenous group as households whose members were mainly engaged in farming and workers in local non-agricultural enterprises were included. As a result of this, the survey households can be further divided into three subgroups (Qin, 2010): 238 labour-migrant households, 95 local off-farm work households, and 142 farming households. The three subgroups were however involved with farming to different magnitudes.

d) Measurement of variables

Four components of rural household livelihoods (agricultural production; use of agricultural technologies; household income expenditure and assets; and resource use and management, captured in the conceptual framework were addressed by the survey. They were all measured by multiple variables and

several socio-demographic characteristics of the households were considered.

Agricultural production practices of rural households were measured by four variables. Farmland use was measured by the size of per labour cultivated land (ha) in the year of survey (2012). Respondents were also required to indicate if or not in 2008 their household was engaged in the following areas of agricultural production: (i) grain crops; (ii) yam; (iii) cassava (iv) beans; (v) vegetables; (vi) fruits; (vii) oil palm; (viii) commercial poultry rearing; (ix) fish farming; and (x) livestock rearing. Production diversity (total number of types of agricultural production involved in) was measured by summing up the dichotomous responses (no = 0, yes = 1) (Qin, 2010). Two other variables were included relating to production of major grain crops in 2012: yield of maize (kg) and yield of guinea corn (kg) per ha of farm land.

Use of agricultural technologies was measured by three variables such as the cost (in N) of chemical inputs-fertilizers, pesticides, and herbicides, in the year prior to the study (2011), and two constructed variables pointing out the levels of use of various types of agricultural technologies. The respondents were asked to signify whether or not their households used the following 14 different agricultural technologies in the most recent year. These technologies included indigenous traditional and modern farming technologies. The indigenous traditional farming technology group included (i) tillage (ii) application of organic fertilizer, (iii) mixed cropping, (iv) intercropping, and (v) rotational cropping. The group of the modern farming technologies included (i) usage of large quantity of chemical fertilizer, (ii) application of chemical fertilizer as directed by agricultural extension agents, (iii) application of pesticide (iv) application of herbicide, (v) usage of plastic mulch, (vi) irrigation with water pump, (vi) usage of sowing machine (viii) usage of harvester, and (ix) zero tillage (no-tillage) techniques. The responses of yes = 1, no = 0 were summed up as two variables (total number of indigenous farming technologies utilized and total number of modern farming technologies utilized.

Research has revealed that household income and expenditure are particularly difficult to measure in rural areas of developing countries (Qin, 2010). As he further suggested, to reduce measurement error, the survey focused on the monetary components of rural household incomes and expenditures. Household income was therefore, assessed as cash income per annum, from both farming and non-farming activities in 2011. household livelihood expenses are the annual monetary spending on regular consumer goods and services in rural areas (Qin, 2010), in 2011. this includes large expenditures on heavy projects such as construction of house and the living costs of labour migrants or student members of the household that live in urban areas. Per capita annual cash income and living expenses (in Naira(N)) were computed to account for differences in a rural household's size and composition. An index variable was also included as an indicator of household consumer assets, made according to Filmer and Pritchette (2001) utilizing principle component analysis to drive weights for constructing a linear index of a group of asset variables. The indicators of asset used included household ownership of various durable consumer goods as used by Qin (2010), such as building materials and style of the household dwelling, and the household's sources of drinking water. The index was rescaled to a value range of 0 to 5 to make interpretation easy.

As also done by Qin (2010), 3 variables were included with respect to rural households' resource use and management activities. The proportion of firewood and crop residues present in the total fuels used by a household was used to indicate its level of dependence on biophysical resources for cooking. The use of general forest resources was assessed by directing respondents to signify whether or not their household utilizes timber and non-timber forest resources regularly. The types of timber and non-timber resources listed in the survey instrument included trees, mushrooms and fungi, medical items and herbs, wild edible vegetables, responses (yes = 1, no = 0) were summed up as variable (total number of types of forest products or services used). The respondents were also requested to signify if or not their household undertook natural resource improvement activities for the past twelve months. The natural resource improvement activities were (i) planting of trees or ledges on household farmland and/or forested land (iii) building stone or soil ridges on sloping farmland to prevent soil erosion, (iv) mending of terraces to prevent soil erosion, (v) maintaining and improving irrigation of farmland, (vi) construction of organic fertilizer, (viii) reduction in the utilization of chemical fertilizer and other chemicals, (ix) planting legumes and other green manure crops, (x) Practice of manual weeding of household farmland and/or forested land, (xi) practicing of fallowing, and (xii) acquisition of information on natural resources and the environment from electronic and print media sources such as television, radio, newspapers and magazines. Another composite variable of total number of resource improvement activities carried out in the last twelve months was created by summed up responses of (yes = 1, no = 0).

