WORLD METEOROLOGICAL ORGANIZATION

AGRICULTURAL METEOROLOGY PROGRAMME

CAGM Report No. 34

CLIMATE APPLICATIONS REFERRAL SYSTEM - DESERTIFICATION

(CARS-DESERTIFICATION)

WMO/TD-No. 297

Geneva, May 1989
AGRICULTURAL METEOROLOGY PROGRAMME

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A main objective of the World Climate Applications Programme (WCAP) is to improve the use of existing climate data and information. This obviously calls for a stocktaking of methods which are currently applied to economic and social activities in which climate plays a significant role.

The purpose of the Climate Applications Referral System (CARS) project of the WCAP is to provide WMO Members with information on proven (i.e. tried and tested) methods of applied climatology currently in use in various countries or regions. The information provided about each method should consist of (1) a description of the method itself (input, output, limitations ...) and (2) references (addresses, bibliographical references ...) indicating sources where more information can be sought.

What are the fields of applied climatology to be reviewed? The WMO Commission for Climatology and Applications of Meteorology (now Commission for Climatology) (at its eighth session, Washington 1982) and the Commission for Agricultural Meteorology (at its eighth session, Geneva 1983) indicated that CARS should cover such fields as: food, energy, urbanization, building, transportation, human biometeorology, tourism and recreation, and economic planning. The first versions of CARS-WIND Energy and CARS-SOLAR Energy were published in August 1983 as WCP-56 and that of CARS-FOOD in January 1984 as WCP-67. Copies of these reports have been sent to all Members of WMO. The Commission for Agricultural Meteorology (at its ninth session, Madrid, Spain 1986) requested that a CARS-DESERTIFICATION should also be prepared.

It appeared that the best way to build up CARS rapidly and with a minimum of misunderstandings between various contributors would be to build a core of information for each major topic and then use an "aggregation process" on which many contributors are asked to add only a bit of information each to the core to achieve a collective account of proven techniques on a given topic.

In order to comply with this request, a circular was sent to all members of CAGM and to scientists and technicians working on desertification-related subjects to obtain inputs to the proposed CARS-DESERTIFICATION. The format for CARS-DESERTIFICATION follows that of CARS-FOOD which has been reproduced in this publication with some modification. It should be referred to for the list of keywords which is supplemented by a list of additional keywords.

Members are invited to comment on this first version of the CARS-DESERTIFICATION and to make further contributions by providing the WMO Secretariat with information on additional proven methods of the applications of meteorology, climatology and hydrology to the combat and control of desertification and related hazards on the blank input forms provided at the back of this publication.

It is expected that the co-operation and contribution of agrometeorologists, agronomists, soil scientists and others in WMO Member States will make CARS-DESERTIFICATION a useful tool in the efforts of Members to combat and control desertification.
THE CLIMATE APPLICATIONS REFERRAL SYSTEM (CARS)

Why?

There is ample potential for contributing to the solution of Food/Water/Energy/Desertification problems by skillful exploitation of climate data and knowledge. To realize that potential, one must ensure:

(1) that the general community and in particular decision-makers and managers are motivated to seek and use up-to-date climate information and knowledge in planning and organizing climate-sensitive activities;

(2) that sufficient expertise is built up in the meteorological services of all countries to enable them to provide effective advice based on applicable techniques and methods.

One of the prerequisites for reaching these objectives is to build an inventory of existing knowledge related to applied climatology and a system to transfer this knowledge from country to country. Over many years a considerable amount of work has been done in the field of applied climatology by institutions and national services in many countries and by international bodies. However, a description of this work is not always readily available and it is often difficult to obtain details of methods and techniques which have been developed and successfully used elsewhere in practical applications of climatology to food, water, energy and desertification problems. It is therefore essential to create a service through which this store of experience and knowledge can readily be tapped and exploited.

What?

CARS is primarily an information service enabling easy identification of existing methods or techniques which may be applicable in a particular subject area being studied. It can also assist the user to discover the institutions or other sources having expertise in his field of interest.

Three aspects of CARS have to be underlined:

1. CARS is devoted to methods and techniques

CARS is devoted to applications methods that make practical use of climatic data and knowledge. Priority in CARS is therefore given to practical methods tried, tested and operationally used in some region or country.
2. **CARS is a referral system**

It provides references about methods; it is neither a summary of methods nor a "cookbook".

A short analysis of the applied methods included in CARS is indeed needed in the system; but this analysis is kept to the minimum necessary to inform the user about the objectives of the methods, the requirements to use the method (manpower, data, computer means...), and the field of application (climatic zones...). Upon identification of an adequate method, the user is provided with related references. This CARS referral system basically consists of a set of files on applied methods. These will be put in a word processing system in WMO in order (1) to allow regular updating and publication of a "CARS book" and (2) to facilitate electronic retrieval of information through a key-word process.

3. **CARS is composed of two parts**

In addition to the direct review of methods mentioned above, CARS will contain a second part listing national or international institutions involved in applied climatology and on-going development projects making profit of applied climatology.

How?

The very wide-ranging, complex nature of CARS necessitates that it be built "by AGGREGATION": first, each CARS subproject will be written by consultants (or WMO Technical Commission' rapporteurs). Then Member States of WMO will be asked to contribute by providing methods nationally used. Up-dates of CARS will be made periodically.
This document is devoted to the core of CARS-DEsertification. It is expected that WMO Members and members of Technical Commissions will comment on and "aggregate" methods to this core.

"CODING SHEETS"

The coding sheets to describe the methods consist of different sections:

1. Object of method
   1.1 Objective/title
   1.2 Key words
   1.3 Other potential key words

2. Description of method
   2.1 Output
   2.2 Description
   2.3 Input data
   2.4 Operational requirements
   2.5 Validity, limits imposed by basic concept, constraints in application

3. Validation/Proven uses

4. References
   4.1 Source (Published literature/Project Report/Others)
   4.2 Details of publication, reports etc.
      - Name of Journal
      - Name of Publishers
      - Year of publication/Completion of project
      - Language (E/F/S/R/Others)
      - No. of pages
      - Other details, if any
   4.3 Author
   4.4 Address
   4.5 Programme/Data/Information available on:
      - Punched cards
      - Floppy disc
      - Microfilm
      - Others

5. Availability/Sources of assistance for future users
   5.1 Contacts
   5.2 Nature of assistance available

6. Remarks
"KEY WORDS"

A provisional input schedule was prepared to facilitate the writing of the core of CARS-Food (WCP-67). This schedule and the accompanying chapter and section keywords are presented below. A thematic list of keywords is given on pages vii-ix. Additional keywords for CARS-DESERTIFICATION are given from page x onwards.

"PROVISIONAL INPUT SCHEDULE"

Chapter key words are underlined by a solid line, section key words by a broken line.

