

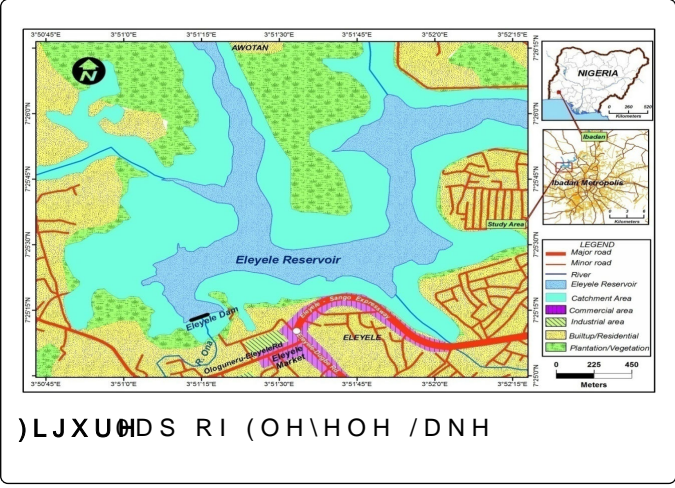
\* URZWK 3DWWHUQV DQG \$RSHQ DFFHVV (OH\HOH /DNH 6RXWKZHVW 1LJHULD

.DUHHP 2.20DQUHZDMXKRI (ZULVDVRODQ2\$NLQWXQGH 0\$
'HSDUWPHQW RI \$TXDFXOWXUH DQG )LVKHULHV 0DQDJHPPHQW 8QLYHUVLW\ RI ,EDGDQ 1LJHULD
)HGHUDO &ROOHJH RI )UHVKZDWHU )LVKHULHV 7HFKQRORJ\ 30% 0DLGXJXUL 1LJHULD
'HSDUWPHQW RI :LOGOLIH DQG )LVKHULHV 0DQDJHPPHQW 2VXQ 6WDWH 8QLYHUVLW\ 1LJHULD
1DWLRQDO 8QLYHUVLW\ RI /HVRWKR 'HSDUWPHQW RI \$JULFXOWXUH 5RPD .LQJGRP RI /HVRWKR 6RXV
&RUUHVSROGLQDDXWRRJ. 'HSDUWPHQW RI \$TXDFXOWXUH DQG )LVKHULHV 0DQDJHPPHQW 8QLYHUVLW\
ND\NDJ #\DKRR FR XN
5HFHLYHG GD\H \$FFHSWHG GD\OH 3XEOLVKHG GDXW\WV
&RSULJKW .DUHHP 2. HW DO 7KLV LV DQ RSHQ DFFHVV DUWLFOH GLVWULEXWHG XQGHU WKH WHUP RI
XVH GLVWULEXWLRQ DQG UHSURGXFWRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRXU

\$EVWUDFW
+HSVHWXVVRGRFRPPHUFLLDOO\ YDOXDEOH ILVK DQG LV FRQVLGHUHG DV HQGHPLF V
FRQGLWLRQ+HDFWIRORRURP /DNH (OH\HOH 2\R 6WDWH ZHUH LQYHVWLJDWHG DV D
HVVHQWLD IRU EULQJLQJ LW WR FXOWXUH \$ 7RWDO RI VSHFLPHQV DQG
FROOHFWHG EHWZHHQ -XQH DQG \$XJXVW 7KH PRUSKRPHWULF LQGLFHV
/HQJWK 6/ %RG\ :HLJKW %: DQG 6WRPDK :HLJKW 6: ZHUH DVVHVHG XVLQJ
OHQJWK ZHLJKW UHODVLRQ & ROLGLWLRQ IDFWRU FDOFXODWHG 6H\ UDWR RI 0D
)HPDOHV ZDV REWDLQH GZLFK VKRZV D IHPDOH GRPLQDWHG SRSDWRQ 7KH
%: UDQJHG IURP FP DQG J UHVSHFWLYHO\ /HQJWK ZHLJKW U
FDOFXODWHG DV
/RJ %: ORJ 6/ U
7KLV DQDO\VLV VKRZH G VLJQLILFDQW UHODWLRQV KLS EHWZHHQ WKH VWDQGDUG
UHODWLYH FRQGLWLRQ IDFWRU .Q FDOFXODWHG UDQJHG IURP ZKLOH WK
IDFWRU IDOO ZLWKLQ WKH UDQJH UHFRPPHQGHG IRU IUHVKZDWHU ILVK VSHFLHV L
WKH ILVK IROORZV FXEH ODZ DQG H\KLELWHG SRVLWLYH DOORPHWU JURZWK 7KL
PDQDJHPPHQW DQG JXLGH IRU IXWXUH FXOWXUH WULDOV

