

Soil Conservation in the Rain-fed Regions of the South African Sugar Industry – Overview



RA Stranack
SASIAA – October 2019

Content

This presentation is a mix of:

History

Science

Observation

Based loosely on the Universal Soil Loss Equation (USLE)

$$\text{Soil loss (A)} = R \times K \times LS \times CP$$

Where...

A is soil loss t/ha/annum

R is a rainfall erosivity factor

K is a soil erodibility factor

LS is length and steepness of slope

CP is a crop management practices factor

Soil Loss Estimates

Annual rate of soil loss in
South Africa

12,6 t/ha/annum !!

Rate of soil regeneration?

5 t/ha/annum

J Le Roux UFS & H Smith Grain SA 2014



South Coast 2019

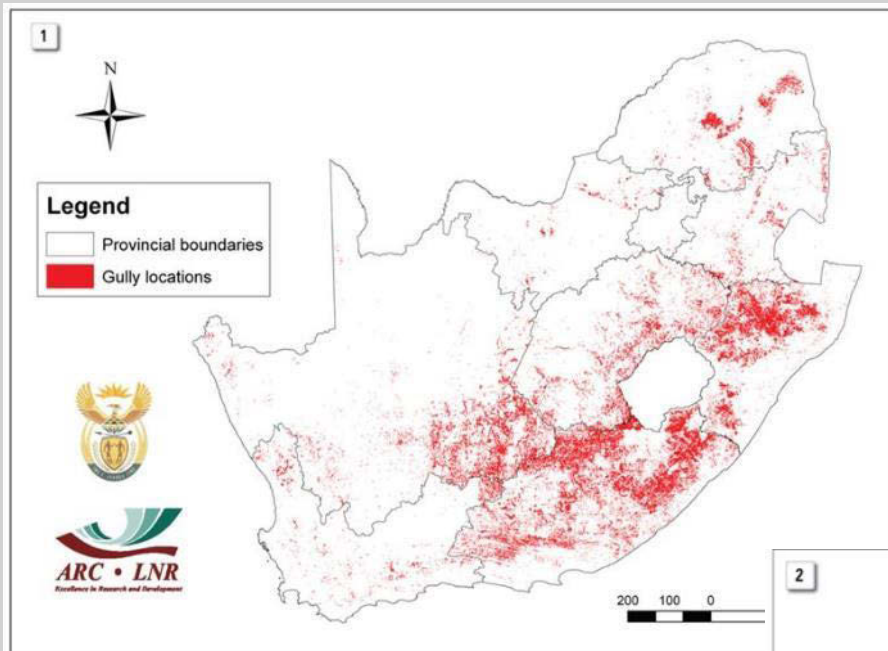


Figure 1: Distribution of gully erosion in South Africa.