1. agroclimatic maps and studies

2. soil and climate

   soil_protection
   fertilizer
   soil_temperatures
   soil_water
   others

3. Climate, weather and crop pasture development and growth

4. Agricultural operations and crop-calendar including pastures

   soil_preparation
   sowing, planting, transplanting
   germination
   weeding, harrowing, flowering, ripening
   water_balance, irrigation
   harvesting
   overwintering
   others
5. Yield and climate including pastures
6. Agriculture and adverse climatic/meteorological events
cold
frost
heat
drought
excessive rain
floods
hail
wind
others
7. microclimates, natural or artificial
8. crop-protection
9. animal production
10. animal protection
11. products, storage and transport
12. diverse
"PROVISIONAL THEMATIC LIST OF KEY WORDS FOR CARS–FOOD"

1. Agroclimatic concepts

- start of season
- length of season
- end of season
- dry spells
- salinization
- degree-days
- crop-calendar
- yields
- crop systems
- crop monitoring
- intercropping

- crop water requirements
- soil water
- water-balance
- variety-choice
- available-work-days
- crop models
- yield simulation
- zoning
- available water
- energy balance

2. Agricultural operations

- soil preparations
- plant density
- seed treatment
- germination
- sowing
- planting
- transplanting
- fertilizer gifts
- weeding
- harrowing
- mulching
- curing
- irrigation

- cutting
- flowering
- harvesting
- ensilage
- storage
- transport
- overwintering
- pest control
- disease control
- rodent control
- crop protection
- animal protection
- crop rotation

3. Specific crops

- barley
- maize
- sorghum
- millet
- oats
- wheat
- rice
- rye
- oil palm
- beans
- coconut

- sugar cane
- potatoes
- sweet potatoes
- cassava
- sugar beet
- food crops
- pasture
- cash crops
- vegetable crops
- forests
- plantain

4. Animals

- cattle
- horses
- goats
- sheep
- poultry
- pigs

- camels
- donkeys
- fish
- animal housing
- animal health
5. Biological elements and processes

assimilation    sugar content
biomass        transpiration
dry matter production plant development
dormancy        plant growth
vernalization   phenological phases
photosynthesis  pest migration
photoperiodism  pest development
respiration     disease dispersion
thermoperiodism disease development
water stress    yield
protein content flowering

6. Climatic elements

heat           drought
frost          rain totals
temperature    rain intensity
thermoperiodism rain duration
vapour pressure rain excess
relative humidity hail
wind           floods
sunshine       evaporation
radiation      evapotranspiration
PAR (photosynthetically
due radiation)

7. Climatic zones

arid           equatorial
humid          temperate
tropical       polar

8. Data analysis techniques

analogues      normals
correlation    probabilities
frequencies    regression
gamma functions sub models
time series    variance analysis
multi-variate analysis

9. Soil elements

alluvial       soil runoff
clay           drainage
sand           leaching
silt           fertilizer
loess          soil conservation
soil erosion   soil temperature
10. Miscellaneous

shade      adverse events
wind breaks soil degradation
microclimate maps
glass houses climate studies
mountains deserts
coasts plains
islands topoclimatology
desertification
"PROVISIONAL THEMATIC LIST OF ADDITIONAL KEYWORDS FOR CARS—DESERIFICATION

1. Agroclimatic Concepts
   Climate Classification  Desert Vegetation
   Climate Change         Desert Flora
   Climate Variability/Variation Alkalisation
   Climate Fluctuation    Overfarming/Overcultivation
   Aridity                Climatic Noise
   Index of Aridity       Dryness Ratio
   Albedo                 Dessication
   Humidity               Paleoclimate
   Subsidence             Climatic Index
                           Isohyet
                           Irrigation

2. Agricultural Operations
   Seeding                Water-harvesting
   Furrowing              Strip Cropping
   Ridging                Tillage
                           Others

3. Specific Crops
   Desert Range Fodder    Drought-resistant Plants
                           Salt-resistant Plants

4. Animals
   Animal Production      Overgrazing
   Desert Fauna          Overstocking

5. Biological Elements and Processes
   Milk Production        Meat Production
   Egg Production         Fibre Production

6. Climatic Elements and Concepts
   Atmospheric Pressure   Anomometry
   Sandstorm              Aerodynamics
   Duststorm              Turbulence
                           Wind Rose

7. Climatic Zones
   Marginal Lands         Hyper-arid
   Semi-arid              Sub-humid
   Sudanian               Saharan
                           Guinean
8. Soil Elements/Characteristics

- Dominant Texture
  - Sandy Soil
  - Clayey Soil
  - Silty Soil

- Deterioration of Soil Structure
- Soil Compaction
- Crusting
- Porosity
- Humic Soil

- Physical Characteristics
  - Surface Roughness
  - Soil Moisture
  - Aggregate Stability

- Infiltration
- Water Holding Capacity
- Chemical Characteristics
  - Salty Soil

- Soil Loss
- Soil Erosion - Water: Wind
- Erosivity/Erosive Capacity

- Dunes
  - Types/Genesis
  - Formation/Stabilisation/
    Fixation/Migration/Status
  - Erg/Dune Field
  - Barchan
  - Saltation
  - Creeping

- Sand
  - Sand Trap
  - Movement/Propagation/Encroachment
  - Desert Sand/Dust Deflation

- Drag Velocity
- Ripple
- Dust Transport/Concentration
- Soil Microfauna

9. Land Use/Management

- Agricultural Land
- Controlled Land Use
- Land Degradation
- Land Reclamation
- Agroforestry
- Cultivated Land

- Afforestation/Deforestation
- Shelterbelts/Windbreaks
- Rangeland
- Mapping (Cartography)
- Cropland/Rainfed Cropland
- Irrigated Land

10. Miscellaneous

- Atmospheric Electricity
- Waterlogging
- Sahelian Drought
- Brush Fires - Grassland
  - Bush
  - Forest

- Nutrient Loss
- Pollution
- Particle Blasting
  - Remote Sensing Applications
    - Land Surface Temperature
    - Satellite Imagery
    - Soil Moisture
    - Vegetation Index
    - Aerial Photography

- Geomorphology
- Sedimentology
- Boundary Layer
- Wind Shear Stress
- Wind Efficiency Threshold
- Moisture Stress
- Hydrogeology

- Greenhouse Effect
- Ozone
CARS - DESERTIFICATION COMPONENTS
1. OBJECT OF METHOD

1.1 Objective:

To describe various methods for reclaiming desertified lands.

Title:

Soviet Deserts are reclaimed.

1.2 Key words:
(from the list)
Erosion, Desertification, Dune Fixation, Land Reclamation, Irrigation

Section: -
Chapter: -

1.3 Other potential key words:

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Various methods for combating land degradation including rangeland, dunes, erosion control and irrigated land.
2.2 Description:

The article describes Soviet experience in claiming arid and degraded land e.g. improvement of natural rangeland vegetation, rotational grazing, increased fodder supply, afforestation of dunes after bitumen surface treatment, wind erosion control, soil conservation, and controlled irrigation.

2.3 Input data:

-

2.4 Operational requirements (including computer requirements):

Appropriate drought-resistant vegetation, fodder plants and trees, bitumen.

2.5 Validity, limits imposed by basic concept, constraints in application:

Nil.

3. VALIDATION/PROVEN USES

Methods used successfully in USSR.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify: Geographical Magazine No. 3

4.2 Details of Publication, Reports etc.
   o Name of Journal: Geographical Magazine No. 3
   o Name of Publishers: Geographical Society
   o Year of publication/Completion of project: 1977
   o Language(s) (E/F/S/R/Others): English
   o No. of pages: pp. 162-166
   o Other details, if any: -

4.3 Author: B.G. Rozanov

4.4 Address: -

4.5 Programme/Data/Information available on:
   o Punched Cards: -
   o Floppy Disc: -
   o Microfilm: -
   o Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
   B.G. Rozanov

5.2 Nature of assistance available: -
6. **REMARKS**
1. OBJECT OF METHOD

1.1 Objective:

To discuss case studies to demonstrate reclamation and prevention of waterlogging and salinisation due to irrigation.

Title:

Waterlogging and salinisation in irrigated semi-arid regions of NSW.

