THE DEVELOPMENT OF A SINGLE STRATEGY FOR THE INTEGRATION OF QUANTITATIVE AND QUALITATIVE DATA TYPES FOR THE PRODUCTION OF DECISION SUPPORT SYSTEMS

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Introduction

- Brief summary of the research
- The case study
- 3 fundamental aspects of the research:

1. Strategy Development
2. Quantitative and Qualitative Data and its integration
3. Decision Support Systems (DSS)

- Summary of findings
- Future applications

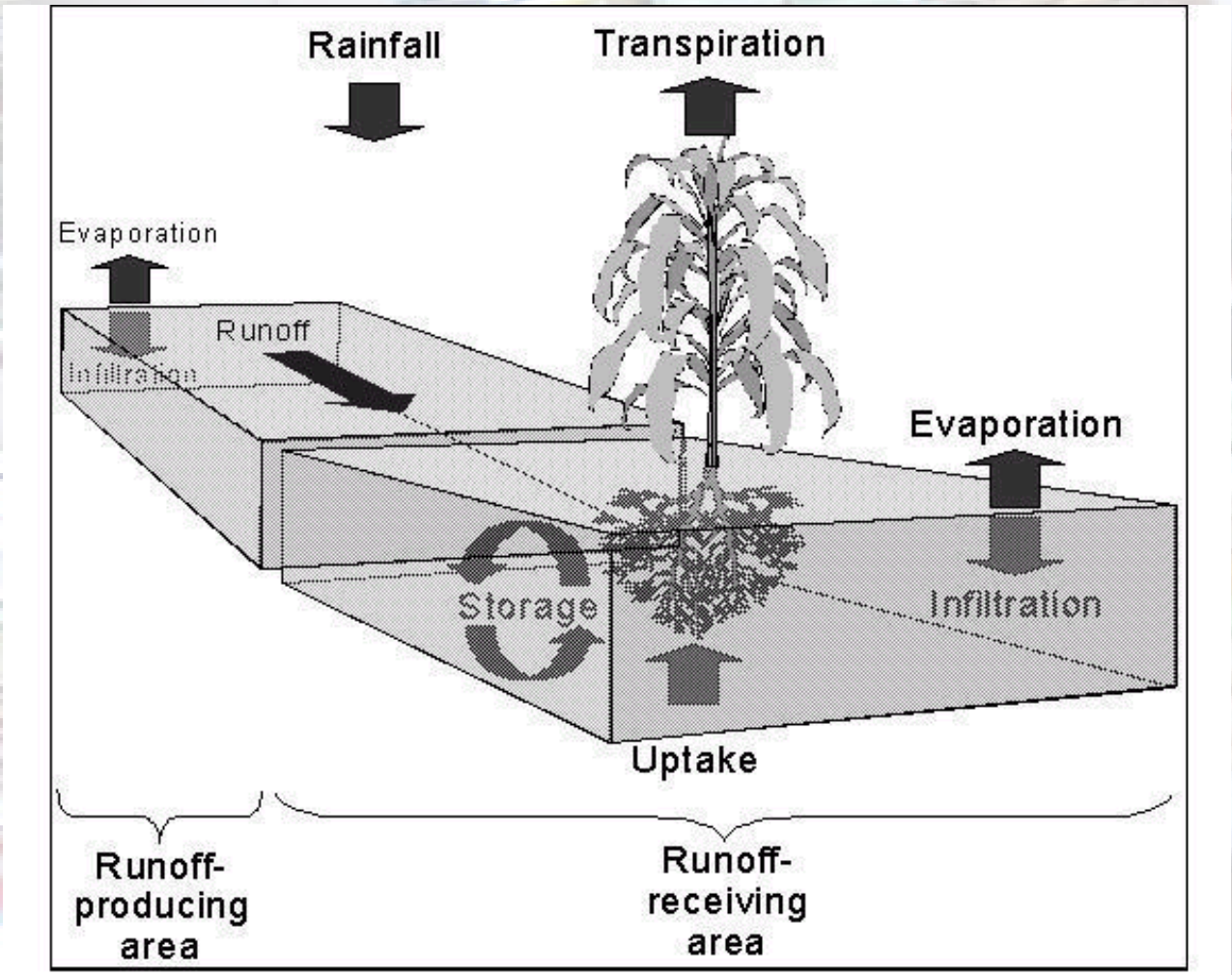
The Research

- Importance of quantitative and qualitative data types for the production of DSSs
- Integration of data types
- Application of social sciences and human interpretation towards management tools
- Agricultural management tools
- Generic systems development process flow developed

The Case Study

- Soil-Water management in Tanzania
- Rainwater Harvesting
- Common Pool Resources
- Two study regions with differing topographical characteristics
- Socio-economic considerations, wealth classifications
- Intrinsic knowledge