.H\ZRUG\H SV\HVRV\HQJWK ZHLJKW UHODWLRQV FRPPHUV\1LJHULD SULQFLSD
&RQGLWLRQ IDFWRU (OH\HOH /DNH \H DU URDGRGDMLD\W\K RQRPLF DQG QX
YDOXH > @ \$ PHGLXP VL]H \$IULFDQ SLNH
,QWURGXFWRQ IDW FDUERK\GUDY\HQ DQG DVK W\LV > @
VSHFLHV SUHIHUV TXLHW DQG GHHS ZDWH
(OH\HOH 0DQDJHPPHQW FRQVWUXFWHG KLOH QJWK XSDUWNJ+LQJGRP RI
FRQVXPSWLRQ DQG FRQVHUYDWLRQ LQFRPPHUV\ZDWHU FDOFXODWHG XWKXJK /DNH
TXHVW WR FUHDWH D PRGHUQ ZDWHU V\SRV\HQW HVRWRPHV WKH FDOFXODWHG
ZDWHU VFDUFLW\ IRU WKH HPHUJLQJ ,EDGDQ PHWURSROLY OHG WR WKH
FRQVWUXFWLRQ RI (OH\HOH 'DP RQ WKH PDYXG\RU 9DQJWK ZHLJKW UHODWLRQ
VWRUDJH FDSDFLW\ RIH ODNL\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
DQG UDLQ\ VHDVRQV W\SLFDO RI WURS\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
IDPLOLHV OLNH &LFKOLGDH &KDQQ\GDH WKH KOLY\SRQD\HQW\UHV\SRQD\HQW\
+HSVHWLGDH &ODULLGDH 2VWHRJORV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
ODNH > @ \$PRQJ W\K\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
}VK\SHFLHV RI}RPHV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
DGHTXDWHO\ VWXGLHG
FRQGLWLRQ+HDFWIRORRURP DQDJHPPHQW VV
+RG\GRFK FRPPRQO\ NQRZQ DVH\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
VROH UHSUHVHQWDWLYH RI WSKH\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
GLVWULEXWHG DURXQG :HVWHUQ DQG &H\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
VKDOORZ ZDWHUV RI ULYHUV LQ WKH SODLQV DV ZHOO DV HVWXDULHV DQG D YD
RI RWKHU IUHV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
VSHFLHV R\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
IHHG SULPDULO\ RQ FLFKOL\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
KLJKO\ SULFHG )UHV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\UHV\SRQD\HQW\
LV UHODWLYHO\ ORZ

DERYH VHD OHYHO DQG VXUURXQGHG E\ TXDUWILJGJH KLOOV WRZDUG WKH  
 GRZQVWUHP VHFWRQ ZKHUH WKH GDFHEDUUDJH LV ORFDWHG \$ QXPEHU RI  
 VWUHPD FKDQQHOV VHUZH DV IHGLQJ UHFKDUJHLOVWUHPD VWRW KH DQHOH  
 ZHWODQGHEODNL KDV D VXUIDZLWVDDPHDQ NP  
 GHSWK RIH ZLHVW DQG QDUURZHVW DUP RI WKH ODNH LV "DERXW  
 P DQG P UHVSHFWLYHO\ KDYLQJ IRUHHVHUHVHUYH ZLWK PFK YHJHWDWLRQ  
 VWUHWFK RQ HDFK VLGH (OZLWK WKH ZDWHU XDOO)  
 OHYHO ULVLQJ GXULQJ HDUO\ SHULRG RI PDQJH VHDVRO ,W FRYHUV VRPH SDUWV  
 ,MRNRGR \$SHW \$ZRWDQ 2ORJXQ HUX \$JEDMH ,GL RVDQ 3RO\WHFKQLF RI  
 ,EDGDQ DQG (OH\HOH) VUHEZLWK LKHLFHO WK ZHLJKW UHODWLRQV KLS RI +H  
 GRPLQDWHG E\ ,ODMH DQG <RUXEDV +ZPHDQ VWRWV SOH WKH DWDQGLQJ XGH  
 }VKLQDUPLQJ DJUR SUWHDVFLQJ DQG ERDW