Five socio-democratic variables were also included in the analysis to cater for the effects of basic household attributes on livelihood activities. The utilization of these control variables allows for a more accurate evaluation of the differences between labour-migrant households and non-labour-migrant households in rural livelihood (Qin, 2010). The variables included number of years of residence, household size, number

of labourers in a household (inclusive of labour migrant members), mean age of labourers, and mean educational level of labourers. Level of formal educational attainment was measured by eight different levels listed in the survey instrument, such as (i) little or no formal education, (ii) less than primary school leaving certificate, (iv) junior secondary school certificate, (v) senior secondary school certificate (vi) Ordinary National Diploma, (vii) Higher National Diploma (viii) Bachelor of science or Art degree or above.

e) Methods of Analysis

Three phases were involved in the statistical analysis of the rural household survey data. In the first phase, descriptive analyses of the data were used to describe study sample characteristics and aggregate patterns of household livelihoods in the study area. The second phase involved the exploration of variations between different household groups with respect to livelihood variables and socio-demographic characteristics, with the use of bivariate comparison statistics. In the final stage, the differences between household groups in livelihood activities were compared, while controlling for the effects of household socio-demographic characteristics, using multivariate discriminant analysis. According to Qin (2010), this technique is particularly suitable in this context because it allowed for the comparison of two or more groups on multiple variables simultaneously. Discriminant analysis is usually utilized while classifying known and unknown cases into groups. In this study, it was used to ascertain the multivariate distinction/differences between household groups, instead of maximizing the odds of correctly predicting the class of a particular case. The bivariate and multivariate analysis were inclusive of the comparison of loabour-migrant and non-labour-migrant households as well as the comparison of labour-migrant, local off-work, and farming households.

V. Results

a) Bivariate analysis of socio-demographic and livelihood differences between labour-migrant and non-labour-migrant household groups.

Table 2 indicates that overall, labour-migrant households were significantly different from non-labour-migrant households in all the five household socio-demographic characteristics captured. Labour-migrant households lived longer on the average, in the rural settlement (Village) and had larger sizes and labourers than non-labour migrant households. Generally, the labour force of labour-migrant households were discovered to be younger and more educated than members of non-labour-migrant households.

The two groups were also significantly different in other livelihood variables such that on the basis of per labourer, non-labour-migrant households had larger farm sizes than labour-migrant households, labour-migrant households had higher per capita cash income than non-labour-migrant households. Labour-migrant households tended to depend less on firewood and crop residues for fuel. These findings are congruent with those of Qin (2010) in his study in South West China.

The results of bivariate comparisons of labour-migrant, local off-farm work, and farming households also captured in Table 2 also show that there were significant differences in socio-demographic variables among the three household groups. Generally, labour-migrant and farming households resided longer in the village than local off-farm work households. With respect to household size and labour pool, labour migrant households were largest on the average, followed by local off-farm work households, while farming household was the smallest. Active labour members of labour migrant and local off-farm work households similarly tended to be younger and more educated than the active labour members of farming households.

In comparison to the two-group comparisons, per capita annual cash consumption expenditure were significantly different among household groups in three-group comparisons. As Table 2 indicates, with respect to five livelihood indicators farming households were significantly different from local off-farm work and labour migrant families. Farming households cultivated more farmland on the basis of per-labourer, but had lower per capita cash income, lower living expenses, fewer consumer assets, and utilized more firewood and crop residues for fuel than off-farm work and labour-migrant and local off-farm work households. However,generally,labour- migrant and local off- farm work households did not significantly differ in these variables. These findings confirm these of Qin (2010) in Chongqing Municipality, NorthWest China.

On the whole or generally, labour-migrant households were significantly different from non-labour-migrant households with respect to socio-demographic characteristics and values for three of the four livelihood constructs captivated in the conceptual models (see Fig 1).

Table 2 : Bivariate Comparisons of Household Groups (in means of Variables)

Variables	two household groups		Three household groups		
	Non-labour-migrant (N = 237)	labour-migrant (N = 238)	Farming (N = 128)	Local off-farmwork (N = 109)	labour-migrant (N =238)
Socio-demographic characteristics					
Years of residence	44.2*	54.0*	46.5**	44.9**	54.0**

Household (HH) size	4.5***	5.5***	3.7***	4.8***	5.5***
Size of household Labourers	3.5***	4.9***	3.4***	4.5***	4.9***
Mean age of household labourers	56.4***	44.0***	49.1***	45.0***	44.0***
mean educational level of household labourers	2.6***	3.6***	2.2***	3.5***	3.6***
Agricultural Production size of per labourer cultivated land	1.9***	1.3***	2.1***	1.5***	1.3***
total Number of types of agricultural production involved	5.7	5.8	5.8	5.5	5.8
Yield of cassava (kg) per ha	436.9	385.0	449.1	419.3	385.0
Yield of maize (kg) per ha	422.1	434.5	424.5	420.1	434.5
Use of agricultural technologies					
Expenditure of farming chemicals per ha of land (N)	256.3	251.9	286.6	246.0	251.9
Total number of traditional agricultural technologies used	4.4	4.3	4.4	4.4	4.3
Household income, expenditure, and assets					
Per capita annual cash income (N)	2,556.8**	3,691.2**	1,566.7***	3,691.0***	381.2***
per capita annual living expenditure (N)	2,445.0	2,731.3	2,039.1**	3,018.5**	2,731.3**
household consumer asset index (0-5scale)	2.2*	2.6*	2.0***	2.8***	2.6***
resource use and management					
proportion of firewood and crop residues in total fuels (%)	30.6**	27.9**	30.1***	25.2***	27.9***
total number of types of forest products used	0.8	0.7	0.9	0.6	0.7
total number of resource improvement					
activities embarked on	5.8	5.6	5.8	5.8	5.6