The Case Study

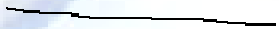


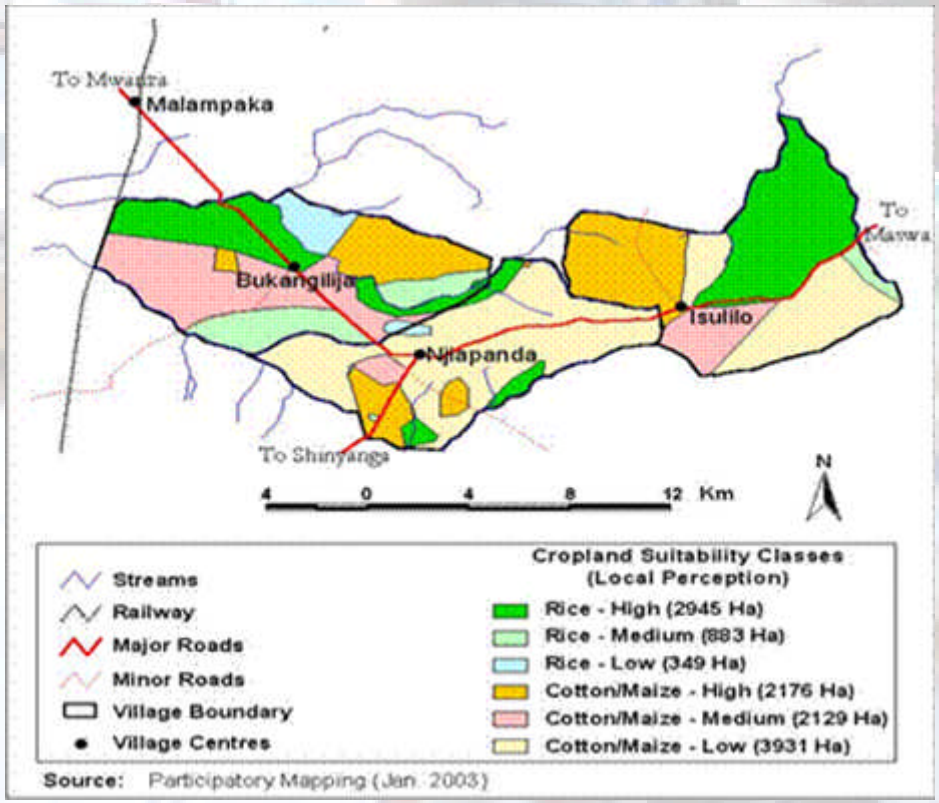
The Case Study

1. Maswa District.

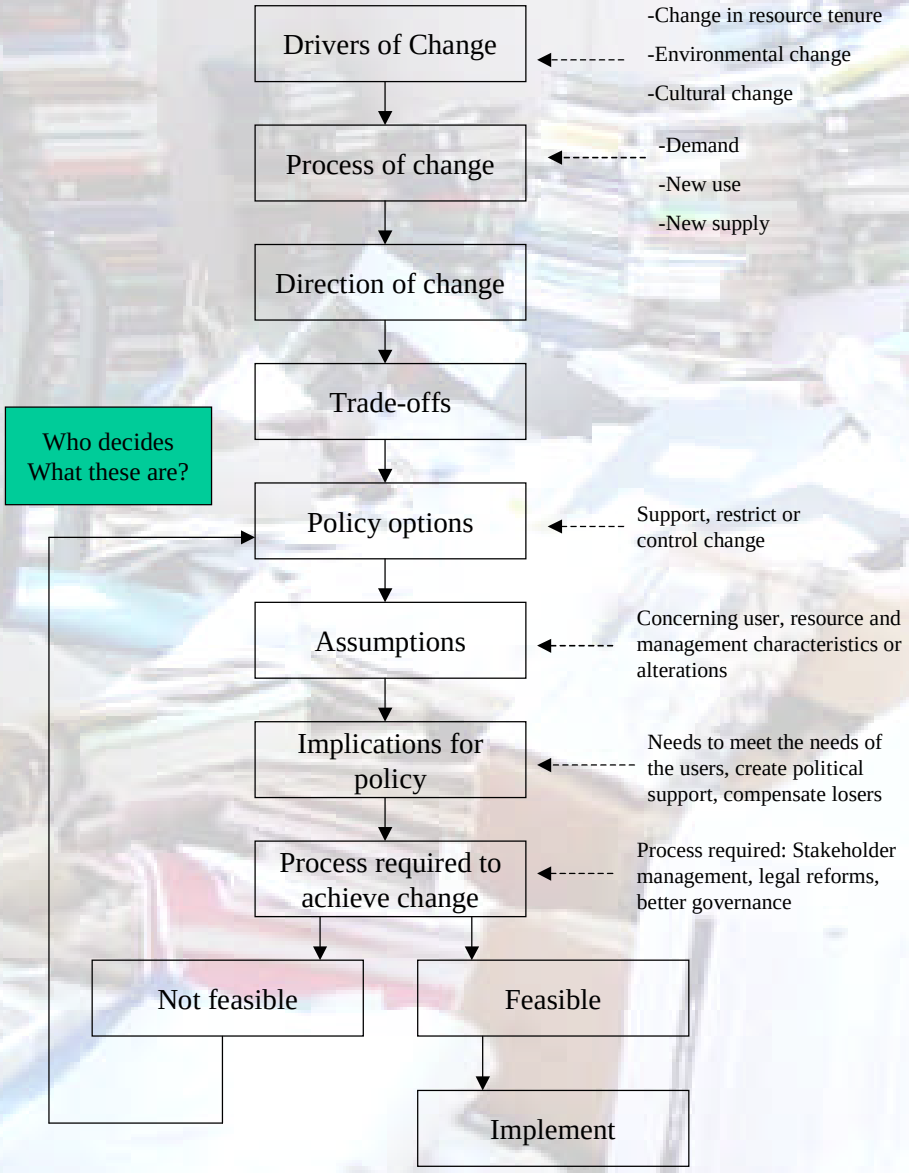
2. WPLL District

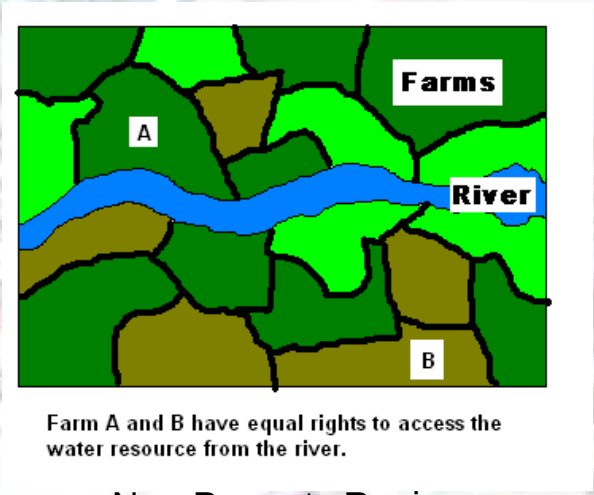
The Case Study

Land Form	Attributes and RWH potential
	Very steep catchment, runoff in deep gullies and moves fast. Difficult to use in the pediment but spreads naturally further down in the lowland plains where it is opportunistically used by farmers. A good example is Kifaru village in Mwanga **High potential for RWH**
	Very steep, a lot of runoff, no area at the bottom to use it. Common in Morogoro. **Poor potential for RWH**
