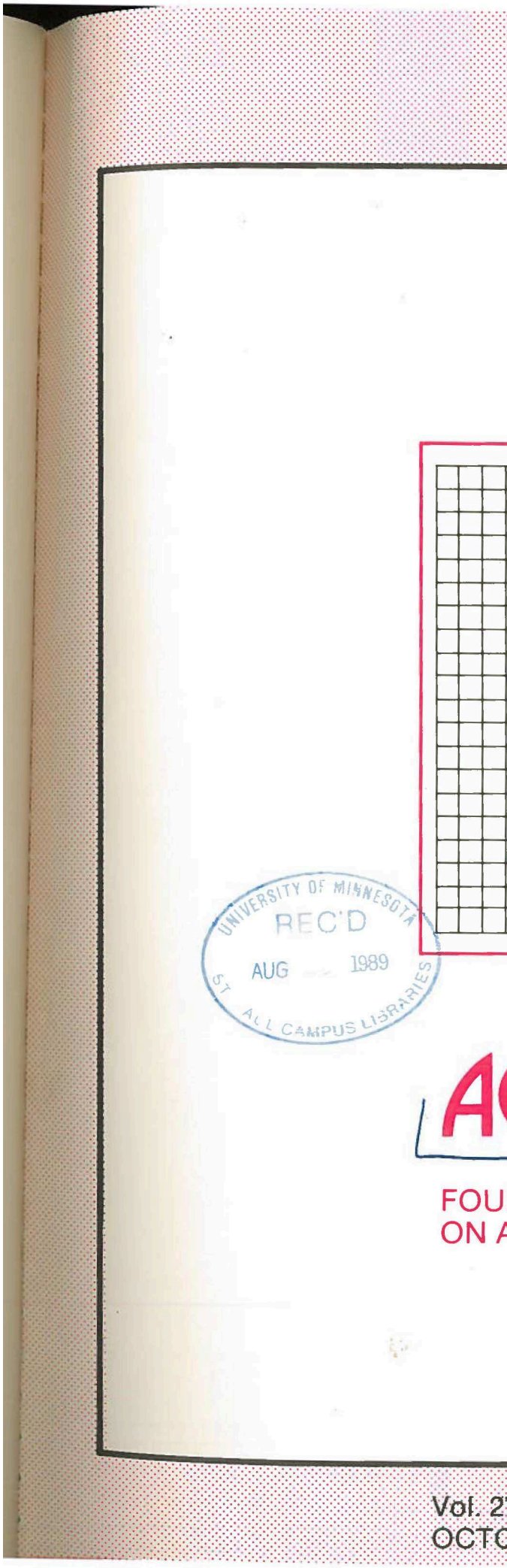

FLOOD DAMAGE
CONDUCTED ON TH

by J. VAN ZY

ABSTRACT

Flood damage on the Umfolozi Plain is statist measurable, and flood damage insurance is ther possible. Average annual net cash flow is greate more stable with insurance than without it. insurance has the greatest potential for use.

INTRODUCTION

For the purposes of this article, flood damage to direct tangible damage caused by a flood. In and non-tangible damage is therefore excluded detrimental effects of flood damage, as indeed any other risk factor in agriculture, operate la via cash flow phenomena leading to pot problems in respect of solvency, liquidity rentability of farming operations (Van Zyl Groenewald, 1984a: 28).

In a previous study on the Lower Um Plain potential financial damage as a result of f was quantified and probabilities were assigne different levels (Van Zyl, 1983, Van Zyl Groenewald, 1984b).

The risks attached to sugar production o Umfolozi Plain, particularly with regard to the effects of flood damage propensity and farm si cash flow, were demonstrated by Van Zyl Groenewald (1984a: 28-32). By combining the level probability with the damage to flood peak it is possible to determine the probability of a level of flood damage being exceeded (Hydrol Research Unit, 1972). Using this method the av annual flood damage and standard deviation been estimated at R108,33 and R300,94 per ha prices), respectively. Using another method pro by Weiss (1976) 20 000 values of a probabilit were generated as an evenly distributed seri random numbers. By linking damages to ea these probabilities an average annual flood da of R113,15 per ha was obtained, while the sta deviation amounted to R361,13 per ha (1985 p (Van Zyl and Groenewald, 1984b).