**** sig. at 1% level, **sig. at 10% level; *sig. at 5% level*

Independent t-test was used to compare labour-migrant and non-labour-migrant households. One-way ANOVA was computed to compare farming local off-farm work, and labour-migrant household

b) *Multivariate discriminant analysis of labour-migrant and non-labour-migrant households*

Though the bivariate comparisons earlier examined is suggestive of the existence of significant differences between labour-migrant and non-labour-migrant households in rural livelihood activities, it did not capture the effects of household socio-demographic characteristics and the inter-relationships among the livelihood indicators. Multivariate discriminant analysis was computed to compare labour-migrant and non-labour-migrant households and for the comparison of labour-migrant, local off-farm work and farming households. In each phase of the analysis as done by Qin (2010), blocks of variables were inputted to create

multiple models meant to examine interactions among variables that measure various livelihood constructs, and to assess the degree to which various sets of livelihood variables differentiate household groups. At the end a final reduced model was estimated by removing non-significant variables from the full model until all the variables remaining in the model had significant effect (Qin, 2010).

Table 3 is indicative that model 1 captured only the four agricultural production variables. The size of the cultivated farm land per labourer and cassava yield per ha of land significantly effected differentiation in the two household groups, statistically but the difference was statistically, marginally significant for cassava yield. However, labour-migrant households cultivated less farm land per labourer and had lower cassava yield than non-labour-migrant households. The variables assessing agricultural technology adoption were captured in the discriminant analysis, in Model 2: The size of labour activated land per labourer maintained the statistical significance in differentiating between the household groups, however, the cassava yield per ha of land could not remain significant. All the three technological use indicators had no significant effects in differentiating the household groups in this model.

In model 3, the three incomes and consumption variables were included. The size of land cultivated per labourer was still strong in distinguishing between labour-migrant and non-labour-migrant households. The cassava yield, became statistical highly significant. The variables that measured the adoption of technologies still had no significant effect. Only per capita annual cash income significantly effected differences between labour-migrant and non-labour-migrant households, out of the three newly captured indicators of income and consumption. Labour-migrant households had higher levels of rural cash income than non-labour-migrant households on per capita basis compared with the effects of other variables. Model 4 captured all the thirteen livelihood variables as the measures of natural resource use and management were included. None of the natural resource use and management variables had significant effects in the model. However, size of land cultivated per labourer, cassava yield per ha and per capita annual cash income – the three major differentiating variables in model 3 remained statistically significant.

Model 5 is the full model as household socio-demographic characteristics were included to the discriminant analysis in the analysis, of all the five socio-demographic variables, only household size did not show significant difference between the two household groups.Labour-migrant households proved to have lived longer in the village and had higher number of labourers than non-labour migrant households. The agile and active members that form the labour force were also seen to be younger and more educated. On the capture of socio-demographic attributes, the size of land cultivated per labourer and cassava yield per ha of land cultivated failed to show statistically significant difference between labour-migrant and non-labour-migrant households. Per capita annual cash income was still statistically significant, and had strong effect on differentiating the household groups like in the previous models. In the full model, household consumer asset index and the proportion of firewood and crop residues in total fuel turned to be statistically significant in the model 5. Labour-migrant households on the average possessed more consumer assets and depended less on natural resources for fuel than non-labour-migrant households.

On conclusion, non-significant variables in model 5 were eliminated to create a reduced model. In final (reduced) model, cassava yield per ha of land, per capita annual cash income consumer asset index, proportion of firewood and crop residue in total fuels, and four of the household demographic attributes (such as number of years of residence, size of labour force, mean age of labour force and mean formal education level of labour force were captured. The size of land cultivated per labour was not significant in the full and reduced models, unlike in the first four models where it was statistically significant. This dynamic suggests that the difference between labour-migrant and non-labour-migrant households in per labourer cultivated farmland is attributable to their differences as touching socio-demographic variables (Qin, 2010). These findings confirm those of Qin (2010) in South West China.