	Runoff generating area well matched with receiving area. Common in some parts of Maswa District. **High potential for RWH**
	Small area generating limited runoff, large area on which to use it. Demand of water exceeds supply. Common in many areas of Maswa District. **Medium potential for RWH**
	Too flat to generate runoff **Low potential for RWH**

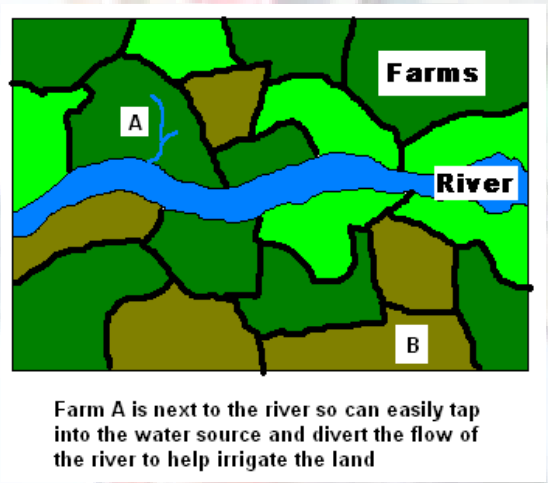


The Case Study





Non-Property Regime



State Property Regime

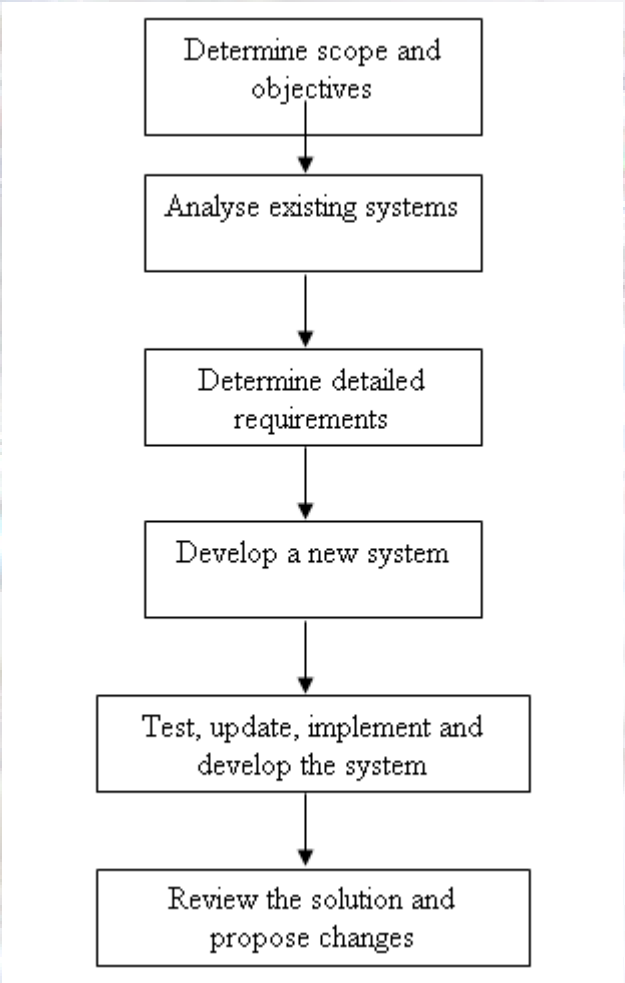
Strategy Development

- No single strategy present
- Approaches vary depending on the amount of information presented and how it's been collected
- Dependent on the type of decisions being made and the purpose of the tool
- Logical structure