1.2 Key words:
(from the list)
Irrigation, Salinisation, Waterlogging, Land Reclamation, Desertification

Section: -
Chapter: -

1.3 Other potential key words:

-

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Measures of reclamation and prevention of waterlogging and salinisation in irrigated areas are shown.
2.2 **Description:**

This article describes the hydrology of the riverine plains of NSW, Australia and the influence of irrigation on waterlogging and salinisation, and discusses reclamation and preventive measures with reference to three case studies: Wakool Irrigation District/Tullakool Irrigation Area, the Curlwa Irrigation Area, and Mildura Weir. The necessity for sound drainage systems without adverse effect on water quality downstream is emphasized.

2.3 **Input data:**

Not applicable.

2.4 **Operational requirements (including computer requirements):**

A good drainage system is necessary.

2.5 **Validity, limits imposed by basic concept, constraints in application:**

Nil.

---

3. **VALIDATION/PROVEN USES**

Used under MAB - Australia Programme to show effects of irrigation on desertification.
4. REFERENCES

4.1 **Source** (Published literature/Project Report/Others) specify: Search 9(7)

4.2 **Details of Publication, Reports etc.**

   - **Name of Journal**: Search, Vol. 9, No. 7
   - **Name of Publishers**: -
   - **Year of publication/Completion of project**: 1978
   - **Language(s) (E/F/S/R/Others)**: -
   - **No. of pages**: pp. 273-275
   - **Other details, if any**: -

4.3 **Author**: S. Pels

4.4 **Address**: NSW Water Resources Commission, Sydney, Australia

4.5 **Programme/Data/Information available on**:

   - **Punched Cards**: -
   - **Floppy Disc**: -
   - **Microfilm**: -
   - **Others, specify**: -

5. **AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS**

5.1 **Contacts**:

   Consult the source (see 4.3).

5.2 **Nature of assistance available**:

   -
Cars/Desertification, Information Entry Format, p.4

6. **REMARKS**

-
1. **OBJECT OF METHOD**

1.1 **Objective:**

To serve as a tool for taking decisions on soil/water conservation techniques to be applied.

**Title:**

Rainfall erosion index in Uruguay (factor R in the universal soil loss equation).

1.2 **Key words:**

(from the list)
Rainfall Intensity, Soil Erosion, Soil Conservation

Section: -
Chapter: -

1.3 **Other potential key words:**

- 

2. **DESCRIPTION OF METHOD**

2.1 **Output** (expected results and accuracy):

Provisional rainfall erosion map of Uruguay.
2.2 Description:

The mean monthly, seasonal and annual values were calculated of erosion index (EI₃₀) for seven sites in Uruguay. It was found that the means for December, January, February and March were generally the highest. The map plotted using the values for Uruguay matches that of Argentina.

2.3 Input data:

See WMO Report WCP-41.

2.4 Operational requirements (including computer requirements):

See WMO Report WCP-41.

2.5 Validity, limits imposed by basic concept, constraints in application:

See WMO Report WCP-41.

3. VALIDATION/PROVEN USES

See WMO Report WCP-41.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:

4.2 Details of Publication, Reports etc.
   - Name of Journal:
   - Name of Publishers:
   - Year of publication/Completion of project: 1983
   - Language(s) (E/F/S/R/Others): Spanish
   - No. of pages: 40
   - Other details, if any:

4.3 Author: Pannone, J.C., Garcia, F., Rovira, L.A.

4.4 Address: División de Uso y Manejo del Agua, Ministerio de Ganadería, Agricultura y Pesca, Garzón 456, Montevideo, Uruguay

4.5 Programme/Data/Information available on:
   - Punched Cards:
   - Floppy Disc:
   - Microfilm:
   - Others, specify:

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

5.2 Nature of assistance available:
6. REMARKS

-
1. OBJECT OF METHOD

1.1 Objective:

To determine relative "dryness" or "moistness" of a given site (water balance) as a basis for determining suitability of the site for tree/shrub planting.

Title:

Determination of soil water balance using Thornthwaite/Penman and the Gausens methods.

1.2 Key words:
(from the list)
Evapotranspiration, Temperature, Rainfall, Arid Zones, Semi-arid Zones, Savannahs, Afforestation

Section: -
Chapter: -

1.3 Other potential key words:

Potential Evapotranspiration (E_t), Actual Evapotranspiration (E_a), Solar Energy

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Determination of relative intensity and length of the dry season.
2.2 Description:

Either of the two methods can be used to determine the relative dryness of a given site with a view to determining its suitability for tree/shrub planting. This information is crucial for determining what tree species are suitable for a given site and whatever water conservation methods or irrigation is necessary. These procedures are necessary for all Sudano-Saharan regions.

2.3 Input data:

Mean monthly rainfall, mean monthly temperature, mean monthly potential evapotranspiration, reflection coefficient.

2.4 Operational requirements (including computer requirements):

A standard weather station.

2.5 Validity, limits imposed by basic concept, constraints in application:

3. VALIDATION/PROVEN USES

Some application in savannas.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:
Tree Planting Practices in African savannas. FAO Forest
Development Paper No. 19, p.149

4.2 Details of Publication, Reports etc.

- Name of Journal: -
- Name of Publishers: -
- Year of publication/Completion of project: 1974
- Language(s) (E/F/S/R/Others): English
- No. of pages: 185
- Other details, if any: -

4.3 Author: FAO, Rome

4.4 Address: -

4.5 Programme/Data/Information available on:

- Punched Cards: -
- Floppy Disc: -
- Microfilm: -
- Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
FAO, Rome

5.2 Nature of assistance available:
-
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<td>04/14/89</td>
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1. **OBJECT OF METHOD**

1.1 **Objective:**

To develop method of protection of plants and livestock against adverse weather/frost and drought.

**Title:**

-

1.2 **Key words:**

(from the list)
Drought Assistance, Forage, Soil Moisture, Early Warnings

**Section:**

**Chapter:** Adverse Events

1.3 **Other potential key words:**

-

2. **DESCRIPTION OF METHOD**

2.1 **Output** (expected results and accuracy):

Maps of estimated soil moisture reserve normalized with climate based estimates.
2.2 **Description:**

Computer based monitoring system for soil moisture reserve.

2.3 **Input data:**

Maximum and minimum daily temperatures, daily precipitation, and estimated potential evapotranspiration (for current and 30-year historical data).

2.4 **Operational requirements (including computer requirements):**

Mini or mainframe computer required to run model. Daily soil moisture budget model (*versatile soil moisture budget model* - version 3).

2.5 **Validity, limits imposed by basic concept, constraints in application:**

Validity depends on weather data - all estimates are relative. Limits imposed - all estimates are based on one theoretical soil type and one crop. Constraints - need for more weather data.

---

3. **VALIDATION/PROVEN USES**

Has had 5 years of operational use for drought assistance decision making and the beef industry in the Praire Provinces.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:
Published literature - Monitoring Drought for Grazing Land Management.

4.2 Details of Publication, Reports etc.

- Name of Publishers: -
- Year of publication/Completion of project: 1984
- Language(s) (E/F/S/R/Others): English
- No. of pages: 3
- Other details, if any: -

4.3 Author: Jim Dyer

4.4 Address: Soil and Climate Section, Crop Development Div., Agricultural Development Br. - CDA-Rm. 535, Sir John Carling Bldg., C.E.F., Ott., Ont. K1A 0C5

4.5 Programme/Data/Information available on:

- Punched Cards: -
- Floppy Disc: -
- Microfilm: -
- Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

Jim Dyer, Soil and Climate Section, Crop Development Div., Agricultural Development Br. - CDA-Rm. 535, Sir John Carling Bldg., C.E.F., Ott., Ont. K1A 0C5

5.2 Nature of assistance available:

Consultation, background papers, system documentation in preparation.
6. REMARKS

Additional references:


1. OBJECT OF METHOD

1.1 Objective:

To forecast in early May and early June, seasonal rain (June-September) in the Sahel area of Africa using analyses of sea surface temperature in the previous few months. Both regression and discriminate analysis techniques are used.