Distribution of;
Gully &
Sheet Erosion in SA

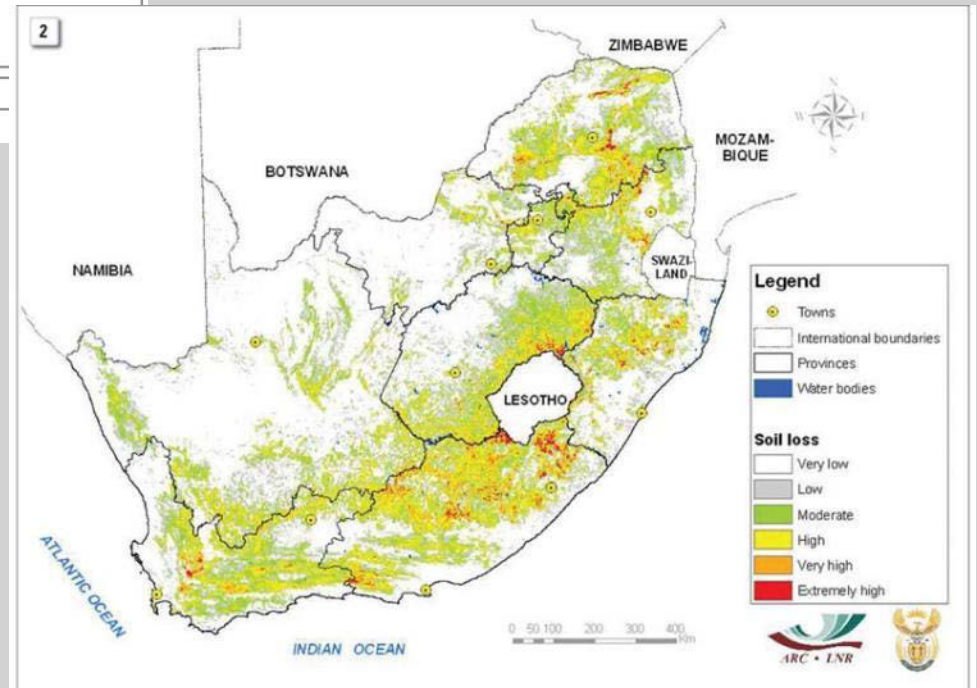


Figure 2: Distribution of sheet and rill erosion in South Africa.

In **KZN** approximately:

1 300 000 ha is affected by sheet & rill erosion

+

88 000 ha affected by gully erosion

= **15% of land area**

Source J Le Roux & N Mararakanye ARC



Extreme sheet erosion



Gully erosion – KZN



Tugela River 1879 & 2002



Rainfall – Volume and Intensity

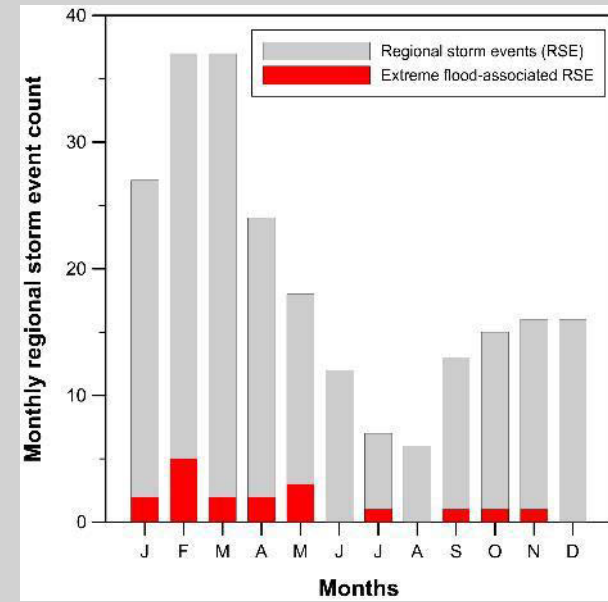
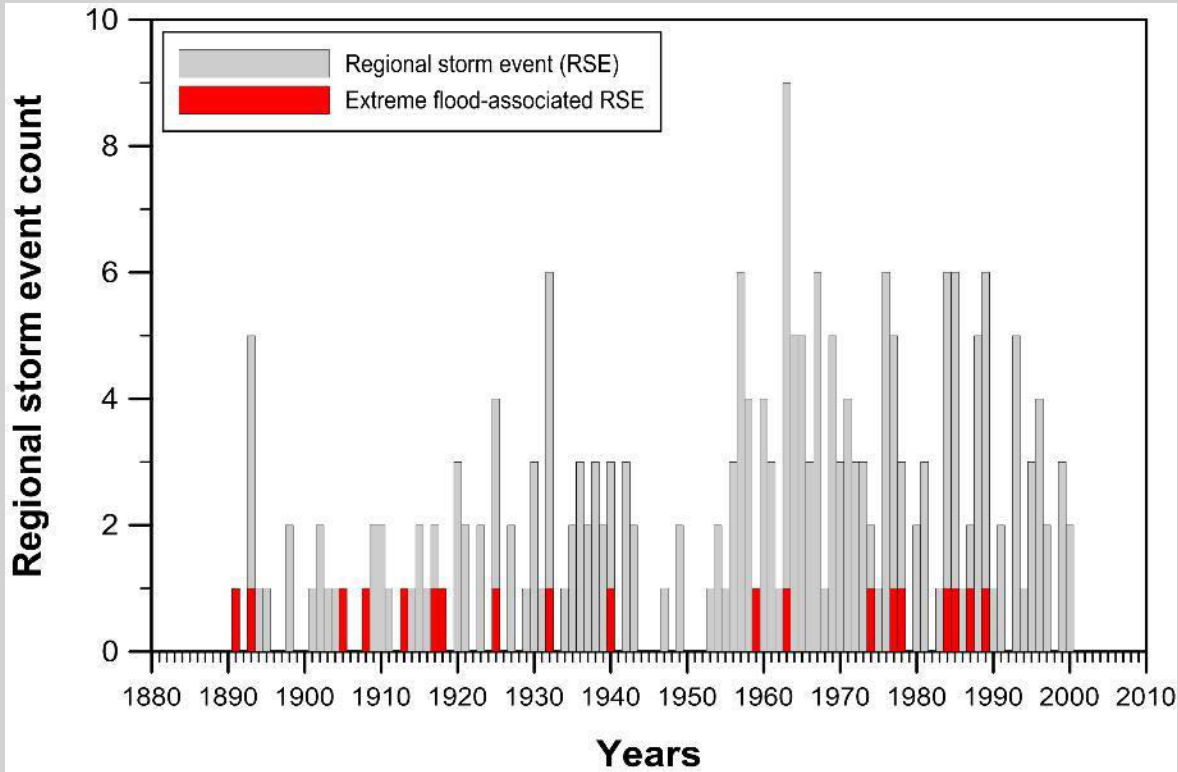