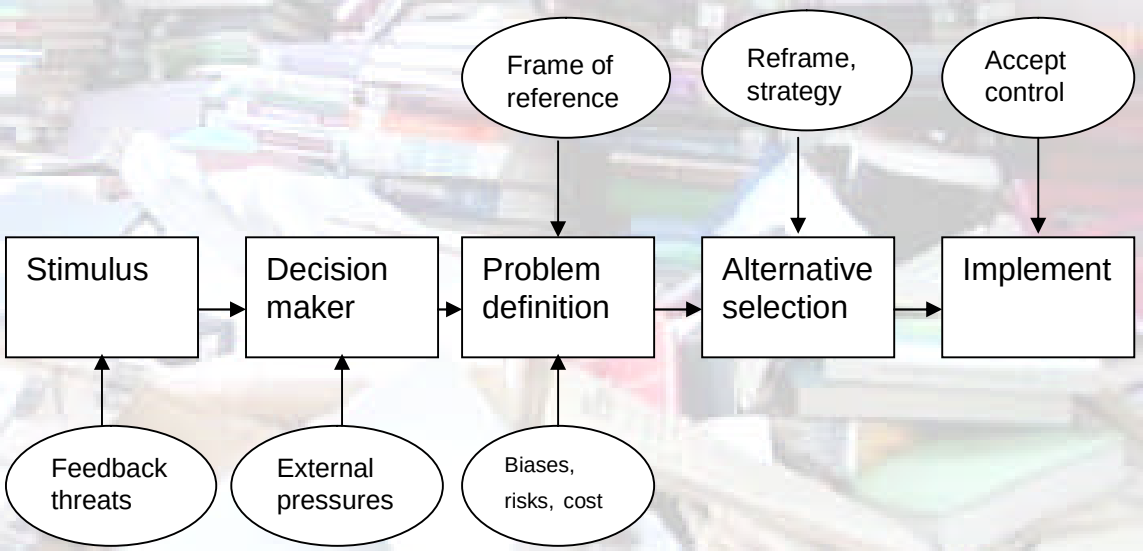
- Examples:
- Systems development management guide
- The work of Marakas
- Simon's model
- SHARES approach
- The Dialog, Data and Models paradigm
- Strategy developed from this research

(These shall be expressed)