Title:

Seasonal rainfall forecast model.

1.2 Key words:
(from the list)
Drought, Rain Totals, Semi-arid, Regression

Section: -
Chapter: -

1.3 Other potential key words:
Forecast, Discriminate Analysis

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Forecasts of total seasonal rainfall for whole area (Nicholson's Sahel time series).
2.2 Description:

The method is based upon the relationship between Sahel rainfall and configurations of monthly averaged sea surface temperature anomalies on a near global scale. The sea surface temperature fields are maintained up to date in the Meteorological Office and are expressed in terms of eigenvectors which have been determined from historical SST data. The current eigenvector time series coefficients are inserted into linear stepwise regression and linear stepwise discriminant function equations which respectively yield a forecast of Sahel rainfall or the probability of the seasons rainfall falling in each of 5 climatologically equally-possible classes (very dry, dry, normal, wet, very wet).

2.3 Input data:

Eigenvector coefficients representing monthly average sea surface temperature fields for the previous few months.

2.4 Operational requirements (including computer requirements):

Large computers to calculate eigenvector coefficients and put them into the formulae. Complex data handling and large programmes. Current sea surface temperature analyses.

2.5 Validity limits imposed by basic concept, constraints in application:

The System has only been developed for total Sahel rainfall and for the northern Nordeste region of Brazil, although systems could be developed for other tropical areas if suitable homogenous rainfall time series were available.

3. VALIDATION/PROVEN USES

Data was broken into two periods 1901-1945, 1945-1986 and formulae developed for each period. The formulae were then tested on the other period. Also forecasts were issued for seasons 1986, 1987 and 1988 before the event.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:
Published Literature - Sea Surface Temperature Anomaly Patterns
and Prediction of Seasonal Rainfall in the Sahel Region of

4.2 Details of Publication, Reports etc.

   o Name_of_Journal: -

   o Name_of_Publishers: Belhaven Press (Ed. S. Gregory)

   o Year_of_publication/Completion_of_project: 1988/1989 (May and
     June)

   o Language(s) (E/F/S/R/Others): English

   o No_of_pages: -

   o Other_details, if any: -

4.3 Author: Parker, D.E., Folland C.K. and Ward, M.N.

4.4 Address: Meteorological Office (Met 0 13), London Road,
     Bracknell, Berks RG12 2JU, U.K.

4.5 Programme/Data/Information available on:

   o Punched Cards: -

   o Floppy_Disc: -

   o Microfilm: -

   o Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

   The Assistant Director for Synoptic Climatology (AD Met 0(SC),
   Meteorological Office (Met 0 13), London Road, Bracknell, Berks,
   RG12 2JU, U.K. (or M.N. Ward at same address)

5.2 Nature of assistance available:

   Receipt of forecasts when issued (usually May and June).
Remarks

1. OBJECT OF METHOD

1.1 Objective:

To quantify soil loss by water under different environmental conditions.

Title:

Soil Water Erosion Model.

1.2 Key words:
(from the list)

Section: -
Chapter: -

1.3 Other potential key words:

-

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Daily or monthly soil water loss under different conditions. Need calibration with field result.
2.2 **Description:**

The model estimates surface - run-off and consequently soil water erosion by the use of daily climatic data and soil characteristics.

2.3 **Input data:**

Meteorological: rainfall, humidity, temperature, wind, sunshine and solar radiation. Soil: type, slope, water capacity, run-off curve no., land use, drainage co-efficient.

2.4 **Operational requirements** (including computer requirements):

IBM - Pc (AT) is required for applications.

2.5 **Validity, limits imposed by basic concept, constraints in application:**

Availability of daily climatic data and actual soil characteristics.

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3. **VALIDATION/PROVEN USES**

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4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify: 
ACSAD / CS/R- 57

4.2 Details of Publication, Reports etc.

- Name of Journal: -
- Name of Publishers: ACSAD
- Year of publication/Completion of project: 1987
- Language(s) (E/F/S/R/Others): English
- No. of pages: 20
- Other details, if any: -

4.3 Author: Y. El-Kawasma

4.4 Address: ACSAD, P.O. Box 2440, Damascus, Syria

4.5 Programme/Data/Information available on:

- Punched Cards: -
- Floppy Disc: -
- Microfilm: -
- Others, specify: Document

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

Y. El-Kawasma, ACSAD, P.O. Box 2440, Damascus, Syria

5.2 Nature of assistance available:

Copies of document - free of charge.
Cars/Desertification, Information Entry Format, p.4

6. **REMARKS**

-
1. OBJECT OF METHOD

1.1 Objective:

Estimate of the different components of the soil water balance under semi-arid conditions.

Title:

Agro-Hydro - Climatic Water Balance Model.

1.2 Key words:
(from the list)
Water Balance, Evapotranspiration, Soil Water, Rain Intensity, Soil - Run-off

Section: -
Chapter: -

1.3 Other potential key words:

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Soil moisture of different zones, drainage, run-off, evapotranspiration under different slopes and land use systems.
2.2 Description:

Using the climatic and soil data the model estimates daily values of the water balance components for different conditions of soil (type, slope, etc.).

2.3 Input data:

1) Climatic: rain, humidity, temperature, energy, etc.
2) Soil: type, slope, water characteristics, land use, etc.

2.4 Operational requirements (including computer requirements):

IBM - Pc (AT) computer.

2.5 Validity, limits imposed by basic concept, constraints in application:

Non availability of actual soil data.

3. VALIDATION/PROVEN USES
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify: ACSAD/CS/R-54

4.2 Details of Publication, Reports etc.
  o Name of Journal: -
  o Name of Publishers: ACSAD
  o Year of publication/Completion of project: 1986
  o Language(s) (E/P/S/R/Others): English
  o No. of pages: 56
  o Other details, if any: -

4.3 Author: Y. El-Kawasma

4.4 Address: ACSAD, P.O. Box 2440, Damascus, Syria

4.5 Programme/Data/Information available on:
  o Punched Cards: -
  o Floppy Disc: -
  o Microfilm: -
  o Others, specify: Document

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
  Y. El-Kawasma, ACSAD, P.O. Box 2440, Damascus, Syria

5.2 Nature of assistance available:
  Copies of document - free of charge.
Cars/Desertification, Information Entry Format, p.4

6. **REMARKS**

   -
1. **OBJECT OF METHOD**

1.1 **Objective:**

Estimation of Crop Water Need During the Life Cycle under Arid and Semi-arid Conditions.

**Title:**

Crop Water Requirement Model in ACSAD.

1.2 **Key words:**

(from the list)

Semi-Arid, Water Balance, Water Stress, Evapotranspiration, Irrigation Drainage, Start of Season

Section: -

Chapter: -

1.3 **Other potential key words:**

Crop Coefficient, Root Depth

2. **DESCRIPTION OF METHOD**

2.1 **Output (expected results and accuracy):**

The monthly values of irrigation need to avoid stress in arid and semi-arid conditions for about 15 crops.
2.2 Description:

The model uses climatic data as well as soil and crop data to estimate the water needed for irrigation to avoid any stress during the life cycle of the crop.

2.3 Input data:

1) Climatic: rainfall, temperature, humidity, wind, sunshine, solar radiation. 2) Soil: structure, texture, water capacity. 3) Crop: root depth, crop coefficient. 4) Other: field size, quality of water.