Table 3 : Discriminant Analysis of differences between labour-migrant and non-labour migrant households given as F values of variables

Variables	model 1	model 2	model 3	model 4	model 5	final model
Agricultural production Size of land cultivated per labourer (ha)	6.45**	7.65**	6.33**	5.51**	0.65	
Total number of types of agricultural production involved	0.50	0.42	0.54	0.30	0.21	
Cassava yield (kg) per ha	2.75(*)	2.16	5.79**	6.31**	1.66	6.75**
Maize yield (kg) per ha	0.06	0.18	0.16	0.10	0.05	
Use of agricultural technologies Expenditure on farming chemicals (N)		1.25	0.52	0.61	0.82	
Total number of traditional agric techs adopted		0.05	0.08	0.22	0.35	
Total number of modern agric techs adopted		0.00	0.04	0.09	0.12	
Household income, expenditure, and assets						
Per capita annual cash income (N)			6.18*	5.94*	6.91**	4.21**
Per capita annual cash living expenses (N)			0.35	0.67	0.31	
Household consumer index			1.86	0.17	5.17*	5.36*
Resource use and management						
proportion of firewood and crop residues in fuels				0.56	5.50*	4.17*
Total number of types of forest products used				0.50	0.30	
Total number of resource improvement activities				0.85	0.06	
Socio-demographis characteristics						
Number of years of residence					5.52*	6.89**
Household size					0.37	
Average age of household labour force					4.25*	4.14*
Average formal education level household						
Numbers					9.16**	10.52**
Size of household labour force					2.51(*)	2.98(*)

***sig. at 10% level, *sig. at 5% level, (*) marginally sig. at level*

c) *Multivariate discriminant analysis for labour-migrant, local off-farm work, and farming households*

Block discriminant were also used to analyze the differences among labour-migrant, local off-farm, and farming households to enhance our comprehension of the effects of rural-urban migration on household livelihoods.

In model 1 (Table 4), only the four agricultural production variables were captured. The size of land cultivated per labourer and cassava yield per ha was

statistically significant but cassava yield was marginally significant. More land was cultivated by farming households than the other two groups in terms of per labourer cultivated land. The labourers in the local off-farm households cultivated almost the same size of land as that of labour-migrant households. The other agricultural production variables were not significant.

Model 2 captured agricultural technology use measures in addition to agricultural production variables. The size of land cultivated per labourer and cassava yield per ha remained significant, but cassava yield was also marginally significant. Expenses on farming chemicals per ha of land also proved to be statistically significant. Farming households spent money most on fertilizers and crop pesticides per hectare of land than labour-migrant and local off-farm households; though was followed by labour-migrant households. Model 3 saw the addition of the three rural income and consumption indicators. Per capita rural income and the household consumer asset index significantly differentiated the groups. On the whole, farming households had lower per capita rural income and fewer consumer assets index than labour-migrant households and local off-farm work households. In model 4 measures of household natural resource use and management variables captured in addition to the variables captured in models 1-3. None of the household natural resource use and management was significant. However, all the five significant variables in Model 3 remained statistically significant. Cassava yield per ha of land cultivated was also marginally significant in model 4. The farming households produced the highest quantity of cassava per unit of cultivated land and was followed by local off-farm work households, while labour- migrant households produced the least quantity.

Model 5 captured household socio-demographic characteristics in the analysis in addition to the ones already captured in the previous models. The number of years of residence, size of household labourers, mean age of household labourers and the average formal educational level of household labourers significantly distinguished the three household groups. Size of land cultivated per labourer, expenses on farming chemicals, and household consumer asset index remained significant but proportion of firewood and crop residues in total fuels and cassava yield was marginally significant. Farming households depended more on firewood and crop residues for fuel than local off-farm work households and labour-migrant households that had near equal or equal levels of dependence on firewood and crop residues as part of total fuels used. Household size did not significantly effect differentiations among the three household groups. Generally, labour-migrant households tended to live slightly longer in the village than farming households. Labour-migrant and farming households lived much longer in the village than local off-farm work households. The labour migrant households had the highest number of labourers, followed by local off farm work and farming households in turn. Older and less educated labourers tended to be found in farming households than in the other two households.

Table 4 : Discriminant Analysis of Differences among Labour-Migrant, Local Off-farm work and farming households, given as F values of variables

Variables	model 1	model 2	model 3	model 4	model 5	final model
Agricultural Production						
Size of Cultivated land per labourer	6.78**	9.41***	10.60***	8.98***	5.72*	6.50
Total number of types of agricultural production involved	0.41	0.56	0.72	0.80	0.83	
Cassava yield (kg) per ha of land	2.42(*)	2.61(*)	2.82(*)	2.16(*)	1.58	2.62*
Maize yield (kg) per ha of land	0.06	0.10	0.12	0.12	0.04	
Use of agricultural technologies						
Expenditure on Farming chemicals per ha of land (N)		5.26**	4.18*	4.05*	5.82*	6.91**
Total number of traditional agricultural technologies used		.64	0.68	0.52	0.38	
Total number of modern						

agricultural technologies used	0.07	0.23	0.23	0.52	
Household income, expenditure and assets					
Per capita annual cash income (N)		3.61*	3.82*	1.96	3.86*
Per capita annual cash living expenditure (N)		0.66	0.66	0.29	
Household consumer asset index		6.83**	5.25**	3.28*	3.91*
Resource use and management					
Proportion of firewood and crop residues in total fuels			0.46	2.52(*)	3.43*
Total number of types of forest products used			0.12	0.12	
Total number of resource improvement activities taken			0.46	0.19	
Socio-demographic characteristics					
Number of years of residence				3.76*	5.29*
Size of household				0.31	
Average of household labour force				21.26***	33.10***
Average formal educational level of household labour force				5.48**	5.86**
Size of household labour force				3.77*	3.90*

