



5HVHDFK \$UWLFQH 2SHQ \$F

%JWFSTJUZ 3FMBUJWF "CVOEBODF 4QFDJFT \$ "TQFDUT PG 'JTIFT JO (JMHEM "CBZ BOE "OEBT &UIJPQJB

<LEHOHWDO \$QDOZ\HW DQGS\$GLV *HWX
'HSDUWPHQW RI \$QLPDO SURGXFWLRQ DQG WHFKQRORJ\ :ROGLD 8QLYHUVLW\ (WKLRSLD
'HSDUWPHQW RI)LVKHU\ DQG ZHWODQG PDQDJPHQW %DKLUGDU 8QLYHUVLW\ (WKLRSLD
'HSDUWPHQW RI \$QLPDO JHQHWLFV DQG EUHHGLQJ 8QLYHUVLW\ RI *RQGD (WKLRSLD
&RUHVSRQGLQJ \$GXWKRWX 'HSDUWPHQW RI \$QLPDO JHQHWLFV DQG EUHHGLQJ 8QLYHUVLW\ RI *RQGD
EHOD\JHWX #JPDLO FRP
5HFHLYHG'GFWPEHU \$FFHSWHG'DFKH 3XEOLVKHG'DJFWH
&RSULJKW \$QDOHP < HW DO 7KLVLV DQ RSHQ DFFHVV DUWLFQH GLVWULEXWHG XQGHU WKH WHUPV RI
XVH GLVWULEXWLRQ DQG UHSURGXFWLRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRXU

\$EVWUDFW
'LYHUVLW\ UHODWLYH DEXQGDQFH DQG VPRH ELRORJLFDO DVSHFW RI ILVKHV
VWXGLHG IURP 6HSWHPEHU WR -XQH E\ XVLQJ JLOOQHWV RI PHVK VLJHV
PRQRLODPHQWV RI GLIIHUHQW PHVK VLJHV FDVW QHW KRRN DQG OLQHV)LVK
OLWHUDWXUH DQG VSHFLPHQ GHSRVLWHG LQ WKH ODERUDWRU\ \$ELRWLF SDUDPH
GLVVROYHG VROLGV DQG WUDQVSDUHQF\ RI WKH ULYHUV ZHUH DOVR WDNHQ XVL
WHVV VKRZHG WKDW WKHUH ZDV VLJQLILFDQW GHIIHQFH LQ S+ DQG WUDQVSD
'S ,Q *LOJHO \$ED\ 5LYHU WKHUH ZDV VLJQLILFDQW GLIIHUHQFH LQ WHPSHU
VHDVRQV 7RWDO\ ILVK VSHFLPHQV ZHUH FROOHFWHG IURP *LOJHO \$ED\ DQ
WKLUWHHQ VSHFLHV RI ILVKHV ZHUH LGHQWLILHG/DERRES\$QGDVVDQDQGPHLOXV
9DULFRUKLQXQHEHODQEDULDVJZULHSWKXPRVWGRPLQDQWILVKVSHFLHVIRXQG LQ
RI 5HODWLYH ,PSRUWDQFH ,5, DQG 6KDQQRQ 'LYHUVLW\ ,QG\ + ZHUH XVHG WR
ILVK VSHFLHV \$QGDVVD 5LYHU KDG KLJKHU GLYHUVLW\ + WKDQ *LOJHO \$ED\
WKDQ *LOJHO \$ED\ LQ ZHW VHDVRQ ZKLFK ZDV + DQG UHVSHFWLYHO\
VSHFLHV LQ \$QGDVVD LQWYHUVZHUWJDULHS\$QGFUDVVLVLELQWUPHGHEVLD
DQ& JDULHS\$QXVWKH PRVW DEXQGDQFH VSHFLHV LQ *LOJHO \$ED\ GXULQJ ZHW
LQWHUPZHUWVWKH PRVW LPSRUWDQW VSHFLHV DW \$QGDVVD DQG *LOJHO \$ED\ 5LYH
LPSRUWDQW ILVK VSHFLHV LQ ZHW DQGHUHQHUVLW\QVZHUH\$QXWH\ UDWLR
DQDO\VLV VKRZHG WKDW WKHUH ZDV VLJQLILFDQW GHYLDWLRQ IURP XQLW\ S

.H\ZRUGLYHUVLW\ 5HODWLYH DEXQGDQFH WSHUHQVDF DQGS VLVWWRQ GW\ UDWLR

)LVK UHVRXUFH RI (WKLRSLD
,QWURGXFWRQ HUHWHU DERXW YDOLG VSHFLHV D
(WKLRSLDQ IUHVZDWHU ERGLHV DOVRORJ\ (WKLRSLDQ ULGHV DQDQGS ORFNLQGHY
FRXQWU\ LW KDV D QXPEHUORNDNFRYEDQ \$RZMDU UHSRUWHG DERXWV RFXUUY
DUHD RI DERXWQW NR ULYHUV FRYHU LQ WKLRSLDQDQZDWHUHV D \$XMRSHJLWVHRYE
NP> @ ZDWHU ERGLHV RI WKH FRXQWU\ DUXHQVW KDRU LQKDS \$E GNRV QDWKHY
WKUHH PDLQ GUDLQDJH V\WHPV ZKLFK DUH DQDQGS EHYE GWAJRWVRGV \$E 1LOR
GUDLQDJH V\WHPV RU ZDWHUVKHGV > HQGZPH RI WUPH LSHDQVJ \$E WWPV DQWV
ZHVWHUQ GUDLQDJH ZKLFK LQFOXGHV DQDQGS DQWV R\K L \$E XE LQDQZ \$E DQGH
DQG WKH 7NNHJH 5LYHUHQV DQWV LQ DQDQGS DQWV R\K L \$E XE LQDQZ \$E DQGH
1LOH \$ED\ VXFK DV ULYHUV 'LGHV \$E DQGS 2PRXVLEHDLQDQGSWV \$E XE LQDQZ \$E DQGH
VRXWKZHVWHUQ SDUWV RI WKH ZHVWHU \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH
WKH ULYHUV LQ 7NNHJH EDVLQ H J \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH
WKH GRUWK ZHVWHUQ SDUWV RI WKH ZHVWHU \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH
\$OO WKH ULYHUV LQ WKH \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH
1LOH LQ WKH 6XGDQ 5LYHU V\WHPV > @ 5SHUHQV \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH
ZDWHU ERGLHV \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH
+ISHURSLVXV /DEHR ODODSWHUXUXV
SURWRSV \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH \$E XE LQDQZ \$E DQGH
H\WHQGV IURP \$WODQWLF FRDVW LQ WKH
LVUDQJH LQFOXGHV WKH PDMRU GUDLQDJ

&LWDWISRODOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGQDFH 6SHFLHV &R
 *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOHGRDVLQ (WKLRSLD)LVK \$TXD -

3DJH RI

SDUW RI 6HQHJDO 1LJHU -X&D G DQ GDV(WKH H E G H D H D E O H W H P LV XQLTXH LQ WKH
 EDVLQV DUH WKH HDVWHUQ PRVW SDUW HR/H W/KH RIL D R V X \$ D U L L F D Q F K W C R O R X G E B D Q C
 SURYLQFH LQ \$IULFD > @ }VKH2PR *KLEH LQFOXGLQJ WKHLU WULEXW

\$V UHFRJQLJHG E\ 5REHUWV > @KWKPHY KRPH WR WSKH7DEORL 2I W/KH P D H K L S H O F L
 DUH IRXQG LQ L W R D W K H U D N H V RI (WKLRS LD D Q G (D V W \$ I U L F D Z D W H U V > @ D V
 H J /D E H R E D U E X V RI /D N H 7 D Q D D Q G (D V W \$ I U L F D Z D W H U V > @ D V
 \$ZDV GUDLQDJH EDVLQ > @ 5HSUHVW Q W D W L Y H V B O L J K O D Q G (D V W \$ I U L F D
 VSHFLHV LQ WKHVHV ZDWHU E B S H R E D U E X V W K H J H Q H U D R I
 %DUEXV &ODULDV *DUUD 2UHR@KURKLRSLDQ 9DULFRUKLOXV

KLJKODQG) UNLQDQDQDHOVR UHVPEOH 6RXWK \$IULFD DQG \$UDELDQ
 3HQLQ)WXRQPV)RU H[DPSOH &)S)W/KQGV \$ZWK GRPLQDQW
 KLJKODQG ULYHUV DQG ODNHV RI (WKLRS LD D Q G (D V W \$ I U L F D Z D W H U V > @
 6LPLODUO\ WKH DERYH LQYHVWLJDWRU :D E V Y K H H O O H W K D W V R P H RI WKH VSHFLHV
 F\SULQLG JHQHUD VXFK D % V D O O G E D U E X V V S H F L H V

WULPDFXODWXVD D G Z G H O D G L M H U L E X W H R I U R P O R X W K \$ I U L F D
 WKURXJK (D V W H S U L L F D) D O V R X S V * D H U D V S \$
 FRPPRQ WR (WKLRS LD KLJKOD Q G V D D Q G S U D E L D Q 3 H Q L Q V X O D
 %XUFKH Q O E H V G E H R E D U E X V H F S P R Q O \ J R X Q G L Q
 (WKLRS LD KLJKODQG ULYHUV DQG ODNHV > @ , W LV E H O L H Y H G W K D W W K H V D
 ODNHV LQ \$IDU 5HJLRQ H J /D N H \$ I G H U D 7 H H H I R U P H G D V D Q H [W H Q V L R Q RI
 WKH 5HG 6HD DV}W K D X Q D V O M P W H L W H O D W H G W R W K H 5 H G
 6HD DQG 0HGLWHUUDQHDQ5LDX Q D O M K D O D N H V 6 R X W K H U Q
 (WKLRS LD \$ E R X V S H F L H V E H O R Q J W R I D P L O H V D Q G J H Q H U D
 ZHUH UHFRUGHG LQ WKH 6KHEHOOH -XED FDWFKPHQWV ZLWKLQ WKH OLPLW RI G

5LYHUV	)LVKLQJ VLWHV	F B G D W L Y H G L V W D Q F H H D E M W W V \ S H V \$ O W L W X G H	P /RFDWLRQ
\$QGDVVD	\$Q6 VLWH RQH	6WRQ\	f 1
			f (
	\$Q6 VLWH WZR	0XGG\	f 1
			f (
	\$Q6 VLWH WKUHH	5RFN\ DQG PXGG\	f 1
		f (
*LOJHO \$ED\ *\$6	VLWH RQH	5RRN\ DQG 0XGG\	f 1
			f (
	*\$6 VLWH WZR	0XGG\	f 1
			f (
	*\$6 VLWH WKUHH	6WRQ\ DQG PXGG\	f 1
			f (
	*\$6 VLWH IRXU	0XGG\	f 1
			f (

7DEOH D P S O L Q J V L W H V Z L W K W K H L U F R G H V *36 U H D G L Q J V D Q G H V W L P D W H G G L W W
 6WDWHPHQW RI WKH SUREOHP EHHQ JLYHQ LRUHUVLW\ DEXQGQDFH DQG H
 .QRZOHGJH RQ GLYHUVLW\ SRSXODWLRQ VWXFWXUH DQG SRSXODWLRQ RI WKH
 (WKLRS LD LFKWK\RIDXQD LV SRRUO\ N Q R Z S X H O B W L Y H O W D H O V W X G \ Q X P E M K H U H I
 VPDOO PHGLXP DQG HYHQ VRPH ODUJH U H P D L Q K D T X H Q R W R Q H H Q Z H O O V W X G L H G
 DQG H[S E B H H R X H W K H U V W X G \ R Q W K H V H U L D M U L W L V S H F L W E R D P S R L W X H R Q RI *LO
 WR EH G O D X W K W R S V *LOJHO \$ E R Z L D Q W R H I P D M R U U L Y H U
 /D N H 7 D Q D \$ V I D U D V O L W H U D W X U H U H V X P W L O D H B \$ E R F H Q G H S Q G B E D D S L D Q H R Q

&LWDWISRODOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGQDFH 6SHFLHV &R
 *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOHGRDVLQ (WKLRSLD)LVK \$TXD -