)LJXUHS RI (OH\HOH /DNH

&ROOHFWLRQ RI VDPSON

6DPSOHVRIWKH VWXG\ ZHUH FROOHFWHG IRUWQLJKWO\ GXULQJ  
 -XQH WR \$XJXVW IURP 6WFKHODDQGHG E\ DUWLVDQDO  
 XVLQJ DOLWDOGLVWJLOGLVWV VLJHV 7ZR  
 KXGUHV DQG VSHFLPHV RI ZHUH VDPSON ZLWK  
 OHQJWK DQG ZHLJKW UDQJLQJ IURP 7DEOH 1 WKH VWRW VWRWV  
 UHVSHFWLYHO\ 2I WKH WRWDO QXPEHU RI VSHFLPHV ZHUH PDQJH  
 ZHUH IHPDOHV

ORUSKRPHWULF PHDVXUHPHQW LQFOXGH 7RWDO /HQJWK 7/ DQG  
 6WDQGDUG /HQJWK 6/ WR WKH QHGHVW 6PRDGLDQJ:HURW %: WVRHQJWDE  
 WKH QHGHVW J RI HDFKDWSEPRWDOVWRPDKZHLGKW UHODWLRQV KLS ZDV FDO  
 IURP WKHU 7ZD VDNHQ IURP WKH WLS RI WKH VQRXW PRXWK  
 FORVHG WR WKH H[W]HODDQGLVIRP WKHWXG\ SOWR  
 WKH PLG SRLQWRIJLQXVLDQJ D PHDVXULQJ ERDUG ZKLOH %:  
 ZDV PHDVXUH XVLQJ D WRS ORDGLQJ OHWOHU EDODQFH > @

/HQJWK ZHLJKW UHODWLRQV KLSV ZHUH  
 Lf " ZKHUH : LV WKH WRWDO ZHW ZHLJ  
 6/ FP DQG D DQG E DUH WKH HTXDWL  
 OHDVW VTXDUHV PHWKRG (FROOHVORFW)  
 LVRPHWULF YDOXH RI E DQG DGRGHW  
 IDFWRU ZKLFK VKRZV WKH GHQGHUHLZH  
 ZDV GHWHUPLQHG E\ WKH IRUPXOD @  
 ZKHUH : ZHLJKW LQ J DQG  
 / OHQJWK LQ FP

5HVXOWV

H OHQJWK ZHLJKW IUHTXHQF\ GLVWULSULQJHWRWDO QHQJWKV SSGHWRPHRIIRU W  
 /DNH (OH\HOH LV VKRZQ LQ 7DEOH 6LPLVXDO\ WKH WRWDO OHQJWK IUHTXHQF\  
 RI VSHFLPHV ZDV LOOXVLDQVWZHUH )XQGHWR UDQJH  
 IURP WR FP LQ WRWDO OHQJWK DQG WRWDO ZHLJKW ZDV UDQJHG  
 EHWZHHQ WR J