Erosive potential of raindrop splash on bare soil

Mulch cover to reduce impact of raindrop splash



Storm and Flood Occurrences - KZN



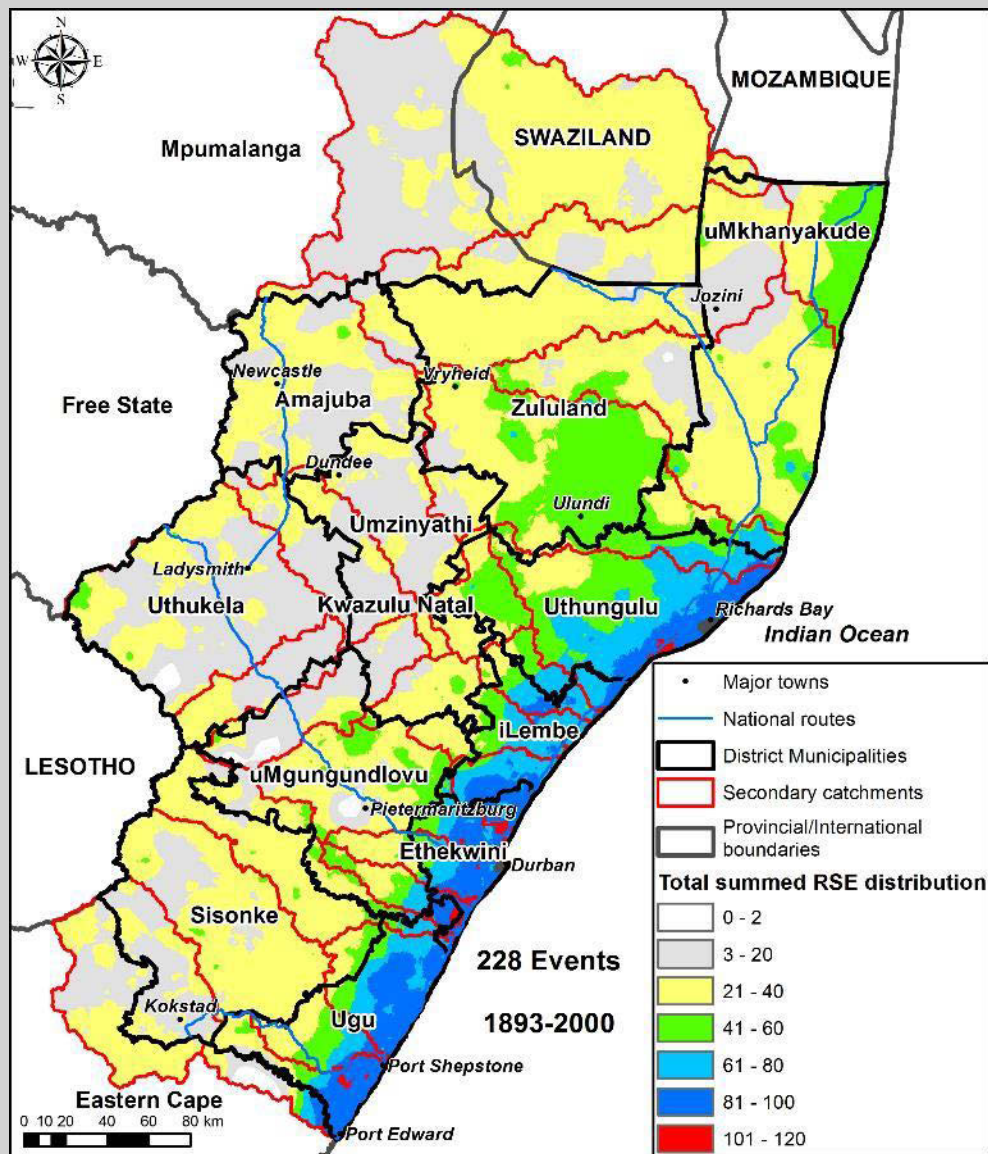
By year

By month

Dr Riaan Botes
PhD thesis



Storm events



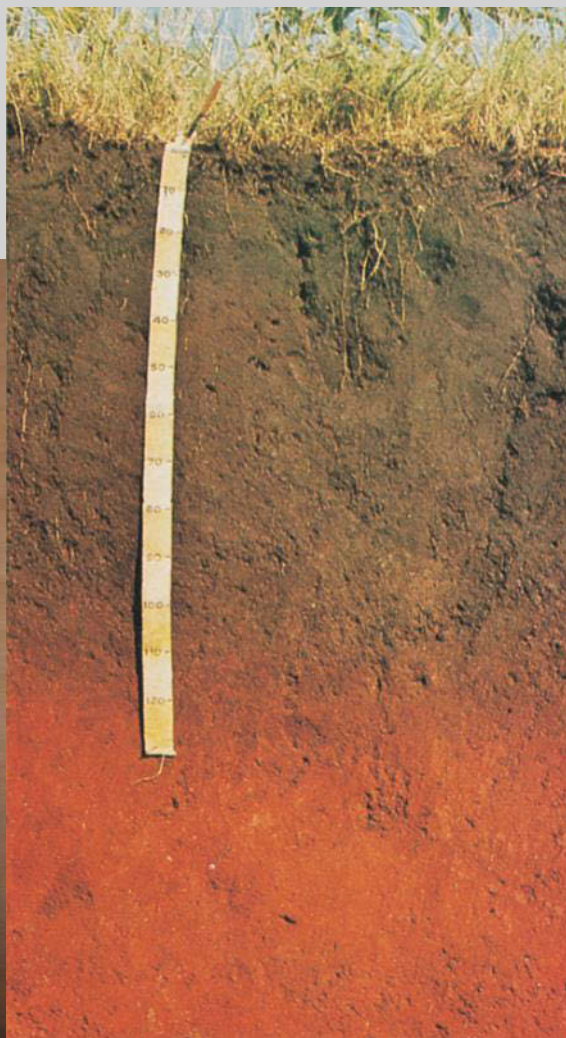
Dr Riaan Botes
PhD thesis

Distribution of Regional Storm Events in KZN



Lest we ever forget

Soils



Soil Erodibility

Soil Parent Material	Approximate % of industry	Risk factors for erosion
Granite	10	Slope & texture
Natal Group Sandstone (Ordinary)	25	Slope depth & texture
Natal Group Sandstone (Mist Belt)	5	
Dwyka Tillite	10	Depth
Vryheid Sediments, Pietermaritzburg Shales & Tarkastad Sediments	15	Depth
Red & Grey Recent Sands	10	Texture
Alluvium	10	Texture & situation
Dolerite	12	Slope
Other	2	
Total	100	Total area at risk 80% !!!

Source: Identification & Management of the Soils of the SA Sugar Industry – SASRI Bulletin

Not to be complacent..

A resistant clay soil at La Mercy - rill erosion following 60 mm in an hour on tilled soil



Sugarcane on Steep Slopes



es and timbered slopes taken at Beeverstowe, Esperanza. J. Kirkman & Sons Mill in hollow.

Sugarcane on the Natal South Coast *circa* 1920
The Natal Sugar Industry

Terrace Farming



Length and Steepness of Slope



Unbroken slope



2019

Contour Farming

Where lands are on steepish slopes the best practice finishes drills (furrows) on the contour In order to prevent wash that is bound to occur during the heavier summer rains. This system requires some skill and the close attention of the farmer as the driver, if left to himself will work downhill and struggle uphill on his return, heeding merely his own ease...taking no account of the oxen or the probable ultimate end in the nearest stream of the soil he has turned -

The Natal Sugar Industry 1924

Then not so long ago...