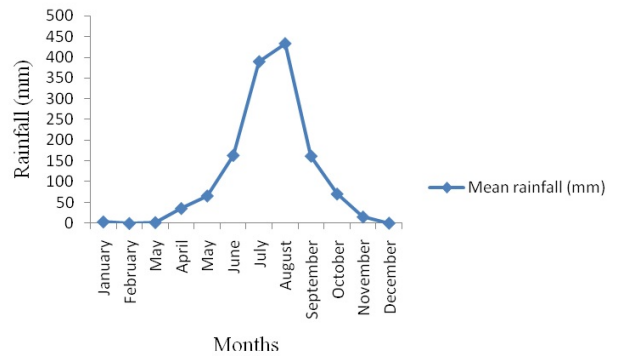
3DJH RI

k ,V WKHUH YDULDWLRQ EHWZHHQ)LOJHO \$ED\ DQG \$QGDVVD 5LYHUV LQ
 VSHFLHV FRPSRVLWLRQ"

k :KDW LV WKH ELRORJ\ RI)LOJHO \$ED\ DQG \$QGDVVD 5LYHUV
 ULYHUV"

*HQHUDO REMHFWLYHV

H PDLQ REMHFWLYH RI WKH QDWLRQDO
 RQ LPSRVVH FRPSRVLWLRQ IRXQG LQ *LOJHO \$ED\
 SURSHU PDQDJHPHQW DQG V\VWUXUVLQ



Specific REMHFWLYHV

k 7R DVVHVV WKH SK\VLFR FKHPDFD
 \$QGDVVD 5LYHUV

k 7R LGHFWLHV FRPSRVLWLRQ LQ ERWK ULYHUV

k 7R HYDOXDWH UHODVSHLDEHQGDQFH)LJXUHDQ PRQWKO\ UDLQIDOO

k 7R FRPSDUH ZHOORH\QGHVHRI GRPLDQW

k 7R HVWLPDWH IHFXQGLW\ DQG LWV UHODWLRQV LQ ZLWK RWKHU SDUDPHWHUV

k 'HVFULSWLRQ RI WKH 6WXG\ \$UHD

\$QGDVVD 5LYHU

\$QGDVVD 5LYHU LV IRXQG LQ :HVW *RMM
 'DU =XULD :RUHGD DQG OHFKD :RUHGD
 RI %OXH 1LOHGRDVLQ UHODVSHLDEHQGDQFH KLJK ZDWHU
 VHDVRO GXH WR DQG JKHGLPHQW DFFXPXODWLRQ IURP WKH
 XSVWUHP

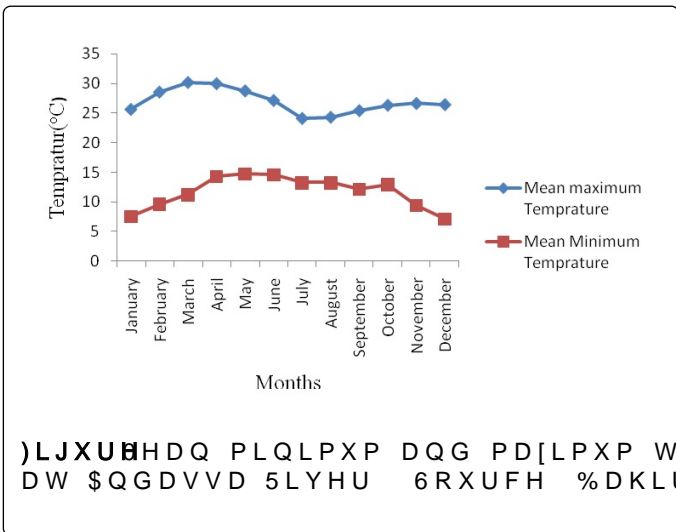
&OLPDWH DVVD 5LYHU KDV PD[LXP
 PRQWKO\ WHPSHUDWXUH r& DQG

RI PP %DKLU 'DU OHWHRURORJLFD

H PDLQ UDLQ\ VHDVRO LV IURP -XQH

UDLQIDOO UHFRUGV LQ \$XJXVW PP

JHQHUDOO\ QHJOLJLEOH LQ WKH PRQWKO\



)LJXUHDQ PLQLXP DQG PD[LXP WHPSHUDWXUH
 DW \$QGDVVD 5LYHU 6RXUFH %DKLU 'DU PHWHRURORJLFD VWDWLRQ
 *LOJHO \$ED\



)LJXUHDQ PRQWKO\ SODQW WISHV DQG ELUGV LQ

)DXQD WKH VWXG\ DQWVHWHU LQHUH RWRKHU
 DQLPDOV OLYLQJ LQ DQG DURXQG WKH UL
 YHUWHEUDWHV DUH YDULRXV VSHFLHV UHODVSHLDEHQGDQFH

DQG 6DEHU DUH IURP FRPSRVLWLRQ DQLPDO REVH
 VWXG\ SHULRG ZDV \$UHMDQR 1LOH PRQLW

*LOJHO \$ED\ 5LYHU RULJLQDWHV IURP
 :RUHGD *DVK \$ED\ WRZQ LQ :HVW *RMM
 QDWXUDO JHRJUDSKLFD ERXQGDU\ WKDV
 OHFKD :RUHGD

*LOJHO \$ED\ 5LYHU RULJLQDWHV IURP
 :RUHGD *DVK \$ED\ WRZQ LQ :HVW *RMM
 QDWXUDO JHRJUDSKLFD ERXQGDU\ WKDV
 OHFKD :RUHGD

&OLPDWH RI *LOJHO \$ED\ 5LYHU DQG LWV
 D PD[LXP DQG PLQLXP PHDQ PRQWKO\ W

&LWDW\$RQDOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGQDFH 6SHFLHV &R
 *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOHG% DVLQ (WKLRSLD)LVK \$TXD -

3DJH RI

/DNH 7DQD'EQIRNEFD'AVX'VCKG WHODBSUSKR PHWULF
 GDWD ZHUH FRQYHUWHG LQWR SHUFHQWDJH ZLWK UHVSHFW WR VWDQGDUG OHQ
 DQG KHGG OHQJWK