2.4 Operational requirements (including computer requirements):

IBM - Pc (AT) computer.

2.5 Validity, limits imposed by basic concept, constraints in application:

Validity: non availability of data.

3. VALIDATION/PROVEN USES

-
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify: ACSAD /CS/ R-58

4.2 Details of Publication, Reports etc.

   o Name of Journal: -
   o Name of Publishers: ACSAD
   o Year of publication/Completion of project: 1987
   o Language(s) (E/F/S/R/Others): English
   o No. of pages: 29
   o Other details, if any: -

4.3 Author: Y. El-Kawasma

4.4 Address: ACSAD, P.O. Box 2440, Damascus, Syria

4.5 Programme/Data/Information available on:

   o Punched Cards: -
   o Floppy Disc: -
   o Microfilm: -
   o Others, specify: Document

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

   Y. El-Kawasma, ACSAD, P.O. Box 2440, Damascus, Syria

5.2 Nature of assistance available:

   Copies of document - free of charge.
6. **REMARKS**

-
CARS entry no. 0010  Date of entry 04/18/89  Last updated 00/00/00
m d y        m d y

1. OBJECT OF METHOD

1.1 Objective:

To improve the establishment, maintenance and productivity of
new and native drought-tolerant or drought-adaptable plants in
arid and semi-arid regions under limited water supply through
proper soil and water management and conservation practices.

Title:

Soil-water-plant relationships of drought-tolerant crops in arid
environment.

1.2 Key words:
(from the list)
Drought, Water Requirements, Arid Zones, Erosion,
Irrigation, Evapotranspiration, Desertification, Water Stress

Section: -
Chapter: -

1.3 Other potential key words:

-

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Determination of water requirements and stress behaviour of arid
zone crops so that irrigation scheduling and drought tolerance
of plants can be better understood.
Cars/Desertification, Information Entry Format, p.2

2.2 **Description:**

A variety of plants will be cultivated under drought and more favourable water conditions by controlling supply of natural and supplemental water (trickle method). Physiological factors such as plant-water stress will be monitored using various techniques and then related to survival, growth, yield, and soil water regime.

2.3 **Input data:**

Rainfall and irrigation water supply; plant water stress.

2.4 **Operational requirements (including computer requirements):**

A trickle irrigation technique, psychometric, biochemical, leaf water content, pressure potential or infra-red thermometric techniques for monitoring plant water stress.

2.5 **Validity, limits imposed by basic concept, constraints in application:**

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3. **VALIDATION/PROVEN USES**

Still in investigation state.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:  

4.2 Details of Publication, Reports etc.

- Name of Journal: -
- Name of Publishers: USDA-ARS Irrigation and Hydraulic Research  
- Year of publication/Completion of project: -
- Language(s) (E/F/S/R/Others): English  
- No. of pages: Not provided  
- Other details, if any: -

4.3 Author: Fink, D.H., Ehrler, N.L.

4.4 Address: USDA-ARS Irrigation and Hydraulic Res., 4311E Broadway,  
Phoenix ARZ, USA

4.5 Programme/Data/Information available on:

- Punched Cards: -
- Floppy Disc: -
- Microfilm: -
- Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

Fink, D.H., Ehrler, N.L., USDA-ARS Irrigation and Hydraulic Research, 4311 Broadway, Phoenix ARZ, USA

5.2 Nature of assistance available:

Description of the techniques given in 2.4 can be obtained from  
the USDA-ARS Irrigation and Hydraulic Research, through the  
Investigators (Fink, D.H., Ehrler, N.L.)
6. **REMARKS**

-
1. OBJECT OF METHOD

1.1 Objective:
To examine the effects of two summer drought episodes in the Canadian prairies in 1961 and 1967 and their social, economic and political impacts of society.

Title:
Nature and possible causes of drought in the Canadian Prairies - case studies.

1.2 Key words:
(from the list)
Drought, Climate Studies.

Section: -  
Chapter: - 

1.3 Other potential key words:
Synoptic Climatology, Drought Forecasting

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):
Causes of drought incidence in the Prairies.
2.2 **Description:**

A synoptic climatological study of three cases was made of the weather systems in Canada. It was found that drought occurred when a mid-tropospheric ridge persists over western Canada. It was also found that quasi-stationary mid-tropospheric ridge over W. Canada acted as a block which displaced the stream of cyclones and moist air masses to the north while anticyclonic circulation under the high pressure ridge gave atmospheric stability and dry conditions on the Prairies.

2.3 **Input data:**

Daily precipitation data, monthly mean data of temperature and relative humidity.

2.4 **Operational requirements** (including computer requirements):

Computer facilities needed to analyse the mass of data.

2.5 **Validity, limits imposed by basic concept, constraints in application:**

Results limited to Prairies only; but techniques can be extended to other regions.

3. **VALIDATION/PROVEN USES**
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify: Journal of Climatology.

4.2 Details of Publication, Reports etc.
   o Name of Journal: Journal of Climatology
   o Name of Publishers: -
   o Year of publication/Completion of project: 1982
   o Language(s) (E/F/S/R/Others): English
   o No. of pages: pp. 233-249
   o Other details, if any: -

4.3 Author: B. Dey

4.4 Address: Dept. of Geology and Geography, Howard University, Washington, D.C. 20059, USA

4.5 Programme/Data/Information available on:
   o Punched Cards: -
   o Floppy Disc: -
   o Microfilm: -
   o Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
   B. Dey, Dept. of Geology and Geography, Howard University, Washington, D.C. 20059, USA

5.2 Nature of assistance available:
   -
6. **REMARKS**
1. **OBJECTIVE OF METHOD**

1.1 **Objective:**

To seek strategies that improve productivity and re-establish vegetation in degraded chaparral-desert ecotones of Arizona and S. California.

**Title:**

Plant characteristics to reverse desertification and increase production in semi-arid lands.

1.2 **Key words:**

(from the list)

- Semi-Arid
- Desertification
- Soil Moisture
- Water Balance
- Grazing
- Microclimate

**Section:** -

**Chapter:** -

1.3 **Other potential key words:**

Revegetation, Productivity

2. **DESCRIPTION OF METHOD**

2.1 **Output** (expected results and accuracy):

To find plant species that, due to their water and heat relations, can act as nurse crop for regenerating chaparral species; water use and grazing will be evaluated versus interactions of biomass, canopy cover, micro-climate and water balance that lead to vegetation changes.
2.2 Description:

Measurement of effect of varying canopy cover on soil evaporation and soil moisture under chaparral shrubs of low leaf conductance, and then follow seasonal progression of leaf conductance and plant water potential at 4 chaparral sites at regular intervals. The effect of temperature on regeneration techniques in greenhouse, lath-house and chamber is then studied to determine which species are appropriate to which area.

2.3 Input data:

Canopy cover, soil evaporation and moisture, air temperature, rate of grazing, plant water status and leaf age in the computer model.

2.4 Operational requirements (including computer requirements):

Greenhouse, lath-house and growth chambers as well as computer facilities.

2.5 Validity, limits imposed by basic concept, constraints in application:

-

3. VALIDATION/PROVEN USES

4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify: Project No. UTA 00778.

4.2 Details of Publication, Reports etc.
   o Name of Journal: -
   o Name of Publishers: Utah State University, Logan, Utah, USA
   o Year of publication/Completion of project: -
   o Language(s) (E/F/S/R/Others): English
   o No. of pages: -
   o Other details, if any: -

4.3 Author:

4.4 Address: Utah State University, Logan, Utah, USA

4.5 Programme/Data/Information available on:
   o Punched Cards: -
   o Floppy Disc: -
   o Microfilm: -
   o Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
   -

5.2 Nature of assistance available:
   -
Cars/Desertification, Information Entry Format, p.4

6. **REMARKS**

-
1. **OBJECT OF METHOD**

1.1 **Objective:**

To study land degradation in a semi-arid area under different farming systems, depending on rainfall climate.