Contractor is Flouting all established conservation norms & laws

Resource Auditor : uThungulu District and Ethekwini Municipality

Department : Agriculture, Forestry and Fisheries

Directorate : Land Use and Soil Management





Strip cropping – then and now

1960s – 1980s

So what happened?

Eldana

Labour issues

Contracting

Harvesting larger areas

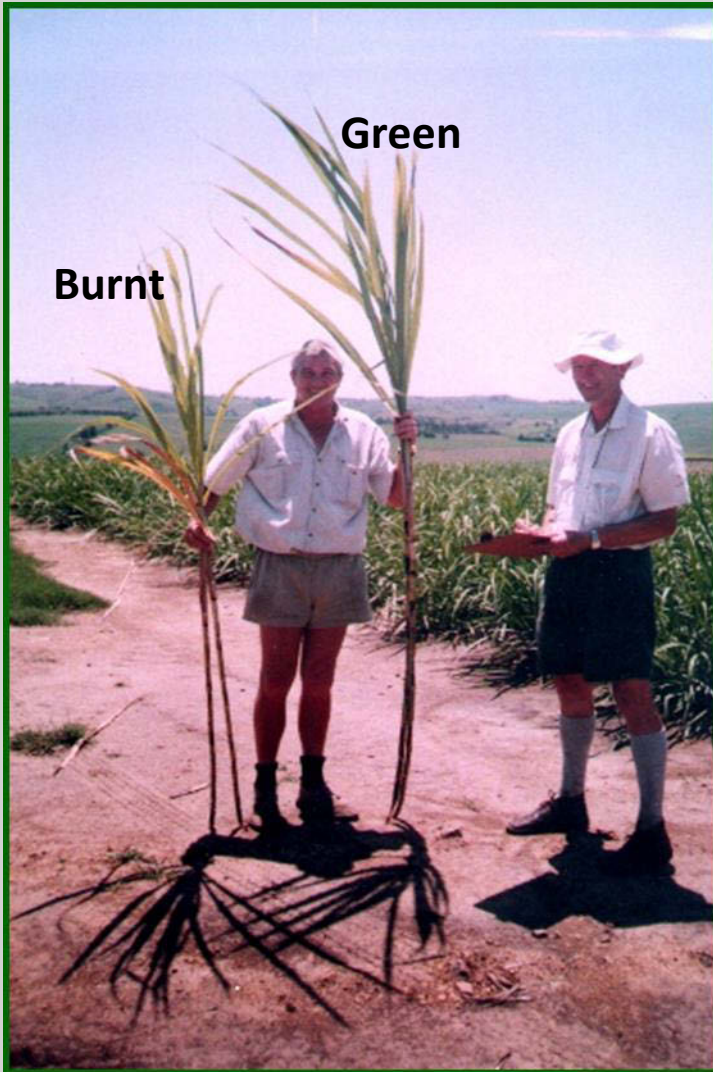


Crop Management Factors (CP)



Maidstone Mill – early 1960s

Green Cane Harvesting – ‘Trashing’



“trash..provides cover..retarding evaporation, absorbing and retaining moisture..keeping down weeds..supplies humus to the soil, essential to its tilth...returns to the land chemical constituents..” 1924

Historically:

**‘Natal’ – South of Tugela – green
Zululand – North of Tugela – burnt**

More ‘recent’

**Midlands – burnt
Lowveld - burnt**

Trends in Green Cane Harvesting



The perfect storm - 80's & 90's

**Eldana
Droughts
Labour issues
Contractors & Mechanical loading**



Mill	1985 /86	1999/20
Entumeni	44	1
Darnall	62	29
Gledhow	65	21
Maidstone	57	25
Sezela	46	20
Industry	27	10

TODAY – 92% Burnt



THE FUTURE?? -

Minimum & Reduced Tillage

Lime application
on steep slopes?

Hand chipping



Roundup off
patent since
1990

Combination tillage



Green Manuring



Wetlands & Watercourses

Forestry led the way....

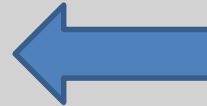


And sugarcane followed..

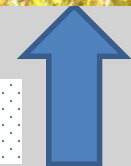
Problems....