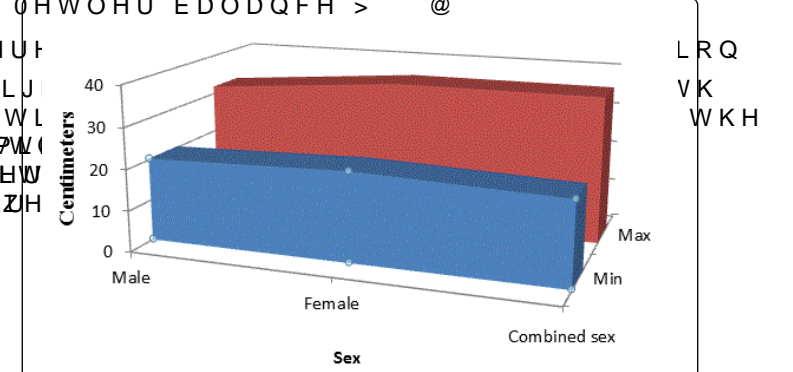
,Q FDVH RI IHPDOHV WKH 7/ DQG %: ZHUH  
 DQG WR J UHVSHFWLYHO\ PDOH ZDV F  
 s FP DQG WKH PHDQ %: FDOFXODWH  
 IHPDOH WKH PHDQ 7/ DQG %: ZHUH FDOFX  
 s J 1 UHVSHFWLYHO\ \$OVR W  
 WKH VSHFLHV DUH ODOHV s FP )H  
 &RPELQHG VH[ HSOHQJWK ZHLJKW UHODW  
 VDPS)H[ SUHVHG E\ WKH UHJUHVVLRQ

'% L ætärws E uäšlrwä

/RJ OHQJWK DJDLQVW ORJ ZHLJKW UHYH  
 WKHUH LV D GLUHFV SURSRUWLRQDOLW\ EH

6H[	Q	6WDQGDUG OHQJWK VWRWV ZHLJKW J			
		0LQ 0D[	0HDQ "	6'0LQ 0D[	0HDQ " 6'
ODOHV			"		"
			"		"

WRWDO VWRWV VWRWV DQG  
 (OH\HOH Q) VWRWV 6' 6WDQGDUG 'HYL



&LWDWLBQHP 2. 20DQUHZDMX \$1 2VKR () 2ULVDVRQD 2 \$NLQWXQGH 0\$ +HSVHVRZWR RGRDHV  
 %ORFK &DSWXUHGLQ (OH\HOH /DNH 6RXVGRZLVHW 1LJHULD )LVK \$TXDF -

3DJH RI

H &RQGLWLRQ )DFWRU . UDQJHG EHDVZH \$ODX ,NRQJEHQRURXQG WKHIRU %DJH  
 VH[HV 7DEQHUVXOW VKRZHG WKD WQW K E K I O D O N H P D Z H U G R F X P D E A R V K Q Q L \$IRHMLUH  
 S ODUJHU WKDQ PDOHV

6H[	&RQGLWLRQ IDFWRU YDOXH	
ODOHV	$\frac{\sum K}{n} = \frac{67.52}{55}$	
)HPDOHV	$\frac{\sum K}{n} = \frac{185.65}{150}$	
&RPELQHG VHE	$\frac{\sum K}{n} = \frac{253.17}{205}$	

> @ FRQGLWLRQ IDFWRU YDOXH VROZDQ  
 WKDQ WKD RI WKH JHPDOHVZLWK WKH UHV  
 8JZXPED DQG ,GRZX IRU PDOH+ RGLDGRH  
 (NLWL UHVHUYGDF) IRU WKD IHPDOHV Z  
 WKDQ PDOHV GXULQF RYXOG ESHDLRGUHVXO  
 HJJ GHYHORSHPHQW LQ WKH IHPDOHV DQG K

&RQFOXVLRQ

LVVWXG\ KDV PDGH DYDLODEOH LQIRUPD  
 FRQGLWLRQ+RGRZWRPRIDNH (OH\HOH)FSDQ  
 UHODWLRQVKLSV ZHUH )VWVDE\OZMKJHGWVW  
 OHQJWK DQG VWRPDFK ZGHILQVWK% DVHGIRU  
 HYLGHQW WKDW AVKAWJ SRZVWLVHO\ DOORP  
 HVRWKRXOG EH GLUHFWHG WR PDLQWDLQ  
 FRQGLWLRQ RI WKH ODNH IRU FRQWLQRRXV