**Title:**

Efficient utilisation of climate resources for rainfed agriculture in Southern Israel.

1.2 **Key words:**

(from the list)

Land Degradation, Yield Simulation

**Section:** Analysis

**Chapter:** Agroclimatic Concepts

1.3 **Other potential key words:**

Rainfed Agriculture

2. **DESCRIPTION OF METHOD**

2.1 **Output (expected results and accuracy):**

Method for estimating land degradation in arid areas using rainfall data.
2.2 Description:

Statistical analysis of the relationship between wheat, hay and sorghum yields and annual rainfall amounts under different temperature regimes.

2.3 Input data:

Annual temperature averages and rainfall amounts.

2.4 Operational requirements (including computer requirements):

Desk top calculators and computers can be used but not too essential.

2.5 Validity, limits imposed by basic concept, constraints in application:

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3. VALIDATION/PROVEN USES

Method valid for arid zones.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:

4.2 Details of Publication, Reports etc.
   o Name of Journal: -
   o Name of Publishers: Israeli Meteorological Service
   o Year of publication/Completion of project: -
   o Language(s) (E/F/S/R/Others): English
   o No. of pages: -
   o Other details, if any: -

4.3 Author: J. Lomas

4.4 Address: Deputy Director of Israeli Meteorological Service,
            Ministry of Transport, P.O. Box 25, Bet Dagan, Israel

4.5 Programme/Data/Information available on:
   o Punched Cards: -
   o Floppy Disc: -
   o Microfilm: -
   o Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
   J. Lomas, Deputy Director of Israeli Meteorological Service,
   Ministry of Transport, P.O. Box 25, Bet Dagan, Israel

5.2 Nature of assistance available:
        Copies of publication obtainable from Author.
6. REMARKS

-
1. OBJECT OF METHOD

1.1 Objective:

To assess and identify processes of land degradation by agricultural practices.

Title:

An assessment of the degradation of agricultural lands in Canada

1.2 Key words:

(from the list)

Erosion, Land Degradation, Salinisation, Agricultural Operations, Fertilisation

Section: -

Chapter: -

1.3 Other potential key words:

-

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

To determine suitable preventive measures to combat land degradation by adverse agricultural practices.
2.2 Description:

Various processes of land degradation and desertification are identified, viz. soil erosion, salinisation and acidification, damage to soil structure and fertility as a result of tillage and contamination by fertiliser residues; and possible preventive measures or practices are proposed.

2.3 Input data:

Measurements of erosivity and salinisation and other chemicals in the soil.

2.4 Operational requirements (including computer requirements):

Facilities for laboratory analysis, tillage and other agricultural machinery, fertilisers.

2.5 Validity, limits imposed by basic concept, constraints in application:

Constraints are due mainly to visual observations of the land and long-term effects of adverse agricultural practices. Experiments therefore are of a long duration.

3. VALIDATION/PROVEN USES
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify: Contribution No. 118, 1982-2E. Agriculture Canada Research Branch.

4.2 Details of Publication, Reports etc.

- Name of Journal: -

- Name of Publishers: Agriculture Canada Research Branch

- Year of publication/Completion of project: 1981

- Language(s) (E/F/S/R/Others): English

- No. of pages: -

- Other details, if any: -

4.3 Author: Coote, D.R., J. Dumaski, and J.F. Ramsey

4.4 Address: Land Resource Research Institute, Ottawa, Canada

4.5 Programme/Data/Information available on:

- Punched Cards: -
- Floppy Disc: -
- Microfilm: -
- Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

Land Resource Research Institute, Ottawa, Canada

5.2 Nature of assistance available:

-
6. REMARKS

-
1. OBJECT OF METHOD

1.1 Objective:

To determine rate of expansion of desertic conditions in NW India.

Title:

Climatic changes relating to desertification in the arid zone of North-West India.

1.2 Key words:
(from the list)
Rainfall, Desertification, Climate Change, Duststorms

Section: -
Chapter: -

1.3 Other potential key words:
- 

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Mean aridity index computed for all districts of Western Rajasthan during decades from 1901 to 1970. During this time, the index line shifted gradually eastward, indicating that desertic conditions are extending toward the east, particularly in the southern region.
2.2 Description:

Annual rainfall data (1891 to 1975) for arid districts of NW India were analysed to determine whether there has been any significant change in rainfall in recent decades. For most of the 9 stations where measurements were taken, a general decrease in rainfall occurred from 1956 to 1969, followed by an increase to the present. During the period of decreasing rainfall and the subsequent year or two, the incidence of dust storms rose significantly and thus contributed to erosion and desertification processes.

2.3 Input data:

Annual rainfall data from the years 1891 to 1975 for arid districts of northwestern India.

2.4 Operational requirements (including computer requirements):

Computer facilities desirable.

2.5 Validity, limits imposed by basic concept, constraints in application:

No limitations.

3. VALIDATION/PROVEN USES

Used in India to prove extension of desert conditions.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:
Annals of Arid Zone 1977, Vol. 16, No. 3

4.2 Details of Publication, Reports etc.
   o Name of Journal: Annals of Arid Zone 1977, Vol. 16, No. 3
   o Name of Publishers: -
   o Year of publication/Completion of project: 1977
   o Language(s) (E/F/S/R/Others): English
   o No. of pages: pp. 302-309
   o Other details, if any: -

4.3 Author: A. Krishnan

4.4 Address: Central Arid Zone Res. Inst., Jodhpur, Rajasthan, India

4.5 Programme/Data/Information available on:
   o Punched Cards: -
   o Floppy Disc: -
   o Microfilm: -
   o Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
   A. Krishnan, Central Arid Zone Res. Inst., Jodhpur, Rajasthan, India

5.2 Nature of assistance available: -
6. REMARKS

-
1. OBJECT OF METHOD

1.1 Objective:

Integrate soil, climate, economics, land use, crop yield and yield potential information for the Canadian prairies region (including semi and sub-arid climatic zones) to make interpretations relevant to potential for crop diversification (land flexibility), land use adjustment, management practices and long term sustainability.

Title:

Prairie regional land evaluation.

1.2 Key words:
(from the list)
Climatic, Classification, Remote Sensing, Land Degradation

Section: -
Chapter: -

1.3 Other potential key words:

Production Potential, Diversification, Land Use Adjustment, Soil Moisture Characterization, Climatic Risk Analysis, Aridity Indices, Physical Land Flexibility, Economic Analyses

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Determination of physical (soil & climatic) resources and their application to crop production models, to assess yield potentials, potential for crop diversification, land use adjustments, and economic analyses of production systems in the Canadian prairie region including semi and sub-arid climatic zones.
2.2 Description:

Long term daily and normal climatic data will be integrated with soils, land use, farming system classification, crop yield data at a scale of 1:2 million for agroecological resource areas defined on the basis of soil, climate and physiographic characteristics. Data will be applied to models to simulate soil moisture, crop production risks, yield potentials, degradation risk, and various derived climatic indices. Land use data will be evaluated in relation to physical and economic factors.

2.3 Input data:

Long term daily weather (temperature, precipitation, and PE) and monthly normal climatic data (temperature, precipitation, wind, solar radiation, vapour pressure, potential evapotranspiration. Soil texture, drainage, depth, water holding capacity, organic matter, horizon data and other soil physical/chemical characteristics and landscape data.