Strategy Development

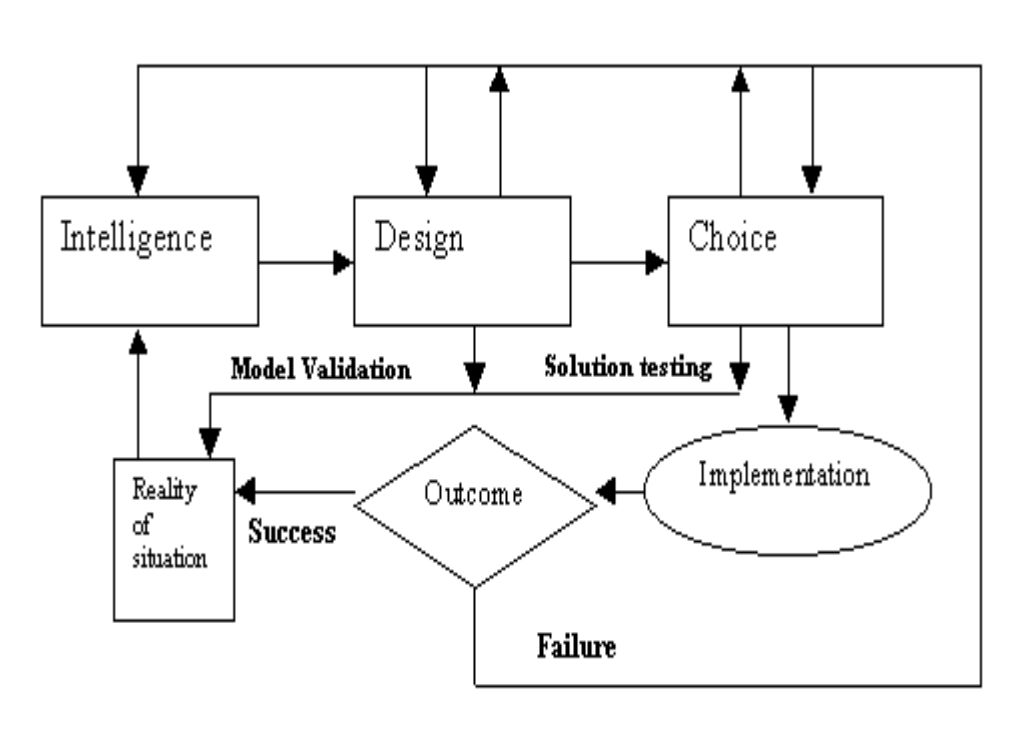


Systems development management guide



Adapted from Marakas, 1998 and 2003

Strategy Development

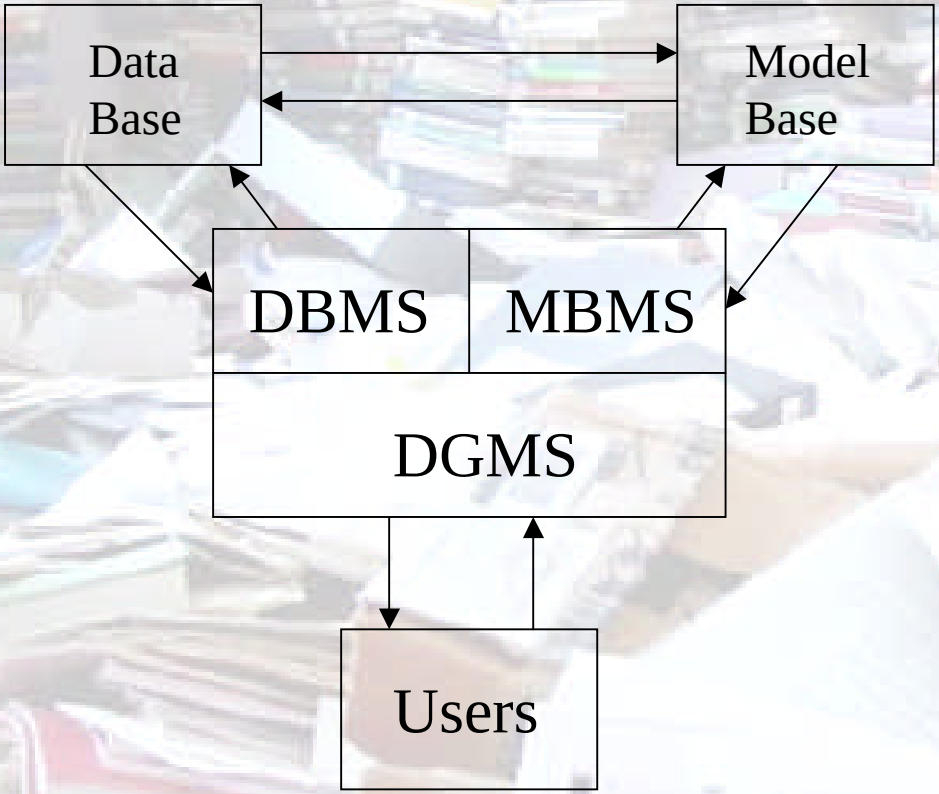


Simon's Model

- SHARES approach as defined by Stroosnijder (2001)
- Qualitative approach to development
- Three phases of development

1. Descriptive phase
2. Explorative phase
3. Planning phase

Strategy Development



<u>The 'dialog, data, and models (DDM)' paradigm</u>.