'HVFULSWLRQ RI JRQDGV	
6WDJHV	0DWXULW\ VWDJH RI PDOHV
,PPDWXUH YLUJLQ D SDLU RI VPDOO WKUHDG , VHUUDWHG&HG H[FHSWDULHSLQXV	0DWXULW\ VWDJH RI IHPDOHV , JDULHSVQXV ! FP WKH RYDULHV GLVFHUQLEOH SLQNLVK LQ FRORXU
'HYHORSLQJ YLUJLQ RU UHFRYHULQJ VSHQW FDYLW\ EXW GLVWLQF W DQG VKRUWHU	' WVDQHQ KDV ODUJHU JRQDG VLJH DQG WKLFN Z
0DWXULQJ RU ULSHQLQJ ORQJ DQG W&KLFN JDULHSVQXV DQG PRUH VRO% WRDQ LQ QLORDVLF XVWDLWJDUHSLQXV	HODWXUERGR LQ DOO RYD GLVFHUQLEOH LQ DOO
5LSH DQG UXQQLQJ ODUJH DQG WKLFN FUHDP2 LQ LORV SUHVHVG&R	DQG RUXQQLQJ LQ ODUJH ZHOO GHYHORSHG DQG ODUJH PDV
6SHQW WHVWLW VKUXQN DQG IODFFLQ VHUUDWHG HGJHV UHYHUW WR RULJLQDO JDULHSLQXV	QDQGG IODFFLQ VVRPH UHPQDQ WVDQHQ QLORV

7DEOH'VHVFULSWLRQ RI YDULRXV JRQDG VWDJHV

6SHFLHV GLYHUVLW\ DQG WLFODWLYH
 DEXQGDQJ
 R\VKLQ WKH WRWDO
 ,PSRUWDQFH ,5, DQG 6KDDQRRQ 'LYHUWUDQJH + ZHUH XVHG WR
 HYDOXDWH UHODWLYH
 ,5, LV D PHDVXUH RI UHODWLYH DEXQGDQFH RU FRPPRQQHV RI WKH
 VSHFLHV EDVHG RQ QXPEHU DQG ZHLJKW RI
 WKHLU IUHTXHQF\ RI RFFXUUHQFH ,5, JLYHV D
 HFRORJLFDQ\ LPSRUWDQW VSHFLHV UDWKHU WKDQ WKH ZHLJKW QXPEHU RU
 IUHTXHQF\ DORQH

$$%IRI = \frac{\sum_{i=1}^Z (%W_i + %N_i) \times F_i}{\sum_{j=1}^J (%W_j + %N_j) \times F_j} \times 100$$

'DWD ZDV DQDO\JHG XVLQJ 6366 YHUVLR
 IRU \$129\$ FRPSDULVRQ RI PHD
 LQGHSHQQGHQW 7 WHVW WR WHVW SK\VLF
 WHVW WR WHVW VH[UDWLR DQG VRPH GH

5HVXOWV DQG 'LVFXVVLRQ

:KHUH :L SHUFHQWDJH
 ZHLJKW DQG QXPEHU RI HDFK VSHFLHV
 QXPEHU RI HDFK VSHFLHV RI WRWDO
 RFFXUUHQFH RI HDFK VSHFLHV LQWR
 1M 3HUFHQWDJH ZHLJKW DQG QXPEHU
 SHUFHQWDJH IUHTXHQF\ RI RFFXUUHQFH
 RI VHWWLQJV + LV D PHDVXUH RI
 DEXQGDQFH > @ + LV FDOFXODWHG

$$H' = \sum p_i \ln p_i$$

:KHUH SL WKH SURSRUWLRQ RI LQGLY
 WKH ZDW

&LWDWISRODOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGDFH 6SHFLHV &R
 *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOHGRDVLQ (WKLRSLD)LVK \$TXD -

3DJH RI

r& D OLWWOH ELW KLJKHU WKDQ *LVSJHFLHV DZHSJHYHXRQG LQ& ERXWK WKH DQG
 YDOXH RI WHPSHUDWXUH LQ WKHVH U\$YQGDWZDZSHLCHMKKSWFDEHVKWKDZKEFHORQJWV
 OLPLW IRU DTXDWLF OLIH > @ &ODULLGDH ZKHUHDV\VKOSHEHEDWKDW W

3+ WHVW LV RQH RI WKH PRVW FRPEXQGHU WKHU IDPLOLHV &SULGDH &ODU
 DQDO\VLV \$FLGLW\ UDQJHG IURP WR RI *LOJHO \$ED\ WKH ZHUH QRW IRXQG DOO
 > @ 3+ YDOXH RI \$QGDVVD 5LYHU DQG ZDV JUHDWZHUWKDQZKHU
 \$ED\ s LVPLJKW EH GXH WR KLJKHU \$ROOXWDOV ORDG UHOHDFHG VDPSC
 WR \$QGDVVD 5LYHU IRFROHDKDUODG VWXG\ LV QHGHG
 WR GRXW WKH URRW GDXMHQERWKLULS+HUV WKH S+ :HW 'U\ :HW 'U\ :HW 'U\
 YDOXH LQ ERWK ULYHUV ZDV LQ WKH UFRPPHQGHG UDQJH

3K\VLFR FKHPFLFDOLYHU	0HDQ 6'	6LJQLILFDQFH	9 EHVR	/ LQWHUPHGLXV				
S+ S+ PHWHU \$QGDVVD			/ QHGJLD					
*LOJHO \$ED\		QV	& JDULHSLQXV					
7HPSHUDWXUH \$QGDVVD		QV	/ FUDVVLEDUELV					
*LOJHO \$ED\			/ VXUNLV					
&RQGXFWLYLW\ \$QGDVVD		QV	/ PHJDVWRPD					
*LOJHO \$ED\		QV	/ EUHYLFH\$KDOXV					
7'6 SSW		QV						
*LOJHO \$ED\		QV						
7UDQVSDUHQF\ \$QGDVVD								
*LOJHO \$ED\								
1RWH VLJQLILFDQW DW S		DQG QV QR VLJQLILFDQW						

7DEOH LVK VSHFLHV FRPSRVLWLRQ LQ \$QG 3UHVHQW \$EVHQW

7DEOH HDQ SK\VLFR FKHPFLFD SDUDPHWHUV LQ \$QGDVVD DQG *LOJHO \$ED\ 5LYHUV ZHW DQG GU\ VHDVRQV FRPSRVLWLRQ WZR VHDVRQV

6SHFLHV FRQGXFWDQFH LQ QDWXUDO VXUIDF ZDWHUV KDV EHQ IRXQG WR UDQJH IURP wV FP WR wV FP *URXQGDZWHU DQG ZDWHU LQ DULG UHJLRQV XVXDOO\ VEHFRQG WDWASH DQG WKH FRQGXFWLYLW\ RI DULG ZDWHUV \$MFWSLFDQO\ DFXWURVWULV wV FP FRQGXFWDQFH RI VHDZDWHU LV XVXDOO\ HISHUHYHG LQ WHUPV RI VDOLQLW\ > H FRQGXFWLYLW\ LQ \$QGDVVD 5LYHU wV FP ZDV ORZHU WKDQ *LOJHO \$ED\ 5LYHU H KLJKW FRQGXFWLYLW\ WYDORXV LQ *LOJHO \$ED\ 5LYHU PD\ EH GXH WR 7'6 DFFXPXODWLRQ IURP XSVWUHP DUHDV DQG WKH KLJKO\ GHJUDGHG QDWXUH RI WKH ORQJ ULYHUEDQN EULQJLQJ GLVHULQW WROYHG VXEVWDQFHV IURP WKH DUFRODQV DPV