**** sig. at the .001 level, ** sig. at the .01 level; * sig. at the .05 level, (*) m. analysis sig. at the .1 level*

In the final model, households livelihood variables such as size of of land cultivated per labourer, cassava yield per ha of land, expenditure on farming chemicals, per capita annual household cash income, and household consumer asset index; and socio-demographic variables-number of years of residence, average age of household labour force, average formal educational level of household labour force, and size of household labour force were captured. Per capita annual cash income and cassava yield which were not significant in model 5 become significant again in the final model. 10 variables became significant here in the final model compared with the final model for the multivariate comparison of labour-migrant and non-labour-migrant households in Table 3.

V. Discussion

The population of the world is growing at a geometric rate. According to Izquierdo *et al* (2011), the global population has increased from 3 billion in 1960 to 6 billion in 2000, and is expected to reach 9 billion by 2050. With this rapid period of growth, the population is expected to become stable and largely settled in urban areas (UNFPA, 2007). It is expected that conditions increase in human population and per-capita consumption, and the changes in diet prompted by rural-urban migration, are increasing the global need for food and propelling agricultural expansion. However, Mather and Needle (1998) Izquietdo et al (2011) suggest that the concentration of modern agriculture on productive soils has favoured the population shift from rural areas to urban centres. Understanding the effects of rural population on land-use change is essential for predicting the future extent and configuration of natural ecosystems and their ecosystems services.

The study examines the effect of rural migration on the rural environment and rural household livelihood is used as a mediating factor. The results revealed that at least one variable measuring each livelihood construct but use of agricultural technologies, was statistically significant, however some of them were marginally significant in distinguishing rural labour-migrant households and non-labour-migrant households. All the livelihood constructs had at least one assessment with significant effect in the discriminant analysis of differences among the labour-migrant, local off-farm work, and farming households. These findings reject the null hypothesis that there is no significant difference between labour-migrant and non-migrant households with respect to agricultural production, agricultural technology use, income and consumption, and resource use and management. The findings are congruent with those of Qin (2010) in his study in China.

The results also indicate that rural non-labour-migrant households are heterogeneous. More significant differences among labour-migrant, local off-farm work and farming households were discovered than in the

comparison between labour-migrant and non-labour-migrant households in the bivariate and multivariate analyses of the household groups. Generally, there were differences between labour-migrant and non-labour-migrant households. Qin (2010) suggests that these differences were mainly due to the differences between labour-migrant and farming households, while labour-migrant households shared many similar livelihood characteristics with local off-farmwork households.

The livelihood differences between rural labour-migrant and non-labour-migrant households have important implications for the environmental consequences of labour emigration in rural areas of origin (Push areas) Qin, 2010). Bilsborrow (1992) state that in developing countries, rural poverty is often closely related to environmental degradation, because the economically disadvantaged primarily live in rural areas and directly depend on local natural resources. However, Izquierdo et al (2011) found that between 1970 and 2001 there was a strong positive relationship between the annual change in rural population and the deforestation rate in Misiones, but rural emigration reduced deforestation by 24% in comparison with "no-migration" scenario. If rural population continues to grow and poverty persists, over exploitation of the forests will occur and the consequence will be deterioration of natural resources. When this happens, food security and rural livelihoods will be adversely affected. There were very great differences between rural labour-migrant households and non-labour-migrant households in terms of income and consumption. Generally, labour-migrant households had higher rural cash income and consumer assets than non-labour-migrant households. This confirms the findings of Qin (2010) in China. This implies that labour migration tends to contribute to improved capital assets and enhanced material well-being for labour-migrant households, while reducing poverty in rural push areas, and consequently reduces the pressure mounted on local natural resources.

With respect to cash living expenditures, significant difference was not found between rural labour-migrant and non-labour-migant households. This is attributed to the fact that the remaining members of the rural labour-migrant households consume less because of rural community development engagements. Qin (2010) opine that this is probably due to the fact that remaining members of rural migrant households are mostly elders and children, who generally have relatively lower levels of consumption. Zhao (1999) gave his own explanation that rural migrant households consider income from labour temporary and therefore do not increase consumption proportionately. Qin (2010), however suggests that rural labour emigration has mixed impacts on rural consumption. He observes that on one hand, even if labour migrants do not remit enhanced income, their absence reduces overall rural household consumption needs. He further explained that labour migration tends to check the increase in numbers of rural households because labour-migrant households are more lively than non-labour households to maintain a multi-generational family structure, and thus may contribute to higher efficiency of rural household resource consumption. Reduced absolute consumption needs and increased efficiency in consumption may consequently reduce pressure of the rural population on the rural local environments. On the other hand, Qin (2010) suggests that rural labour migration enhances the consumption level of rural-migrant households. Remittances from rural labour-migrant help to enhance the standard of living of their rural families. Rural labour-migrant households had significantly higher per capita annual cash expenditure than farming households in the bivariate comparisons that captured the two non-labour migrant household subgroups. The labour-migrant households had significantly more consumer assets than the non-labour-migrant households, especially the farming households in the bivariate and multivariate discriminant analysis. In Nigeria, and in Delta State in particular, there is no efficient waste management facilities in most of the rural areas, this implies that this increase in household consumption will worsen the very serious residential pollution challenges in the rural areas. This is the same situation in China where Qin (2010) observes that, given the lack of efficient waste disposal in most rural areas, increased household consumption may worsen already serious residential pollution problems in rural villages.