2.4 Operational requirements (including computer requirements):

Computer facilities to store, analyze, display data over time and space. ARC/INFO will be used as a geographic information system to carry out spatial analyses. A Relational Data Base Management System (DBMS) is needed to relate information in various computer files.

2.5 Validity, limits imposed by basic concept, constraints in application:

Scale requires some level of generalization. Crop production and land use practices are also influenced by socio/economic and political factors.

3. VALIDATION/PROVEN USES

A preliminary study of the prairie region integrating soils, climate and land use information has been completed at 1:5 million scale and results are in press. 1:2 million scale analyses are on-going under existing project.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:
(Project 87-4, Land Resource Research Centre (see 6 below)

4.2 Details of Publication. Reports etc.

- Name of Publishers: Agric. Canada, Res. Branch
- Year of publication/Completion of project: 1988
- Language(s) (E/F/S/R/Others): English
- No. of pages: 12
- Other details, if any: -

4.3 Author: Dumanski J., Bootsma A., de Jong R., Huffman E., MacDonal, B., et al.

4.4 Address: Agriculture Canada, Land Resource Research Centre,
Central Experimental Farm, Ottawa, Ont., Canada K1A OC6

4.5 Programme/Data/Information available on:
- Punched Cards: -
- Floppy Disc: -
- Microfilm: -
- Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
Dumanski J., Bootsma A., de Jong R., Huffman E., MacDonal, B.,
et al.

5.2 Nature of assistance available:
Source of additional information, methodologies, project results.
6. **REMARKS**

CARS/Desertification INFORMATION ENTRY FORMAT

CARS entry no. 0017 Date of entry 03/15/89 Last updated 00/00/00

1. OBJECT OF METHOD

1.1 Objective:

To increase farming efficiency in sloped farm land.

Title:

Integrated soil improvement in sloped farm land.

1.2 Key words:
(from the list)
Deforestation, Land Reclamation, Land Degradation, Soil Loss

Section: -
Chapter: -

1.3 Other potential key words:

Soil Survey, Soil Development, Conservation

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Detailed information on practical means to change physico-chemical properties of soil that could improve crop yield of a given sloped land area.
2.2 Description:

Sloped soils are the major target of land reclamation to increase the arable land area in Korea. Root zone was extended and crop yields were increased by soil physical improvements, such as chiseling, trenching and vertical mulching. The chemical improvement of compost addition enhanced crop yield better than liming, or phosphate addition did.

2.3 Input data:


2.4 Operational requirements (including computer requirements):

Computer facilities, zoning data of sloped land by soil physical and chemical properties, tractor and subsoiling equipments.

2.5 Validity, limits imposed by basic concept, constraints in application:

3. VALIDATION/PROVEN USES

Still in investigation stage.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:
Proceedings of Korea-China Bilateral Symposium on Reclamation
and Soil Conservation of Sloped Farm Land, 18-24 August 1986

4.2 Details of Publication, Reports etc.

- Name of Journal: -
- Name of Publishers: -
- Year of publication/Completion of project: 1986
- Language(s) (E/F/S/R/Others): English/Korean
- No. of pages: 18 (pp.149-166)
- Other details, if any: -

4.3 Author: In-Sang Jo

4.4 Address: Soil Survey and Physics Division, ASI, RDA, Republic of
Korea

4.5 Programme/Data/Information available on:

- Punched Cards: -
- Floppy Disc: -
- Microfilm: -
- Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
Contact author

5.2 Nature of assistance available:
-
6. **REMARKS**
1. OBJECT OF METHOD

1.1 Objective:

To determine appropriate designs and benefits from shelterbelts planted for soil erosion control on the Canadian Prairies.

Title:

Shelterbelts Effects on the Canadian Prairies.

1.2 Key words:
(from the list)
Shelterbelts, Erosion, Designs

Section: -
Chapter: -

1.3 Other potential key words:

-

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):

Study results are summarized in an annual report, brochures, bulletins, newsletters, or through presentations, concerning shelterbelt effects on wind, wind erosion, crop yields, snow distribution as well as concerning shelterbelt design and management. Other uses of trees are also investigated.
2.2 **Description:**

A programme of shelterbelt studies is conducted by the Investigations Section of the PFRA (Agriculture Canada) Shelterbelt Centre across Saskatchewan and Manitoba.

2.3 **Input data:**

Data is collected and analyzed according to accepted scientific and experimental principles.

2.4 **Operational requirements (including computer requirements):**

Data is collected with specialized scientific instrumentation, and dataloggers and is analyzed by microcomputer.

2.5 **Validity, limits imposed by basic concept, constraints in application:**

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3. **VALIDATION/PROVEN USES**

Results are used to improve shelterbelt design as well as to inform farmers and agricultural professionals about shelterbelts benefits.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify: Shelterbelt Studies, 1986 Report, PFRA Tree Nursery.

4.2 Details of Publication, Reports etc.

 o Name_of_Journal: -

 o Name_of_Publishers: Investigations Section, PFRA Shelterbelt Centre

 o Year_of_publication/Completion_of_project: 1986

 o Language(s) (E/F/S/R/Others): English

 o No_of_pages: 8 (pp.35-43)

 o Other_details, if any: -

4.3 Author: J. Kort

4.4 Address: Investigation Section, PFRA Shelterbelt Centre, Indian Head, Saskatchewan, Canada S0G 2K0

4.5 Programme/Data/Information available on:

 o Punched_Cards: -

 o Floppy_Disc: -

 o Microfilm: -

 o Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

 Mr. J. Kort, Shelterbelt Biologist, Investigations Section, PFRA Shelterbelt Centre, Indian Head, Saskatchewan, Canada S0G 2K0. (Phone (306) 695-2284)

5.2 Nature_of_assistance_available:

 Information.
6. REMARKS
1. **OBJECT OF METHOD**
   
   1.1 **Objective:**
   
   Characterize Canadian/North American drought by its frequency, intensity, geographic extent, and geographic movement.

   **Title:**
   
   Drought Characterization.

   1.2 **Key words:** (from the list)
   
   -

   **Section:** -
   
   **Chapter:** -

   1.3 **Other potential key words:**
   
   Drought, Frequency Analysis

2. **DESCRIPTION OF METHOD**

   2.1 **Output (expected results and accuracy):**

   Comprehensive climatological characterization of Canadian and nearby American areas' drought patterns using largely statistical methods. Frequency/intensity analysis method applicable to droughts. Drought indices and monitoring techniques.
2.2 Description:

Development of a comprehensive digital database of meteorological and meteorologically derived parameters of relevance to drought, potentially as part of a geographic information system.

2.3 Input data:

Daily precipitation and temperature values from the climatological station network.

2.4 Operational requirements (including computer requirements):

Will utilize IBM AT microcomputer.

2.5 Validity, limits imposed by basic concept, constraints in application:

Outputs will be for Canada and nearby land areas. Analysis concepts will likely be applicable anywhere.