)LVK VSHFLHV FRPSRVLWLRQ LQ \$QGDVVD DQG *LOJHO \$ED\ 5LYHUV

H GRPLQDQV VSHFLHV ERWK DW \$QGDVVD 7DEOH LVK VSHFLHV FRPSRVLWLRQ LQ *LOJHO ZHUH WKH IDPLO\ &SULQGLGDH &ODUWZHU VHVHQW DEVHQW JDULHSDQGV&LEKQDQVSLFRWDO RI VSHFLHV ZHUH UFRUGHG LQ GU\ DQG ZHW VHDVWUHQV DULV DQG RI WKH VSHFLHV FRPSRVLW UHSUHVHQWHG E\ IDPLO\ &SULQGLGDH DNH &ODUWZHU DQG WKLRO\LGMBV QXPE /DEHREZDZXWKH EHVW UHSUHVHQW HG JHQXGA ZLWKOWHUSAFHHLWLDUDVLEDXJENLV IDXQD RI WKH VWXG\ DUHD FRQWDLQ KEUKODQGS KIDMMSDQVAFK MRWR WNDPSWHLIRU LQWHUPHGLXV DQGLVORWUJEXULHSKLFXVPHJQVDRPDPDFURSZHULHPXHSRUWHG ZKLFK WKH IDUUDLOVRIHXRQG LQ ERWK ULYHUV SUHVHQW VWXG\ 7DEOH ERWK VHDVRQV DW \$QGDVVD DQG *LOJHO \$ED\ 5LYHUV

1DJHONHUNH	GH *UDII	'HMHQ	\$PHKD	3UHVHQW 6WXG\
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&LWDWISRODOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGDFH 6SHFLHV &R
 *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOHGRDVLQ (WKLRLD)LVK \$TXD -

3DJH RI

/ LQWHUPHGLXV	/ LQWHUPHGLXV	% KXPLOV	/ LQWHUPHGLXV	/ LQWHUPHGLXV
/ QHGJLD	/ QHGJLD	% WDQDSHODJLV	/ QHGJLD	/ QHGJLD
/ FUDVVLEDUEL	/ FUDVVLEDUEL	% SOHXUJUDP	/ FUDVVLEDUEL	/ FUDVVLEDUEL
/ VXUNLV	/ VXUNLV	-XYHQLOH/DUJH EDUEXV	/ VXUNLV	/ VXUNLV
/ ORQJLVVLPXV	/ ORQJLVVLPXV		/ ORQJLVVLPXV	
/ SODWGRUVXV	/ SODW\GRUVXV			
/ JRURUHQVLV	/ JRURUHQVLV			
/ EUHYLFHFKDOHV	/ EUHYLFHFKDOXV	/ EUHYLFHFKDOXV	/ EUHYLFHFKDOXV	/ EUHYLFHFKDOXV
/ WVDQDQVLV	/ WVDQDVLV		/ QHGJLD	/ WVDQDQVLV
/ DFXWLURVWULV	/ DFXWLURVWULV		/ DFXWLURVWULV	/ DFXWLURVWULV
/ PHJDVWRPD	/ PHJDVWRPD		/ PHJDVWRPD	/ PHJDVWRPD
/ JRUXLU	/ JRUXUL			
/ GDLQHLOLL	/ GDLQHLOLL		/ GDLQHLOLL	
/ PDFURSWDLPXV	/ PDFURSWDOPXV		/ PDFURSKWDOPXV	/ PDFURSKWDOPXV
/ WULXWWLIRUPV	/ WULWLLIRUPV		* GHPEHFKD	/ WULWLLIRUPV
	& JDULHSLQXV		& JDULHSLQXV	& JDULHSLQXV
	9 EHVR		9 EHVR	9 EHVR
	2 QLORWLFXV		2 QLORWLFXV	2 QLORWLFXV
	6PDOO %DUEXV			
	*DUUD VSS			

7DEOH 6SHFLHV FRPSRVLWLRQ FRPSDULVRQ DW /DNH 7DQD DQG WKH SUHVHQW VWXG

6SHFLHV GLYHUVLW\ DQG DEXQGDFH

)LVK VSHFLHV	)DPLO\	5LYHUV			
		\$QGDVVD		*LOJHO \$ED\	
		:HW	'U\	ZHW	'U\
/ LQWHUPHGLXV	&\SULQLGDH				
9 EHVR	&\SULQLGDH				
/ QHGJLD	&\SULQLGDH				
& JDULHSLQXV	&ODULLGDH				
/ EUHYLFHFKDOXV	&\SULQLGDH				
/ FUDVVLEDUEL	&\SULQLGDH				
/ VXUNLV	&\SULQLGDH				
/ DFXWURVWULV	&\SULQLGDH				
/ WVDQHVLV	&\SULQLGDH				
/ PDFURSK\WDODPXV	&\SULQLGDH				

&LWDWISRODOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGDFH 6SHFLHV &R
 *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOHGRDVLQ (WKLRSLD)LVK \$TXD -