Some solutions...



Leaving alone....



Planting up....



TWINSTREAMS TRUST HONOURS THE WORK OF IAN GARLAND



Dr Ian Garland and his wife Jean photographed in the garden of their new home. Overlooking the Kloof Gorge, the house is aptly named "New Forest" for Ian has planted more than 800 trees of 290 species in the grounds!

A Trust has been launched to support and finance future conservation projects on the famous Zululand farm "Twinstreams", and to honour the pioneering work done there for many years by Ian and Jean Garland.

Almost 50 years ago, the first group of young naturalists arrived at "Twinstreams" to attend an environmental education (EE) course being run by the Wildlife Society and the farm's owner, Ian Garland. Since then thousands more have

learned about conservation and the concepts of ecology while staying there.

In 1987, the farm was bought by Mondi Forests and the project was expanded to take in about 200 hectares, including the wetland areas next to the farm's superb forests, in which Ian had planted many thousands of indigenous trees to augment the original forest. In 1995, the "Twinstreams" Environmental Education Centre was opened on the farm, and later the Mondi/WESSA joint venture was started, with Jonathan Wigley leading the Society's EE team.

Thousands of children from all over South Africa now visit "Twinstreams" each year, and a number of the instructors who have led courses there have gone on to make their mark in the conservation world. One of these was Toogood Mchunu, now Director of Education with the Department of Environmental Affairs and Tourism.

Tim Wright, WESSA's Regional Manager who represents the Society on the Trust, has paid warm tribute to the Garlands for the part they have played in conservation in KwaZulu-Natal and in environmental education in particular, and has appealed for donations to the Trust, via Russell Addison, P.O. Box 1511, Empangeni, 3880.

Conservation structures



South Coast
Midlands
Zululand

Land Use Planning



SASRI Farm Planning Unit established

Support from Department of Agriculture



Agreement between Department of Agriculture and SASEX

1973



3/1/73

(70)
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In reply please quote
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REPUBLIC VAN SUID-AFRIKA-REPUBLIE OF SOUTH AFRICA

DEPARTEMENT VAN LANDBOU TEGNIESE DIENSTE
DEPARTMENT OF AGRICULTURAL TECHNICAL SERVICES

NATALSTREEK X9059
PRIVAATSAK X9051
PIETERMARITZBURG

NATAL REGION X9059
PRIVATE BAG X9051
PIETERMARITZBURG

15 -6 - 1973

The Director,
S.A. Sugar Association Experiment
Station,
P.O. MOUNT EDGECOMBE.

Dear Sir,

PROPOSED DEPARTMENTAL SPECIFICATIONS
OF ANTI-EROSION WORKS ON SUGAR CANE
LANDS

--- The attached draft of the proposed Departmental proposals for the protection of sugar cane lands is an attempt to meet a greatly overdue need among our field officers concerned with the application of soil conservation measures to these lands.


These proposals have been drawn up in consultation with growers, soil conservation committee members and Departmental Officers. At the meeting held at the Umhlali Country Club, on 19/2/73, Messrs. R. Paxton, O. Landrey and A. Stead of your staff were also present.

To avoid confusion amongst growers, it is considered essential that both your Association and the Department adopt the same approach regarding the conservation measures which should be applied to sugar cane lands.

For this reason your comments and suggestions on the attached guide would be highly valued. Further discussions could also be arranged if required. Possibly you could provide me with copies of any guide-lines you may have on the conservation and lay-out of sugar canelands.

Your co-operation in this most important matter would be greatly appreciated.

Yours faithfully,


DIRECTOR : NATAL REGION

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- 7 JUN 1973
ANSD.