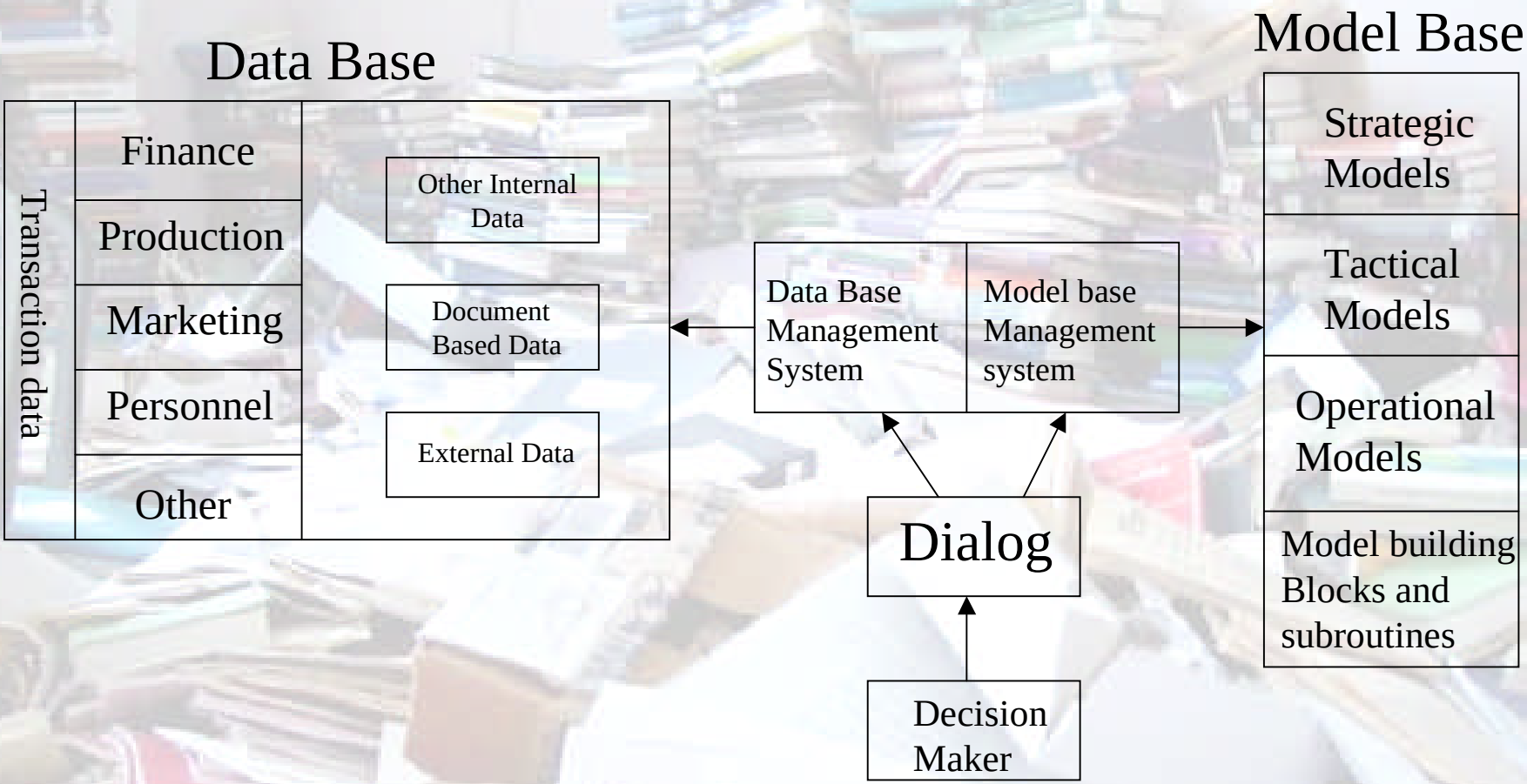
DBMS – database management system,

MBMS – model base management system,

DGMS – dialog generation management system

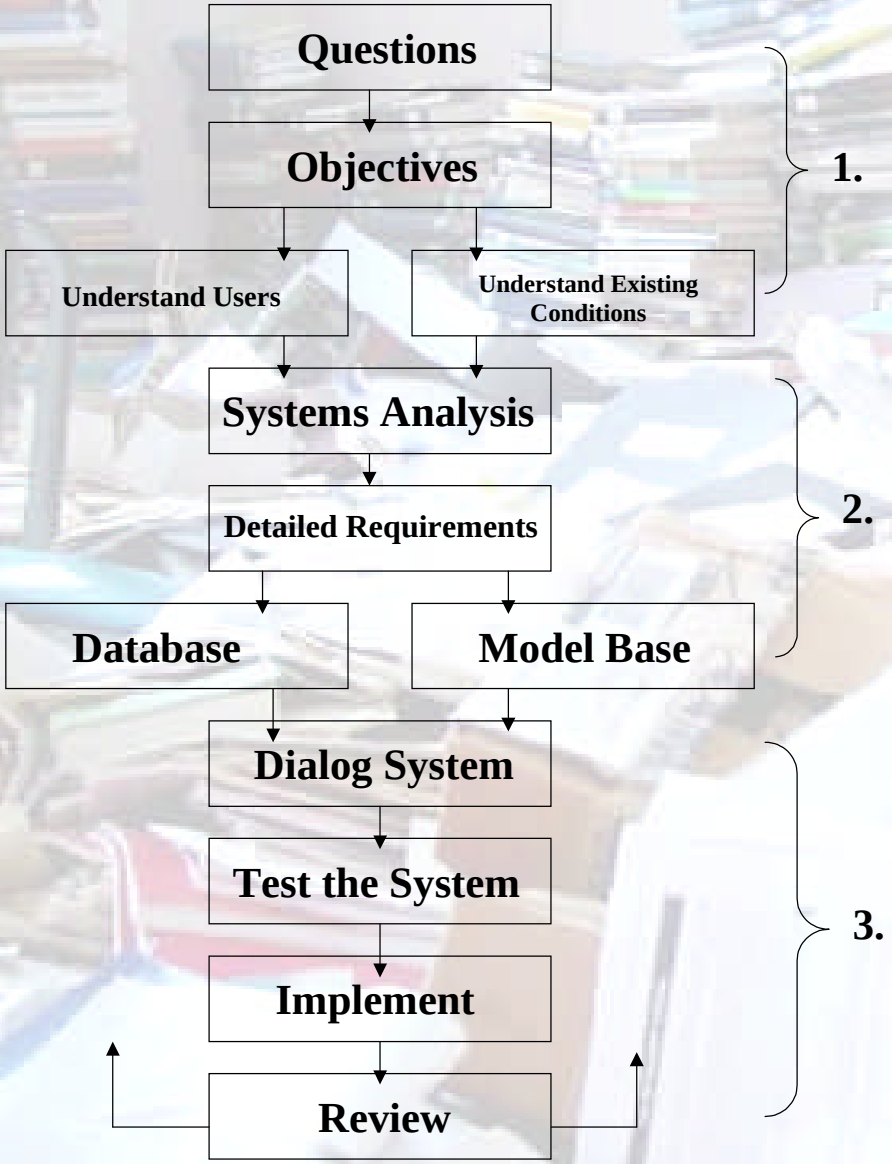
(Sprague and Carlson, 1982)