3DJH RI

/ PHJDVWRPD	&\SULQLGDH				
/ WULXWWLIRUPV	&\SULQLGDH				
2 QLORWLFXV	&LFLKLOGDH				

7DEOH LVK VSHFLHV FRPSRVLWLRQ LQ ERWK 5LYHUV 3UHVHQW \$EVHQW

H IDPLO\ &\SULQLGDH DQG &ODULLGDH*ZGJHHSHEHGRPLHODQWVDMOSHQGDVSDHFLH
 DQG *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV HLJKW VSHFLHV LQ WHUPV RI QX
 JDULHSLDQMYLFDQGDVVDVZLHWHFRPPRQQERWKULHFDWFK DQG WRWDO ZHLJKW DUH
 ERWK VHDVRQV DW \$QGDVVD DQG 1LQSHOD \$ED\ 5LQDQQRQRZGLYHUVLW\ LQGH[Z
 DQG PHJDVWRPD RQO\ DW \$QGDVVD 5LQSHODWRWK\ LQ ZBWSDDQJGLWHV DQG ULYH
 VHDVRQVVDQHQWLLXWMLXWMLFRUFURSKIWDEBRXVYDULHW\ DQG WKH VSHFLHV DEXQ
 DFXWLDRQVQLLQZMLHFRXQG RQO\ DW *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV GLYHUVLW\ WKD
 ZHW VHDVRQV)LVK VSHFLHV IRXQG DEX \$QGDVVD V KDUZEDV VHDVRQVPHEDDM D
 QXPEHU LQ ERWK VHDVRQV \$W *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV WRWDO 6HDOQRQ DQG H
 VSHFLHV GXULQJ ZHW DQG 6LJKGHYHURQWRBDM SRIFWSMROHV EHWZHHQ \$QGDVVD D
 ERWK ULYHUV ZHUH QRW WKH VDPH LQ ZHW DQG 6LQYHUVWRQLQQRZDQ WKJKHUWL
 UHSRUWHG E\ 'HMQ > @ DW %HOHV DQG *LOJHO \$ED\ 5LYHUV WRWDO 6HDOQRQ DQG H
 HW DO > @ DW \$LDP *XDQJ 6KLQV GQGHUVQVZXLQGH \$LZBUVORZHUHLQ GUI VHDV
 GLYHUVLW\ ZDV KLJKHU LQ GUI VHDVRQ WKDQ ZHW VHDVRQ +LJK GHQVLW\ LQ
 VKDOORZHU SRROV LQ GUI VHDVRQ DQG XWRQJHDV\ WR FROOHFW
 WKH DY\KODHEDUH FRXOG EH WKH UHDVRQV IRU KLJK GLYHUVLW\ 7DEOH

6DPSOLQJ VLWHV									
	\$Q6	\$Q6	\$Q6	*\$6	*\$6	*\$6	*\$6	\$Q	*\$
+•									
1									

7DEOH 6DKDQQRQ GLYHUVLW\ LQGH[DQG QXPEHU VSHFLHV GXULQJ GUI VHDVRQ LQ ER

6DPSOLQJ VLWHV									
	\$Q6	\$Q6	\$Q6	*\$6	*\$6	*\$6	*\$6	\$Q	*\$
+•									
1									
\$Q \$QGDVVD 5LYHU DQG *\$ *LOJHO \$ED\ 5LYHU									

7DEOH 6DKDQQRQ GLYHUVLW\ LQGH[DQG QXPEHU RI VSHFLHV GXULQJ ZHW VHDVRQ L

H QXPEHU VSHFLHV DQG WKHLU ZHLJKW ZPEHU KLZDEOH) V6SHFLHVUDRURVV WKH
 VHDVRQ WKDQ ZHW VHDVRQ DW \$QGDVVDYHUXWRWKERWKYHUVRQVVLVHFRGIGFDWBD
 *LOJHO \$ED\ DQDVRQ PD\ EH GXH WR WKH XPSHURQSHPLHVDVQLRQ\ RVHDVRQ ZDV KL
 /DEHREDUEXV VSHFLHV IURP /DNH 7DQDLORHQLSEHO \$ED\ DQDVRQV LQJWWRH DO
 UDLQ\ VHDVRQ 7DEOH LQ ZHW VHDVRQ WKDQ GUI VHDVRQ EXW L
 VHDVRQ
 \$QGDVVD 5LYHU ZDV KLJKHU WKDQ *LOJHO \$ED\ 5LYHU LQ ERWK VHDVRQV E\
 WRWDO ZHLJKWJRDQGH E\ QXPEHU H[FHSW GXULQJ WKH ZHW VHDVRQ

5LYHUV	6HDVRQV	7RWDO QXPEHU	1	7RWDO ZHLJKW	.J	6XP RI HDFK VHDVRQ
					1	:HLJKW .J

&LWDWISRODOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGDFH 6SHFLHV &R
 *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOHGRDVLQ (WKLRSLD)LVK \$TXD -

3DJH RI

/ FUDVVLELHXLV LPSRUWDQW LQ VLWH \$Q6 DQG
 \$Q6 UHVSHFWLYHO\

6LWH	)LVK	1	1	:	:	)	)	,5,	,5,
\$Q6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	& JDULHSLQXV								
	/ FUDVVLEXUELXV								
7RWDO									
\$Q6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	& JDULHSLQXV								
	/ FUDVVLEXUELXV								
	/ VXUNLV								
7RWDO									
\$Q6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	& JDULHSLQXV								
	/ FUDVVLEDUUELXV								
7RWDO									

7DEOR&DWFK FRPSRVLWLRQ DQG LQGH[RI UHODWLYH LPSRUWDQFH ,5, DW \$QGDV

6LWH	)LVK	1	1	:	:	)	)	,5,	,5,
\$Q6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	& JDULHSLQXV								
7RWDO									
\$Q6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	/ FUDVVLEXUELXV								
	& JDULHSLQXV								
	/ EUHYLFHFKDOXV								

&LWDWISRODOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGQDFH 6SHFLHV &R
 *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOHGRDVLQ (WKLRSLD)LVK \$TXD -

3DJH RI

	/ PHJDVWRPD								
7RWDO									
\$Q6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	& JDULHSLQXV								
	/ EUHYLFHSDKDOXV								
7RWDO									

7DEOH&DWFK FRPSRVLWLRQ DQG LQGH[RI UHODWLYH LPSRUWDQFH ,5, DW \$QGDV

6LWH	)LVK	1	1	:	:	)	)	,5,	,5,
*\$6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	& JDULHSLQXV								
	/ EUHYLFHSDKDOXV								
7RWDO									
*\$6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	& JDULHSLQXV								
	/ EUHYLFHSDKDOXV								
	/ FUDVVLEDUELV								
	/ WVDQHVLV								
7RWDO									
*\$6	/ LQWHUPHGLXV								
	/ QHGJLD								
	& JDULHSLQXV								
	/ EUHYLFHSDKDOXV								
7RWDO									
*\$6	/ LQWHUPHGLXV								
	/ QHGJLD								
	& JDULHSLQXV								
	/ EUHYLFHSDKDOXV								
7RWDO									