The results imply that labour-migrant households cultivated smaller land size per labourer, had lower cassava yield and spent lesser on pesticides, herbicides and fertilizers on per ha of land cultivated than farming households subgroup of the non-labour-migrant households. The key informants gave a similar comment to what was given in Qin's study that labour migration was a substitute for subsistence agricultural production, and farmers were mostly found among the older generations and that these farmers were mainly women who were not as energetic as their male contemporaries. Labour shortages emanating from the absence of major household labourers, combined with the unprofitable nature of agriculture, can result to progressive abandonment of previously cultivated distant farmland (Qin, 2010). Observations in abandoned farmlands showed to the researchers by key informants, confirmed the natural vegetative re-growth on the abandoned farms in Utagba-Uno, Ugborhe and Agbadabri.

As labour migration prompted labour shortage and land abandonment, land quality and soil erosion is affected. This is mostly so in the swampy areas. It was also found that land abandonment that was induced by migration reduced environmental degradation and more

vegetative re-growth in Bolivia and Central Mexico and Misiones, Argentina Swiss maintain (Preston et al, 1997; Aid and Grau, 2004; Lopez *et al*, 2006; Gellrich *et al*, 2007; Izquierdo *et al*, 2011). However, Qin (2010) observes that the impacts of labour-migrant households withdrawal from farming on rural land quality and soil erosion appears to largely depend on local ecological and socio-economic characteristics.

The results indicate that the there were no significant differences between rural-migrant households and non-labour-migrant households with respect to the uses of traditional and modern agricultural technologies. But the discriminant analysis showed that farming households spent more on agro-chemicals than labour-migrant households. The reduced agro-chemical usage by the labour-migrant households is expected to mitigate pollution induced by agricultural production activities to some levels. Most farmers in Nigeria make excessive use of fertilizers and other agro-chemicals which cause heavy non-point pollution in the rural areas, thus reduced use of these chemicals may reduce such pollution.

The biovariate and multivariate analyses indicate that labour-migrant households depended less on forest resources for fuel than non-migrant-labour households. The implication is that labour migration results to reduced dependence on forest resources for fuel. This is expected to enhance land and forest conservation, since fuel wood collection is a major cause of deforestation which leads to soil erosion in rural areas of developing countries (Qin, 2010), especially Nigeria, where there is uncontrolled exploitation of the forests. These findings congruent are with Mather (1992) in the forest transition theory, which states that there is a long-term sequence from initial deforestation due to human settlement to eventual recovery. There are two major pathways of forest recovery at the end of agricultural expansion identified by Rudel *et al* (2005), - (i) economic development, and (ii) forest scarcity. He explained that in the first case, urbanization and economic development prompt farmers to emigrate from rural settlements to urban areas for better paying non-agricultural jobs. The loss of labour raises wages of farm workers in rural origin areas. This makes agricultural production unprofitable. Smallholder farmlands are therefore abandoned and these eventually re-grow into forests. In the second case, rapid progressive deforestation increases forest product prices. This leads to a situation where people participate in reforestation or people seek alternatives to forest products which eventually leads to reforestation. The federal and state governments are the major actors in this type of forest recovery as they purportedly create forestation programmes in response to deforestation consequences. However, in Nigeria and in Delta State in particular, corruption and lack of political will is inhibiting these programmes. Tree planting days are observed but no meaningful numbers of trees is planted. However, this study unveils a relationship between rural labour emigration and natural forest re-growth in the study area. The findings in this study confirm the findings of Qin Chongqing municipality in South West China.

VI. Conclusion

This study was conducted to examine the effect of rural-urban labour migration on rural household livelihoods and rural environment in Delta State, Nigeria. The rural household livelihoods concept was used as integrated factor mediating in the conceptual framework of rural-urban migration and the rural environment. Data on the rural household collected from the survey and key informant interviews. The findings is at variance with the null hypothesis of this research which states that there is no significant difference between labour-migrant and non-migrant households with respect to agricultural production, agricultural technology use, income and consumption and resource use and management. The results indicate that labour-migrant households farm less intensively, have more rural cash income, possess more consumer assets, and depend lesser on biophysical resources for fuel than non-labour migrant households. Rural non-labour-migrant households are a heterogeneous group. While labour-migrant households are different from farming households, they share similar characteristics with local off-farm work households.