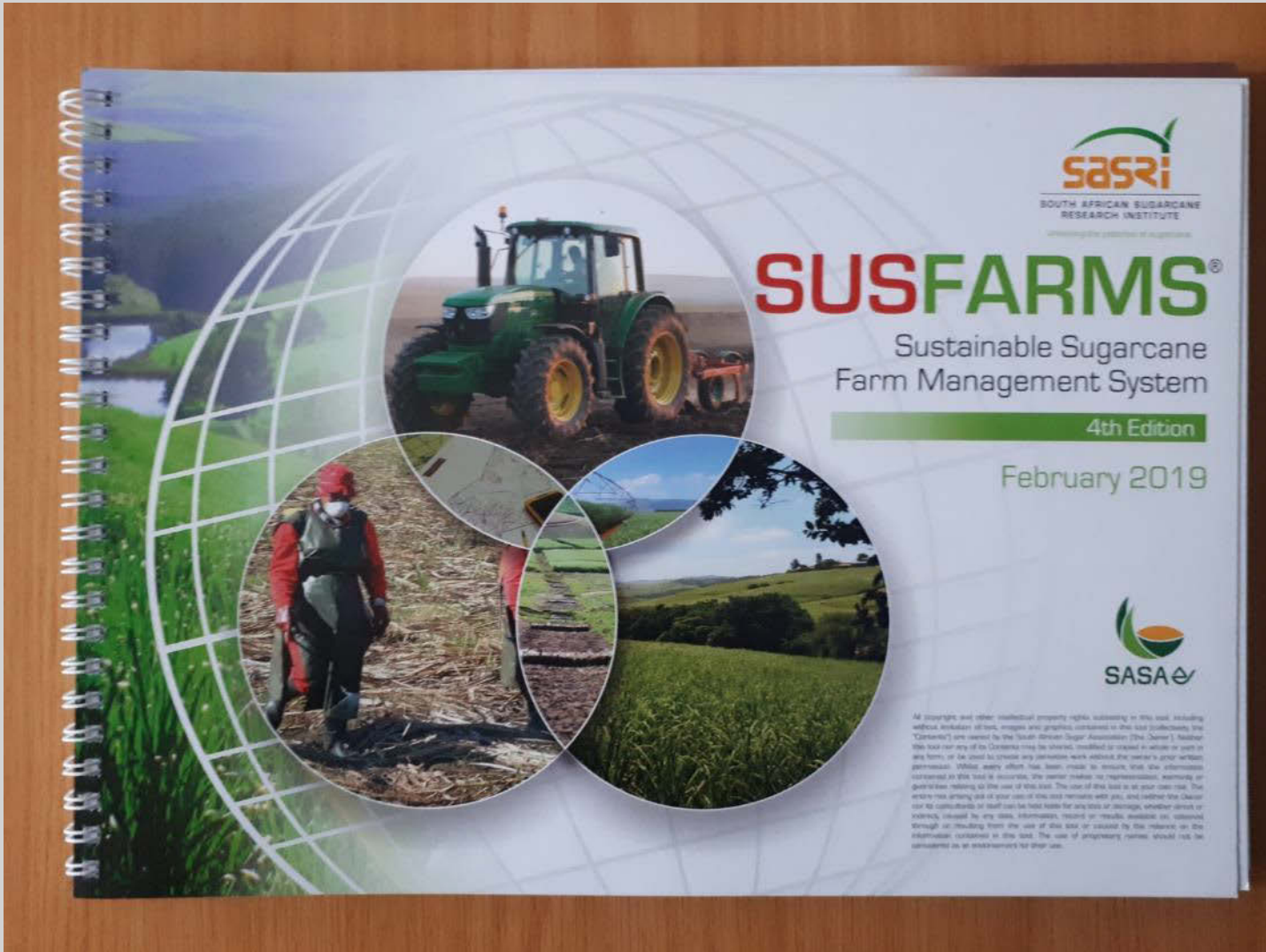
Agreement between Dept Agric and SASRI (then SASEX) giving responsibility to the industry to recommend & implement soil conservation measures to sugarcane lands

SASEX/SASRI Farm Planning Department

Key Activities in the 20 years of its existence

- Land Use Plans
- Farm conservation assessments
- Erosion control
- Soil surveys
- Drainage plans
- Wetland and watercourse rehabilitation
- Manuals bulletins standards
- **Research** – Run-off plots, La Mercy catchment project, rainfall simulator
- SUSFARMS – initial versions

SUSFARMS®



sasri
SOUTH AFRICAN SUGARCANE
RESEARCH INSTITUTE
Advancing the production of sugarcane

SUSFARMS®

Sustainable Sugarcane
Farm Management System

4th Edition

February 2019

SASA

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And other crops?



Some key questions

Policing – who is policing conservation practices these days?

Research?

Leadership – where are the champions?

Farm planning services?

The sugarcane farm of the future?



The answer to all our woes....

Discovered
on the
banks of the
Tugela River
following a
flood