7DEORQGLWLRQ IDFWRU RI +HSVHWXV RGRH LQ /DNH (OH\HOH 1LJHULD  
 ZKHUHXPPDWLRQ RI FRQGLWLRQV KDFRVRQJHMHUHQFHV RI  
 XVHG

'LVFXVLRQ

7LMDQZODOSZOXEDZMR ,PSDFW RI 8UEDQL  
 :HWODQG 'HJUDGDWLRQ HSHOHVGGVX,EDSDQ  
 :HVW 1LJHULD  
 /HQJWK :HLJKW UHODWLRQSRUHQSHSL \$QDOVLV RI VWRPDFK FRQVWQW  
 H[SORLWDWLRQ DQG PDQDJPHQW VRRFMKH SRXODWLRQ RI 5YHU 1LJHULD +IGUREL  
 \$FFRUGLQJ WR 1DJVVKQL)FSDRQWHDQFH LQ 9RGR8PHK )UHVK)ZDWHULJHULD 7D[RC  
 WKH JURZWK JRQDGO GHYHORSPHQW DQG JHQHUDO ZHOORHLOJ R]LOJDLWRQ  
 SRSXODWLRQ > @ ,Q WKH SUHVHQW VWXG\ WKH UHODWLRQVKLS (FRQJ)RI 6HU  
 VWDQGDUG OHQJWK 6/ DQG VGRZV D L V K % L R R J I  
 VLJQLFDQVHQFH S VGRZVHQFH  
 RI ZDV REWDLQHG DV D UHODWLRQVKLS EHVZHOVWKH 1LJHULD )LVK DQ  
 DQG WKH VWRPDFK ZHLJKWVGRGLFWWKHVWDFV  
 VWDQGDUG OHQJWKHV DV WKH ERG)ZHLJKWVHQFHVZRH 62 2JXQGLUDQ  
 /LNHZLVH VWRPDFK ZHLJKW LQFUHDVH D V W K L E R G Z H L K W L R V W G H P H W  
 LQFUHDVHV WKDW WKH JURZWK OSRPVWUQFRZV KHVHUURLU 2JERPRV 1LJHULD \$I  
 LQGLFDWHG EI FRKHVIRHOMLODMVQOW FRQIDUPHG 2. \$MDQL (. 2ULVDVRQD 2H 20DQUH  
 WR VQGLQJVS\$GHGRNXQ ZKR UHSRUWHG SRVWLWYH\*DOORPRVWLIF JORZWKLHW FRPSR  
 LQ +HSVHWXV RGRH LQ 2JERPRQLOWHU SRNH +H@VHXLORH %ORH %ORFK LQ (OH  
 RGRZHUH UHSRUWHG EI ,GRZX DQG 2VR IURP \$SRNLWL UHVHUURLU  
 1LJHULD ZLWK SRVLWLYH DOORPHWLF ROPXZSRBWHU WKDQHQJWK :HJKW 5I  
 /HQJWK ZHLJKW UHODWLRQVKLS RDNH LV DOORPHWLF DUVWR ,EHVKH :DWHUVLGH /DJR  
 WKDW RI RWKHU VSHFLHV LQ 1LJHULD ZDWHU ERGLHV 1LJHULD (NHQHPX DQG  
 6DPXHO UHFRUGHVHQORVWQFXOD ODNH %SUQDUG  
 GRFXPHQWHG2UHRFIRORVWQFXOD 5LYHU ZKLOH )DIBY2OXDMR /HQJWK ZHLJKWVWUQDWL  
 \$IRDGH DQG ,NXODOD IRXQG IRU &KUSVFLHV LQ)SLD JROQLJHULD LQSU -%LRV  
 (OH\HOH /DNH > @ +RZHYHU \$IRDGH DQG ,NXODOD UHSRUWHG QHJDWLYH  
 DOORPHWLF JURZWK SDWWHUQV IRU 6DURWKHURGRQ PHODQRWKHURQ 458 4YDUWH  
 +HPLFKURPLV ELPDFXODWXV LQ (OH\HOH /DNH 26 @-DQD 'KDDQJDLQ /HQJWK ZHL  
 UHODWLRQVKLS DQG UHODWLYH FROGDWLRQ  
 %DJHQDO RSLQOQYVQDWDQD IDYRXUDEOHDIQYLHROPHQWQSTXDFXOW  
 WHUP RI IRRG DYDLODELOLW\ DQG JRRG \$QGRVQOPHZRO2FRQGLWLRQ 7SURZ  
 IDVWHU ZLWK @ PHDQ FRQGLWLRQ IDFWRUQWLRQ ZDFWRUV RI \$IULFDQ SLNH f+HSV  
 REWDLQHGFRVSWXUHGLQ(OH\HOH)WLNHFRQVWLWVHV  
 ZLWK)QGLQJVS\$GHGRNXQ DQG :LQHPLOOHU.ERKXUHRVSHG WPHDQVSHVWVWUQDWL  
 FRQGLWLRQ IDFWRU+RGRZWRPRIDNH LQ 2JERPRVWLVHUKLDWKHVLV 8QLYHUVLW\ RI  
 UHVHUURLU DQG 5LYHU =DPEH]L UHVSHFWLYHO) @ %DORJXQ DOVR UHSRUWH  
 D PHDQ FRQGLWLRQ+RGRZWRPRIDNHUHVHUYRGLW @RQGLWLRQDGRDWRB DOORPHVXV  
 &RPSDULQJ . YDOXHV LQ WKLV VWXG\ ZLWK RWKHU VSHFLHV VWRPDFK VHVHUYR  
 WKDW WKLV YDOXH YDULHV IURP ! WR )LGRZHLWVSRUWHG IRU ,OLVKD  
 DIULFDQD LQ 1NRUR 5LYHU &ODORVSRQJH IRU