VII. Implications

The findings in this study have proved that rural-urban labour migration has effect on the local rural environment. It has enhanced our comprehension of the environmental effects of rural-urban migration. The environmental consequences of labour emigration in rural push areas are dependent on the resulting changes in rural household livelihoods. The rural household livelihood variables that serve as the mediators between rural-urban migration and the rural origin environment unveil the potential areas to be considered in policy making. Rural-urban migration may result to either gains or losses to the conservation of local natural resources. Therefore, future rural environmental management policies of the federal and state governments should have the objectives of providing favourable conditions that will make it easy to achieve positive environmental consequences of rural-urban migration and which will at the same time reduce drastically, the negative consequences.

The broader social and economic contexts at the federal and state levels have influence on the relationship among rural-urban migration processes, household livelihood, and changes in rural environment. In the household system in Delta State farmers have free-hold to land either by purchase or inheritance. Inherited land is held sacred and it is almost regarded

as a taboo to sell such land. Thus, a migrant household cannot sell its farmland under any circumstance. Labour migrant households keep the land for future use by any member of the household who may become interested in farming, especially when the urban economic situation is on longer favourable. Labour-migrant households abandon their farmland abandon their farmland or under-cultivate it because of household labour shortages. The relationship between agricultural land use and the rural environment in Delta State and other coastal states in various countries of developing countries is not complicated as in the hilly mountain areas. Rural-urban labour migration and under-cultivation, and farmland abandonment facilitate forest re-growth and ecological recovery. In order to make ecological recovery faster, agro-siviculture should be implemented to further benefit from the ecological effects of rural-urban labor migration and concomitant household agricultural adjustments. Formulation and proper implementation of policies that encourage ecosystem recovery on abandoned land, such as tree and tree crops planting can promote sustainable land use and reduce soil and water erosion.

This study shows that local off farm work households share similarities with labour-migrant households with respect to livelihood activities. Since off-farm local work and therefore, employment do not majorly impact on the rural environment and result in long term absence of household labour, policies that will enhance a combination of resource-based and non-resource-based activities should be encouraged among rural households. This calls for the creation of more non-agricultural employment opportunities close to rural communities without environmental degradation. This will promote sustainable agricultural production and natural resource use.

The ministries of environment and agriculture seldom study environmental impacts of human activities. However, this study indicates that rural emigration results to reduced dependence on agriculture and natural resources for sustenance of livelihood, and that the emerging trend in the study area is toward vegetation regeneration. There is also the need to study changes in land quality, forest cover over a period and soil erosion in the rural areas where there is high level of labour emigration.

VIII. Acknowledgements

This study was inspired by Qin (2010) and his article in Human Ecology 38,675-690 formed the guide for this study. The cooperation of the rural community leaders, key informants and the respondents is also highly appreciated.

References Références Referencias

1. Abbass, I.M. (2009). Trends of rural-urban migration in Nigeria *European Scienctific Journal, 8(3), 97-125.*
2. Adams, R.(2006). Remittances, Poverty and investment in Guatemala: In Ozden, C. and Schiff, M. (eds). *International Migration, Remittances, and the Brain drain.* Washington, D.C. World Bank. Pp 53-80.
3. Adewale, J.G. (2005). Socio-economic factors associate with urban rural migration Nigeria: A case study of Uyo State, Nigeria, *Journal of Human Ecology,* 17(1), 13-16.
4. Aide, T.M, and Grau, H.R. (2004): Globalization migration, and Latin American ecosystems. *Science*, 305, 1915-1916.
5. Airola, J (2007). The use of remittance income in Mexico. *International Migration Review*, 41(4), 850-859.
6. Bilsborrow, R.E. (1992). Rural poverty, Migration and the environement in developing countries: Three case studies. World Bank Policy Research Working Paper (WPS 1017).
7. Bilsborrow, R.E. (2002). Migration, Population change and the rural environment. *Environmental Change and Security Project Report*, 8; 69-94.
8. Carr, D. (2009). Population and deforestation: why rural migration matters? *Progress in Human Geography.* 33(3), 355-378.
9. Dunn, K. (2000). Interviewing in Hay, I. (ed), *Qualitative research methods in human geography*. New York: Oxford University Press Pp 50-82.
10. Ekong, E.E. (2003). An introduction to Rural Ecology. Uyo, Nigeria: Dove Educational Publishers.
11. Filmer, D. and Pritchett, H. (2001). Estimating Wealth effects without expenditure data-or tears: An application to educational environments in States of India. *Demography*, 38(1), 115-132.
12. Gellrich, M. Barr, P. Koch, B. and Zimmermann, N. (2007). Agricultural land abandonement and natural forest re-growth in the swiss mountains; A spartially explicit economic analysis. *Agriculture, Ecosystems and Environment,* 118 (1-4), 93-108.
13. Izquierdo, A.E.; Grau, H.R. and Aide, T.M. (2011). Implications of rural-urban migration for conservation of the Atlantic Forest and Urban growth in Misiones, Argentina (1970-2030) *AMBIO*, 40, 298-309.
14. Jolly, C.L. (1994). Four theories of Population Change and the environment. *Population and Environment,* 16(1), 61-90.
15. Lopez, E. Boccoa, G. Mendoza, M; Velazquez, A. and Aguirre-Rivera, J. (2006). Present emigration and land-use change at the watershed level: GIS-based approach in Central Mexico. *Agricultural Systems*, 90(1-3), 62-78.