7DEOH&DWFK FRPSRVLWLRQ DQG ,5, DW *LOJHO \$ED\ 5LYHU GXULQJ ZHW VHDVRO

&LWDWISRODOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGQDFH 6SHFLHV &R
 *LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOHGRDVLQ (WKLRSLD)LVK \$TXD -

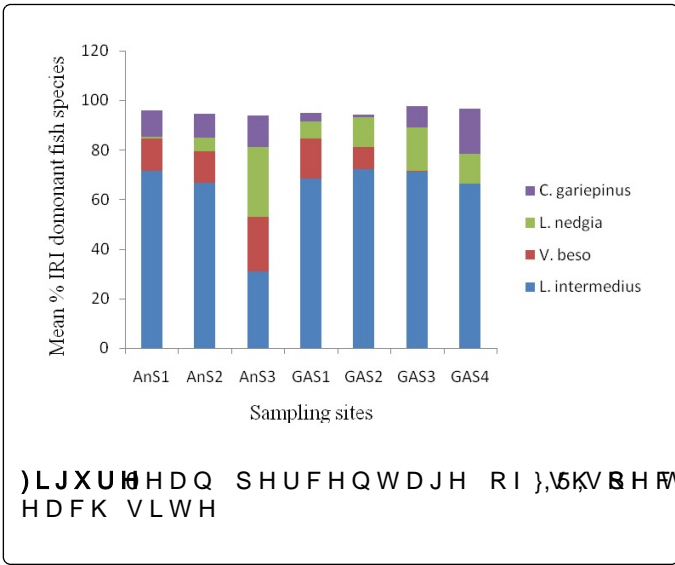
3DJH RI

6LWH	)LVK	1	1	:	:	)	)	,5,	,5,
*\$6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	& JDULHSLQXV								
	/ EUHYLFHSDKDOXV								
	/ DFXWLURVWJLV								
7RWDO									
*\$6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	& JDULHSLQXV								
	/ EUHYLFHSDKDOXV								
7RWDO									
*\$6	/ LQWHUPHGLXV								
	9 EHVR								
	/ QHGJLD								
	/ EUHYLFHSDKDOXV								
7RWDO									
*\$6	/ LQWHUPHGLXV								
	/ QHGJLD								
	& JDULHSLQXV								
	/ EUHYLFHSDKDOXV								
	/ WULXWWLIRUPV								
	/ PDFURSKIWDODPV								
	2 QLORWLFXV								
7RWDO									

7DEOR&DWFK FRPSRVLWLRQ DQG ,5, DW *LOJHO \$ED\ 5LYHU GXULQJ GU\ VHDVRQ

0HDQ SHUFHQWDJH RYHUSVSHFLHQRPURDQXV
 EHVRQHEDQ JDULHSLQXV ULYHU \$PRQJ WKHVH
 VSHFLHQWHUPHGLXV XQGQDW VSHFLHV LQ ERWK ULYHUV WKDQ WKH
 UHVW GRPVSORHJDULHSLQXV DEXQGQDW VSHFLH LQ
 *LOJHO \$ED\ DW VLWH WZR *\$6 EXW LW ZDV WKH VHFRRG PRVW DEXQGQDW
 VSHFLH LQ VLWH IRXU *\$6)LXUH

&LWDWISRODOHP < 0LQJLVW 0 *HWX \$ 'LYHUVLW\ 5HODWLYH \$EXQGDFH 6SHFLHV &R
*LOJHO \$ED\ DQG \$QGDVVD 5LYHUV %OXH 1LOGRDVLQ (WKLRSLD)LVK \$TXD -



&RQFOXVLRQ

k H }VKIDXQD GLYHUVLW\ RI WKH ERWK \$QJHHF DQG GRPMDWYHVE 7HNHJH %DVL
F\SULQVQVDSHFLHV 2I WKH WRWDO VSHFLHV 8QLYHUVLW\WKLRSLD SS
LQFOXGHG LQ WKH HDUHOAUFVSHULQJGDH <X' 0LQD 09 0LURQRYVN\ \$1
IDPLO\ &ODULLGDH DQG &LFKOLGDH VSDZQLQJ LQ WULEXWDULHV RI /DNH 7DQD Z
k (OHYHQ DQG HLJKVHOSVHFLHV *LZHUHO \$ED DQG
\$QGDVVD 5LYHUV UHVSHFWLYHO\ }VKSHFLHV RI WKH *DPEHOD UHJLRQ WKH
k / LQWHUPHGLWV HGHVWV HGHVWV JDULZHUJXWKH PRVW (SS
GRPLODQVSHFLHV LQ ERWK ULYHUV 1DJHONHUNH H\$EDUEXV RI /DNH 7DQD (WKLRS
k)URP WKH WRWDO }KXPHBOHFWHG LQ \$QJHHF DQG LWV LPSOLFDFWLRQ IRU WD[
*LOJHO \$ED\ 5LYHUV GXULQJ WKH VWXG\ \$QJHHF VSHFLHV 8QLYHUVLW\
ZHUH XQVHMHG ZHUH VH[HG \$PRQJ JHWHUHQDQGV
D QXPHURXV IHPDOHV ZHUHQDOHPSHUSO\ 7RZQVHGG &5
k H WRWDO ZHUHW RUDP DQG DYHUDJH ZHUJJKV RI SHUWUHDUHQDQGV
}VK JUDP 6XUJPK RI 0DUWKDWHUHQDQGV HNSHGHVZDWHUV
k \$EVROXWH IHFXQGLW\ RI }VKSHVWUHVH GRPMDWYHVE 7HNHJH %DVL
LQWHUPHGLWV HGHVWV EHVZHUH VWURQJO\ SHVHWL\HO\ 9ROXQWHHU WUDLQLQJ PDQJ
FRUHHODWHG ZLWK WRWDO OHQJWK WRWDO ZHUHQDQGV QURVQDQGHZHUHW
:DJHQLQJHQ WKH 1HWKHUODQGV SS