The average outcome with regard to damage is therefore known, although indiv outcomes would vary. Because what is being with here is a risk, which is statistically measu it is possible to insure against flood damage pro expected damage is within actuarially accep limits (De Villiers, 1974: 6).

*University of Pretoria
Article submitted: November 1987
Article received back from authors: April 1988

use of a flood plain. Whipple (1968), howe
out that state assistance with flood damag
encourage irresponsible and even dangerou
flood plain. The danger exists, however,
high compulsory insurance premium r
entrepreneurs no longer being prepared
and in this way a scheme that would in
been profitable would come to nothing
1974).

Insurance is protection against
specified loss. Pfeffer (1952) defines insu
method by which the risk attached to a
event can be lowered for one party (
party) by transferring such a specific risk
party (the insurer). The insurer is in a
offer the insured party full or partial
against a possible economic loss by
protection fund, built up over time
contributions (premiums) of individua
parties.

According to De Villiers (1974)
consists of four elements:

- it reduces uncertainty on the part of
  party;
- it transfers the risk from the insur
  the insurer;
- the economic loss of the insured pa
  good wholly or partially; and
- there are only two parties involved.

PREFERENCES

In the farming situation both se
opportunity are pursued, depending on th
judgement of the producer on the prob
of chancing a risk or the necessity for
protection and security (Friedman and S
325). De Villiers (1974: 19-21) inc
combination of security and opportunit
of a utility curve including rising
marginal utility and income levels.

In the early stages of a farming ve
available capital is limited, the producer'

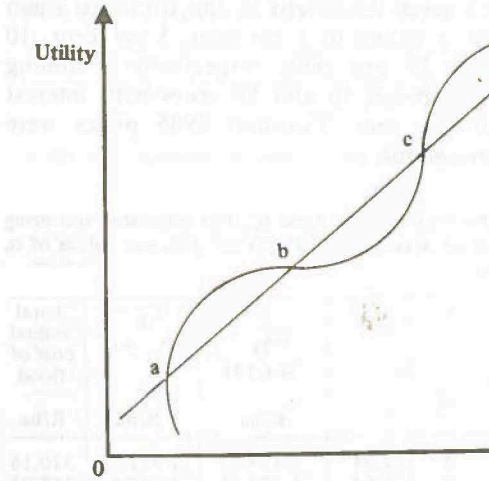

FIG. 1 - Utility curve

Guaranteed cover crop insurance falls
the Insurance Act and any body that wishes to
such insurance must register as an insu
institution in terms of this Act and is the
obliged by law to comply with the requiremer
set by the Act. Provisions of the Insurance
require, among other things, a legal contract be
the two parties, and that a reserve fund be set
order to insure guaranteed cover by the insurer.

In this way only a financially s
undertaking with considerable available funds
offer guaranteed cover crop insurance of this
The number of producers on the Umfolozi Pl
limited and it is unlikely that existing companie
be interested in guaranteed cover insu
specifically against flood damage for this small
of farmers. Better then to examine the possibilit
an insurance pool.

As has already been mentioned the insu
pool is particularly suited to a homogeneous
of producers who wish to insure against one sp
risk only. The implementation of such a pool s
is therefore possible on the Umfolozi Plain
only sugar cane is cultivated and the producers
to insure against flood damage only. One se
problem though is that the settlement farmers al
suffer flood damage at the same time and fo
reason the feasibility of a central stabilisation
for this group of farmers should be looked at.
economic situation of sugar cane farmers or
Umfolozi Plain is described in Van Zyl
Groenewald (1984a).

INSURANCE PREMIUMS

Determining flood risks and then calcul
premiums usually involves problems. An exa
here is the different levels of vulnerability
sensitivity of each flood plain user to a
(Schaake and Fiering, 1967: 913-927; Kunreu
1970: 659-667; Krutilla, 1966). In order to dete
insurance premiums scientifically comprehe
information is necessary and mathematical mo
which must be revised regularly, are used (Whi
1968). It is probably on account of all
problems that insurance companies are not ke
underwrite flood damage insurance in South Af

If a limited number of producers participa
an insurance pool, their annual premium will
normal circumstances be equal to the exp
average value of the annual flood damage (
1967). However, if there is a severe flood w
great deal of flood damage, the stabilisation
could be inadequate for full compensation ar
such a case damage would be compensated for
on a *pro rata* basis. The risk is therefore
partially insured against.