16. Mackeller, F.L; Lutz, W.; McMichael, A.J., and Suhrke, A. (1998). Population and climate change . in Rayner, S. and Malone, E.L. (eds), *Human Choice and climate change*, vol.1. Battelle Press, Colubus Pp 89-193.
17. Marther, A. (1992). The forest trainsition. *Area*, 24(4), 367-379.
18. Mather, A.S. and Needle, C.L. (1998). The forest transition: A theoretical basis. *Area*, 30:117-124.
19. Mendolh, M. (2008). Migration and technological change in rural households: Complements or substitutes? *Journal of Development Economics*, 85(1), 150-175.
20. Oberai, A. S. and Bilsborrow, E. (1984). Theoretical Perspectives on migration. In Bilsborrow, R.E.; Oberai, A.S. and Standing, G. (eds). *Migration surveys in low-income countries: Guidelines for survey and questionnaire design*. London and Sydney: Croon Helen. Pp 14-30.
21. Ofuoku, A.U. and Chukwuji, C.O. (2012). The impact of rural-urban migration on plantation agriculture the Niger Delta Region, Nigeria*. Journal of Rural Social Sciences,* 27(1), 137-151.
22. Pichon, F.J. (1997) Settler households and land-use patterns in the Amazon frontier: Farm-level evidence from Ecuador. *World Development*, 25(1), 67-91.
23. Perz, S.G. (2003). Social determinanats and land use correlates of agricultural technology adoption in a forest frontier: A case study in the Brazilion Amazon*. Human Ecology*, 31(1), 133-165.
24. Presten, D.; Macklin, M. and Warburton, J. (1997). Fewer People, Less erosion: The twentieth Century in Southern Bolivia. *The Geographical Journal*, 163(2), 198-205.
25. Qin, H. (2010). Rural-urban labour migration household livelihoods, and the rural environment in Chongqing Municipality, South West China. *Human Ecology*, 38, 675-690.
26. Schmook, B. and Radd, C. (2008). International labour migration from a tropical frontier: Globalizing households and on incipient forest transition. *Human Ecology*, 36(6), 891-908.
27. Tadaro, M.P. (1976). *Internal migration in developing countries: A world employment study.* Geneva: ILO.
28. Tashakkori, A. and Teddlie, C. (1998). *Mixed methodology: combining qualitative and quanititative approaches.* Thousand Oaks, California: Sage Publication.
29. Taylor, J. and Mora, J. (2006). Does migration shape expenditures in rural households? World Bank Policy Research Working Paper 3842.
30. United Nations Family and Population Agency (UNFPA) (2007). State of the world population. Unleashing the potential of urban growth. http://www.unfpa.org/swp/swpmain.htp
31. Von Braun, J. (2004). Towards a renewed focus on rural development. *Agriculture and Rural Development,* 11(2), 4-6.
32. Wouterse, F. and Taylor, J. (2008). Migration and income diversification: Evidence from Burkina Faso. *World Development*, 36(4) 625-640.
33. Zhao, Y.(1999). Leaving the countryside: Rural to urban migration decision in China. The *American Economic Review,* 89(2), 414-432.
34. Zimmerer, K.S. (1993). Soil erosion and labour shortages in the amdes with special reference to Bolivia, 1953-91: Implications for "Conservation-with-development". *World Development*, 21(10), 1659-1675.

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- 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.

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Tables: Tables should be few in number, cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g. Table 4, a self-explanatory caption and be on a separate sheet. Vertical lines should not be used.

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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Even though low quality images are sufficient for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit (or e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings) in relation to the imitation size. Please give the data for figures in black and white or submit a Color Work Agreement Form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution (at final image size) ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs) : >350 dpi; figures containing both halftone and line images: >650 dpi.

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Figure Legends: Self-explanatory legends of all figures should be incorporated separately under the heading 'Legends to Figures'. In the full-text online edition of the journal, figure legends may possibly be truncated in abbreviated links to the full screen version. Therefore, the first 100 characters of any legend should notify the reader, about the key aspects of the figure.

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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.

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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.

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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.

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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.

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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

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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.

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- 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

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- Explain the value (significance) of the study
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- 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:

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Materials:

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- 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.

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- 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:

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- Resources and methods are not a set of information.
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- Leave out information that is immaterial to a third party.

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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.

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- 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.
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- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
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Approach

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- 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.

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- 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.
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- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

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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

Index

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