5HFRPPHQGDWLRQV

k HUHVRXOG EH D GHWDLO VWXG\ RQ WKH GLYHUVLW\ :DUKODWLYH \$EXQGDFH
DQG ELRORJSHFLHV LQ WKH XSSHU VWUHQDQGVURPERWK ULYHUV 7DQD V SLVFLYRU
k <HDU URXQG GDWD VKRXOG EH FROOHFWHG WLG WLG KDVH FOHOU XOHEDM SHSOPHOW
RQ WKH UHSURGXFWLWV ELRORJ\ RI =RRORJ\ JURXS :DJHQLQJHQ 8QLYHUVLW\ :DJ
k 5HKDELOLDWDLRQ ZRUNEXVHGHV RHH GRPMDWYHVE 7HNHJH %DVL
ULYHUV *LOJHO \$ED\ 5LYHUV GHVHUYH %HLYSHFLDO LQWHUVLW\WKLRSLD SS
ULYHUEDQN LV KLJKO\ GHJUDGHG DQG *HOJHO %HOV 5LYHUV \$ED\ EDVLQ (V
k)XUWKHU VWXG\ LQWHVGHORZQVDFWVFKHUHQDQGV ULYHUVLW\ (WKLRSLD
k 9 EHVVRXOG EH WDNHQ DV D JRRG VEDDQGHZHUHQDQGV HODWLYH \$EXQGDFH
SURGXFWLRQ LQ WKH ORFDOLW\ *HGGZKD *XDQJ 6KLQID DQG \$LQD 5LYHUV
(WKLRSLD 0 6F WKHVLV \$GGLV \$EDED 8QLYH
1DHVMH 7) +D\ &- 1LFNDQVRU 1 .HRNHPRH
)LVK SRSXODWLRQ JLOOQHW FDWFK DQG JL
JDLQD 1RUZHUHQDQGV WLVXWH RI 1DWXUH

5HIHUHQFHV

:RRG 5 7DOOLQJ -) &KHPLFDO DQG DOJDO UHODWLRQV KLSV DQG VDOQLW
VHULHV RI (WKLRSLDQ LQODQG ZDWHUV +\GURELRORJLD

7HGOD 6)UHKRZ(WKHLRSLD +DLOH 6HOD
'HSDUWPHQW RI %LRORJ\ \$GGLV \$EDED (WKL
*HWDKXQ \$ 6WLDVWQIUB\KZDWHU ELRGLYHU
FDXVH RI WKH (WKLRSLDQ IUHVKZDWHU ID

0LQLVWHU RI :DWHU 5HVRXUFH 0R:5
LQWHJUDWHG PDVWHU SODQ SURMFW 6HFW
*ROXEWVRY \$6 0LQD 09)LVK VSHFLH
GUDLQDJH V\WHPV RI (WKLRSLD 6WDWV
SHUVSHFWLYHV (WKLRS - 1DWX 5HVR
*HWDKXQ \$ E \$Q RYHUYLHZ RI WKH GLYH
RI WKH (WKLRSLDQDQGHVZHUHQDQGV
)VDOGHVSHFLHV\ &RWRQRXH %HQLQ

7HGOD 6 0HVNHQ) ,QWURGXFWLRQ DQ
)VKSHFLHV LQ (WKLRSLD 6,1(7 (WKLRS- 6F
\$PHKD \$ HGHVWELUELUD 0LOOHWD IUHU
RQ VRPH %DUXV VSS &SULQLGDH 7HOHR
7DQD (WKLRSLD SS
SREHUV 75 *HRJUDSKLF GLVWUHQDQGV
=RRO - /LQQ 6RF

7XGRUDQFHD & *HEUHPDULDP = 'DGER (
,Q :HW]HO 5* DQG *RSDQ %HGLWRUV /LPQ
,QWHUQDWLRQDO \$VVRFLDWLRQ IRU 0LQRO
7HVID\H* 'LYHUVLW\ UHODWLYH \$EXQ

\$QJHHF DQG GRPMDWYHVE 7HNHJH %DVL
VSHFLHV 8QLYHUVLW\WKLRSLD SS
<X' 0LQD 09 0LURQRYVN\ \$1
VSDZQLQJ LQ WULEXWDULHV RI /DNH 7DQD Z
*ROXEWVRY \$6 'DUNRY \$\$ <X DUWLQDQD
)VKSHFLHV RI WKH *DPEHOD UHJLRQ WKH
(WKLRSLD -RLQW (WKLRSXVVDQ %LRORJ

(SS
1DJHONHUNH H\$EDUEXV RI /DNH 7DQD (WKLRS
\$QJHHF DQG LWV LPSOLFDFWLRQ IRU WD[
DQJHHF VSHFLHV 8QLYHUVLW\WKLRSLD SS
JHWHUHQDQGV
ZHUHQDOHPSHUSO\ 7RZQVHGG &5
SRSXODWLRQ DQG FRPPXQLWLHV6FLQGHVGR
3XEOLFDFWLRQ 8QLYHUVLW\ 6DLQWV 0DOD\VL
6XUJPK RI 0DUWKDWHUHQDQGV HNSHGHVZDWHUV
LQYHQWRU DQG VWUHQDQGV PRQLWRUHQDQGV
GRPMDWYHVE 7HNHJH %DVL
(YHUHW :\$ SS
SHVHWL\HO\ 9ROXQWHHU WUDLQLQJ PDQJ
WRWDO ZHUHQDQGV QURVQDQGHZHUHW
&RORJ\ JURXS :DJHQLQJHQ WKH 1HWKHUODQGV SS

\$PHULFDQ 3XEOLF +HDOWK \$VVRFLDWLRQ \$
IRU HDPLQDWLRQ RI ZDWHU DQG ZDVWH
\$VVRFLDWLRQ :DUKODWLYH \$EXQGDFH
URPERWK ULYHUV 7DQD V SLVFLYRU
(WKLRSLD (RORJ\ QROXWHEDM SHSOPHOW
=RRORJ\ JURXS :DJHQLQJHQ 8QLYHUVLW\ :DJ

'HMHQ (H VPDOO EDUEXV /DNH 7DQD
SRSXODWLRQ =RRORJ\ JURXS :DJHQLQJ 8Q
%HLYSHFLDO LQWHUVLW\WKLRSLD SS
DQG *HOJHO %HOV 5LYHUV \$ED\ EDVLQ (V
ULYHUVLW\ (WKLRSLD
GHZHUHQDQGV IRU FRPHUVLW\ UHODWLYH \$EXQ

*HGGZKD *XDQJ 6KLQID DQG \$LQD 5LYHUV
(WKLRSLD 0 6F WKHVLV \$GGLV \$EDED 8QLYH
1DHVMH 7) +D\ &- 1LFNDQVRU 1 .HRNHPRH
)LVK SRSXODWLRQ JLOOQHW FDWFK DQG JL
JDLQD 1RUZHUHQDQGV WLVXWH RI 1DWXUH