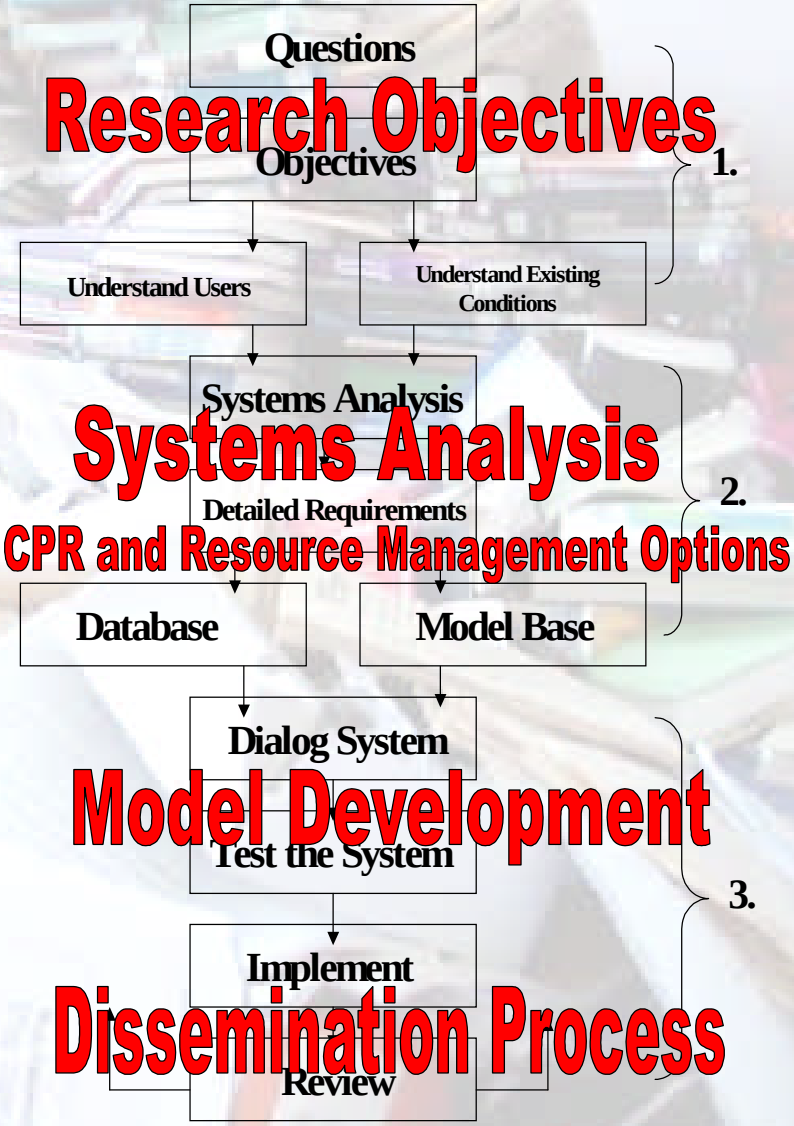
Strategy Development



Expansion of the DDM paradigm. To give emphasis to the three important elements of DSS development (Sprague and Watson, 1996).

Strategy Development





Data Types

- Quantitative data looks at collecting numerical data and carrying out statistics
- Impersonal point of view
- Development of relationships and mathematical models
- Various variables and types of analysis can be applied
- Questionnaires, surveys, experimental design
- Beginning…Middle…End

- "*there are lies, damn lies, and statistics*" (Disraeli)

- *"I don't have to concern myself with how I'm going to analyse my survey data until after I've collected my data. I'll leave thinking about it until then, because it doesn't impinge on how I collect my data"* (Bryman)

Data Types

- Qualitative research emphasises words
- Concerned with observations
- People centric
- Participant observations, interviews, open questions, document analysis
- Often defined by how it differs to quantitative research
- Tests theories
- Takes place in natural settings
- Helps to give better understanding to the research being carried out
- Adds a new level to the research
- Interactive approach to data collection

Data Types

- Multi-strategy employs both quantitative and qualitative data
- Assumes the researcher can capitalise on both data type traits
- Very research specific
- Three approaches defined by Hammersley:

1. Triangulation
2. Facilitation
3. Complimentarity

- Implementation plan required

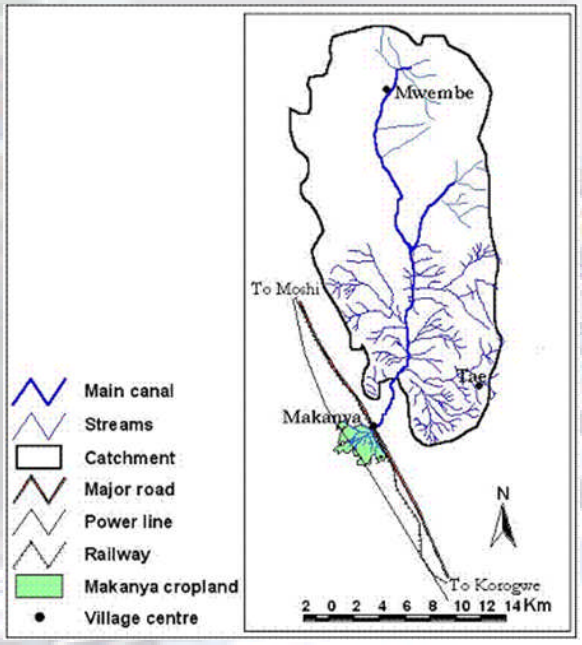
- "*every research tool or procedure is inextricably embedded in commitments to particular versions of the world. To use a questionnaire, to use an attitude scale, to take the role of participant observer, to select a random sample, to measure rates of population growth, and so on, is to be involved in conceptions of the world which allow these instruments to be used for the purposes conceived*". (Hughes)