&LWDWLBQHP 2. 2ODQUHZDMX \$1 2VKR () 2ULVDVRQD 2 DQG \$NLQWXQGH 0\$ HSHVHWXKZVCR  
%ORFK &DSWXUHG LQ (OH\HOH /DNH 6RXWVGRZLVH VW 1LJHULD )LVK \$TXDF -

3DJH RI

(NHOHPX6DPXHO \$\$= \*URZWK 3DWWHUQV\$ ERZHE RQGLW &RQ DFWLRQV)DFWRU /HQJWK  
RI )RXU 'RPLQDQW )LVK DSWXUHG LQ (OH\HOH /DNH 6RXWVGRZLVH VW 1LJHULD )LVK \$TXDF -  
%HUQDULQNRQ\$NDQGH\$GH\HFL\$D DDOXVL .DOX .0 8PHKDP 61 2NHUHH ) /HQJWK  
2UJDQROHSWLF FKDUDFWHULVWLFV /HQJWK ZHLJKW UHODWLRQV KLS PQC ERQHJWLBQ  
IDFWRU RI 2UHRFKURPLV QLORWLFXV LQ (JDK 6RXWVGRZLVH VW 1LJHULD )LVK \$TXDF -  
1LJHULD ,QWHUQHW -RXUQDO RI )RRG 6DIHW\  
\$IRD\$N,NXO\$D2D /HQJWK :HLJKW 5HODWLRQV KLS PQC ERQHJWLBQ PRQ 6\* /HQJWK :HLJKW  
)DFWRU DQG 6WRPDFKHPLFQW RFDVFXDWX DQG &RQGLWLRQV DFFRPPURRI \$NDHW\$HQXH VW  
6DURWKH RFRQRW DQG RPLGRW XDSLHUL 1LJHULD -RXUQDO RI \$QLPDO DQG 3ODQW 6F  
3HUFLI RUPKOL (DHLV DHR XWKZH VJHUL DLRSHY \$IRD\$ /HQJWK ZHLJKW UHODWLRQV KLS  
7URS /DEHR RJXQHQLV %RXOHQJHU LQ \$VH  
%DJHQO 0HWKRGV IRUVS VGRXFWQWRQLLVK \$TXD 6FL  
IUHVKZDWHU HG %DFLHOCME)LODFNL RHOSS  
%DORJXQ H ELRORJLFDV KXQYHODRRQ 0 VF  
HVL\$QLYHUVLW\ RI /DJRV /DJRV