3. VALIDATION/PROVEN USES

Project just commencing in 1988 so no validation yet performed.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify: Hydroclimatology Section, National Hydrology Research Centre, Saskatoon, Saskatchewan, Canada

4.2 Details of Publication, Reports etc.

- Name of Journal: 

- Name of Publishers: Hydroclimatology Section, National Hydrology Research Centre

- Year of publication/Completion of project: 

- Language(s) (E/P/S/R/Others): English

- No. of pages: 

- Other details, if any: 

4.3 Author: D.J. Bauer and L.E. Welsh

4.4 Address: Hydrometeorological Research Division, National Hydrology Research Centre, 11 Innovation Boulevard, Saskatoon, Saskatchewan, Canada S7N 3H5

4.5 Programme/Data/Information available on:

- Punched Cards: 

- Floppy Disc: 

- Microfilm: 

- Others, specify: 

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

D.J. Bauer and L.E. Welsh, Hydroclimatology Section, National Hydrology Research Centre, 11 Innovation Boulevard, Saskatoon, Saskatchewan, Canada S7N 3H5. [Phone (306) 975-5688]

5.2 Nature of assistance available:

Initial consultation as to plans and concepts. Extensive assistance may be available subject to cost recovery.
6. REMARKS
OBJECT OF METHOD

1.1 Objective:
To predict dry (and wet) periods one or more months in advance.

Title:
Prairie Drought Prediction.

1.2 Key words:
(from the list)

Section: -
Chapter: -

1.3 Other potential key words:
Drought Prediction, Atmospheric Circulation Anomalies, Teleconnections

DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):
A statistical likelihood of significant anomalous precipitation. Accuracy currently unknown but anticipated to be generally marginal except possibly after the onset of special configurations of hemispheric upper atmospheric flow patterns.
2.2 Description:

The forecast method will relate northern hemispheric flow patterns to Prairie dry/wet periods via teleconnections.

2.3 Input data:

Digital 20 year database of monthly average hemispheric 50 kPa heights and 100-50 kPa thicknesses is needed to derive regional/hemispheric teleconnection climatology. Digital near real-time hemispheric monthly average height and thickness anomalies needed for operational forecast production if implemented.

2.4 Operational requirements (including computer requirements):

Currently implemented on an IBM clone mainframe computer (AMDAHL NAS/9060), but could be adapted to any computer with graphics output devices and a method of hemispheric data importation (tape drives, telecommunication download, etc.)

2.5 Validity, limits imposed by basic concept, constraints in application:

The method will be applicable to the Canadian Prairie (if it works at all significantly), but the concept could be applied to other temperate regions with significant development work. Accuracy is expected to be marginal generally, but might be significantly higher for certain hemispheric flow situations where teleconnections between Prairie dry/wet spells and general circulation anomalies are greater.

3. VALIDATION/PROVEN USES

Validation has yet to be completed.
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:
Hydrometeorological Research Division, National Hydrology Research Centre

4.2 Details of Publication, Reports etc.
  o Name of Journal: -
  o Name of Publishers: -
  o Year of publication/Completion of project: As yet unpublished.
  o Language(s) (E/F/S/R/Others): English
  o No. of pages: -
  o Other details, if any: -

4.3 Author: R.G. Lawford and J. Knox

4.4 Address: Hydrometeorological Research Division, National Hydrology Research Centre, 11 Innovation Boulevard, Saskatoon, Saskatchewan, Canada S7N 3H5

4.5 Programme/Data/Information available on:
  o Punched Cards: -
  o Floppy Disc: -
  o Microfilm: -
  o Others, specify: -

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:
R.G. Lawford, Chief, Hydrometeorological Research Division, National Hydrology Research Centre, 11 Innovation Boulevard, Saskatoon, Saskatchewan, Canada S7N 3H5. [Tel: (306) 975-5775)]

5.2 Nature of assistance available:
Initial consultation as to nature, use and applicability of method. Extensive assistance may be available on a cost-recoverable basis.
6. **REMARKS**

-
CARS entry no. | Date of entry / / m d y | Last updated / / m d y
--- | --- | ---
1. | OBJECT OF METHOD | 1.1 Objective: |

Title:

1.2 Key words: (from the list)

Section: -

Chapter: -

1.3 Other potential key words:

---

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):
2.2 Description:

2.3 Input data:

2.4 Operational requirements (including computer requirements):

2.5 Validity, limits imposed by basic concept, constraints in application:

3. VALIDATION/PROVEN USES
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:

4.2 Details of Publication, Reports etc.
   - Name of Journal:
   - Name of Publishers:
   - Year of publication/Completion of project:
   - Language(s) (E/F/S/R/Others):
   - No. of pages:
   - Other details, if any:

4.3 Author:

4.4 Address:

4.5 Programme/Data/Information available on:
   - Punched Cards:
   - Floppy Disc:
   - Microfilm:
   - Others, specify:

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

5.2 Nature of assistance available:
Cars/Desertification, Information Entry Format, p.4

6. **REMARKS**
CARS/Desertification INFORMATION ENTRY FORMAT

CARS entry no. Date of entry / / Last updated / / m d y m d y

1. OBJECT OF METHOD

1.1 Objective:

Title:

1.2 Key words:
(from the list)

Section: -
Chapter: -

1.3 Other potential key words:

2. DESCRIPTION OF METHOD

2.1 Output (expected results and accuracy):
2.2 Description:

2.3 Input data:

2.4 Operational requirements (including computer requirements):

2.5 Validity, limits imposed by basic concept, constraints in application:

3. VALIDATION/PROVEN USES
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:

4.2 Details of Publication, Reports etc.
   o Name_of_Journal:
   o Name_of_Publishers:
   o Year_of_publication/Completion_of_project:
   o Language(s) (E/F/S/R/Others):
   o No_of_pages:
   o Other_details, if any:

4.3 Author:

4.4 Address:

4.5 Programme/Data/Information available on:
   o Punched_Cards:
   o Floppy_Disc:
   o Microfilm:
   o Others, specify:

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

5.2 Nature_of_assistance_available:
6. **REMARKS**
1. **OBJECT OF METHOD**
   
   1.1 **Objective:**

   **Title:**

   1.2 **Key words:**
   (from the list)

   **Section:** –
   **Chapter:** –

   1.3 **Other potential key words:**

2. **DESCRIPTION OF METHOD**

2.1 **Output** (expected results and accuracy):
2.2 Description:

2.3 Input data:

2.4 Operational requirements (including computer requirements):

2.5 Validity, limits imposed by basic concept, constraints in application:

3. VALIDATION/PROVEN USES
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:

4.2 Details of Publication, Reports etc.

   o Name of Journal:
   o Name of Publishers:
   o Year of publication/Completion of project:
   o Language(s) (E/F/S/R/Others):
   o No. of pages:
   o Other details, if any:

4.3 Author:

4.4 Address:

4.5 Programme/Data/Information available on:

   o Punched Cards:
   o Floppy Disc:
   o Microfilm:
   o Others, specify:

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

5.2 Nature of assistance available:
6. REMARKS
1. **OBJECT OF METHOD**

1.1 **Objective:**

**Title:**

1.2 **Key words:**

(from the list)

**Section:** -

**Chapter:** -

1.3 **Other potential key words:**

2. **DESCRIPTION OF METHOD**

2.1 **Output (expected results and accuracy):**
2.2 Description:

2.3 Input data:

2.4 Operational requirements (including computer requirements):

2.5 Validity, limits imposed by basic concept, constraints in application:

3. VALIDATION/PROVEN USES
4. REFERENCES

4.1 Source (Published literature/Project Report/Others) specify:

4.2 Details of Publication, Reports etc.
   o Name of Journal:
   o Name of Publishers:
   o Year of publication/Completion of project:
   o Language(s) (E/F/S/R/Others):
   o No. of pages:
   o Other details, if any:

4.3 Author:

4.4 Address:

4.5 Programme/Data/Information available on:
   o Punched Cards:
   o Floppy Disc:
   o Microfilm:
   o Others, specify:

5. AVAILABILITY/SOURCES OF ASSISTANCE FOR FUTURE USERS

5.1 Contacts:

5.2 Nature of assistance available:
6. **REMARKS**