Grant and Ireson (1960: 265) suggest th
order to counter the effects of such catastr
floods, a safety factor should be built in whe
premiums are fixed. They propose that the exp
value of the average annual flood damage shou

As can be seen the considerable varia
cost of uncertainty is a result of the diffe
of probability and risk attached to the exh
the stabilisation fund before the end of th
period. Although the results as set out
provide no magic answer, they do provide
which a rational evaluation of the results c
budgeting option may be based.

Simulation provides an alternative
representing uncertainty in flood damage
and Groenewald, 1984b). Figure 2
comparison between the simulation metho
results obtained using the technique of M
(1962).

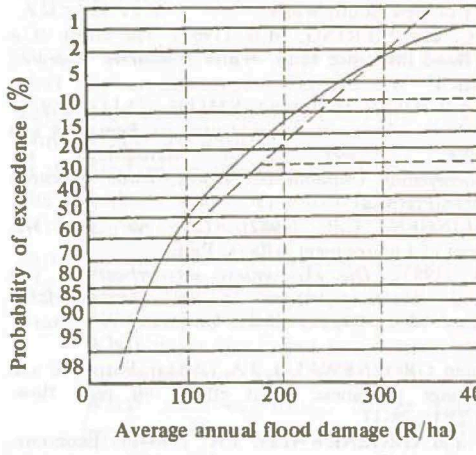

**FIG.2 - Comparative frequency distributions of sin
damage and those according to the Maass et al. (19
Umfolozi Plain (1985 prices)**

The differences in results are prima
the fact that the method of Maass *et a*
based on a hypothetical (normal)
distribution of annual flood damage, wh
influenced by the length of the planning
which is dependent on interest rates. On
hand, the simulation method is not necess
on a normal distribution and results are
by the length of the planning period.

BENEFITS FROM FLOOD INSURANC

The benefits to be derived from flood in
sugar producers on the Umfolozi Pla

TABLE 2 - Average net cash flow for different sizes

Item	
Insured or not	**Net cash flow**
Without flood insurance	Average standard deviation Coefficient of variation
With flood insurance	Average standard deviation Coefficient of variation
Average benefits of insurance	

familiar with the inherent problems associated w
sugar cane production on the Umfolozi Plain a
estimations of flood damage along with possi
claims can be dealt with potentially more quic
and more accurately, to the greater satisfaction
the members of the insurance pool or stabilisat
fund.

CONCLUSION

Because the average outcome with regard to flo
damage for the Lower Umfolozi Plain is known a
the risk is therefore statistically measurable, it
possible to insure against flood damage. P
insurance has the greatest potential for applicat
with a group of homogeneous producers, a h
degree of participation and a low risk situation
that only one specific risk, namely flood dama
would be insured against.

The average annual net cash flow in respect
each farm size is not only higher where flo
damage is insured against, but also more stable.
against this there is a considerable variation in
annual net income stream where flood damage is
insured against. Flood damage insurance raises
cash flow in years in which flood damage occ
while net cash flow in normal years is slightly lo
Apparently then, flood damage insurance has,
least potentially, considerable benefits for the su
cane producers on the Lower Umfolozi Plain.

BIBLIOGRAPHY

DE VILLIERS, A. (1974). *Ekonomiese aspekte*
oesversekering Unpublished M.Sc. (Agric) th
University of Pretoria, Pretoria

FRIEDMAN, M. and SAVAGE, R.J. (1962). The utility ana
of choices involving risk. Hamilton, E.J. (Ed.). *Landm*
in Political Economy Vol. 2. University of Chicago P
Chicago

GRANT, E.L. and IRESON, W.G. (1960). *Principle*
Engineering Economy Poland Press, New York

Hydrological Research Unit. (1972). Design flood determin
in South Africa. *H.R.U. Report No. 1/72* University of
Witwatersrand, Johannesburg

KRUTILLA, J.V. (1966). An economic approach to coping