Data Types

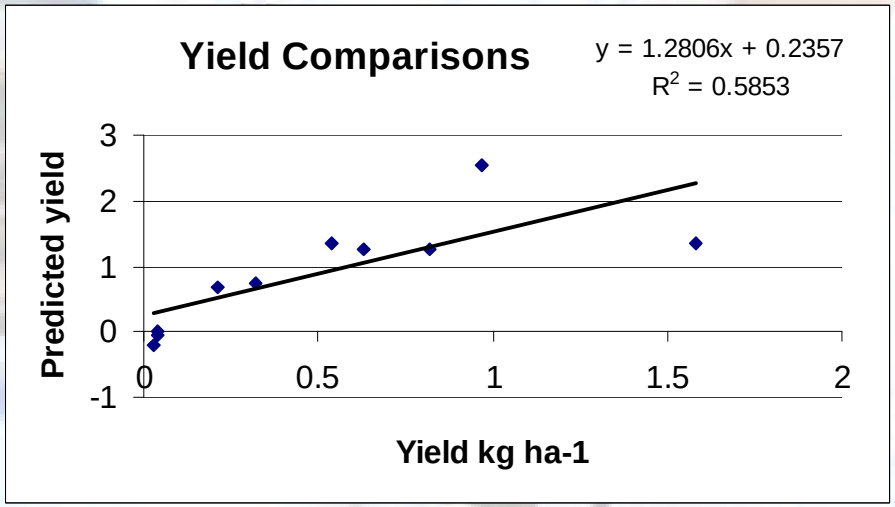
- Methods used:
- Questionnaires
- Focus Groups
- GIS
- Participatory Rural Appraisal
- Experimental design
- Existing models
- Statistics
- Observations

- Limitations of these methods include:
- Positionality
- Data sets
- Acquirement of data from Tanzania
- Reliability of model predictions
- Field work
- Feedback from farmers and participants

Data Types

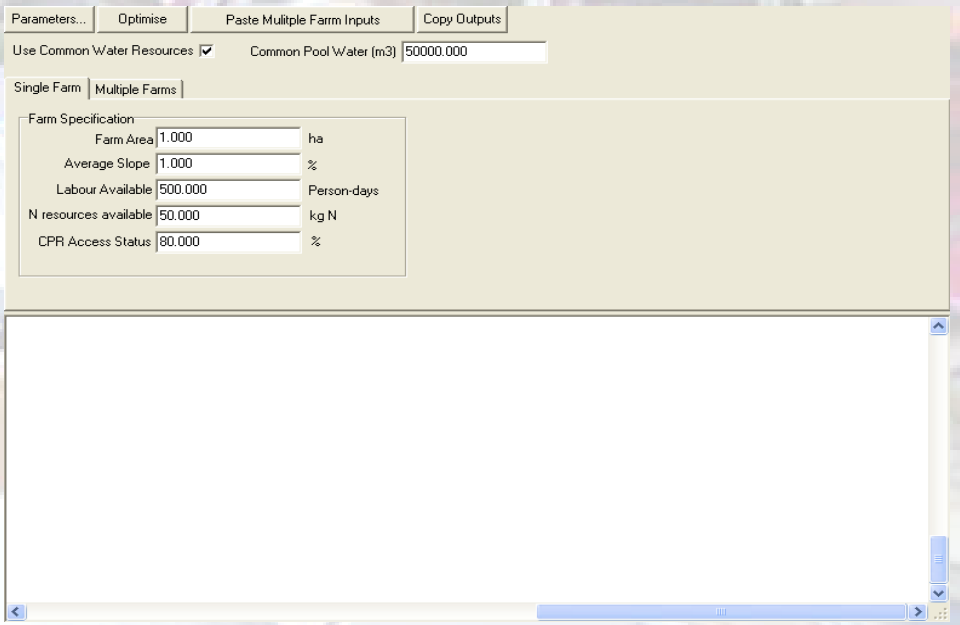


	Rich	Middle	Poor
Housing	Built with bricks, roofed with iron sheets with glass windows. Well furnished.	Built with bricks and roofed with iron sheets Poorly finished Not well furnished	Built with poles mud and thatched with grass
Livestock	Own more than 10 heads of cattle, more than 15 goats	Less than 15 goats Less than 9 heads of cattle	Only chicken
Food security	Never experience hunger	Sufficient	Food insecure - take single meal a day
Business enterprises	E.G. run large shops and guest houses. Own gypsum mine and engaged in gypsum trading	Engaged in petty business	Not engaged in business
Clothes:	Wear expensive clothes	Self sufficient	Poor clothing
Farm implements	Either own or can pay for tractor services in farm operations	Own/ use none	Own none
Access to social services	Afford costs of primary education and health service	Afford costs of primary education and health services	Cannot afford costs of primary education and health services
Access to farm inputs	Use farm inputs	Do not use modern farm inputs	Cannot afford farm inputs

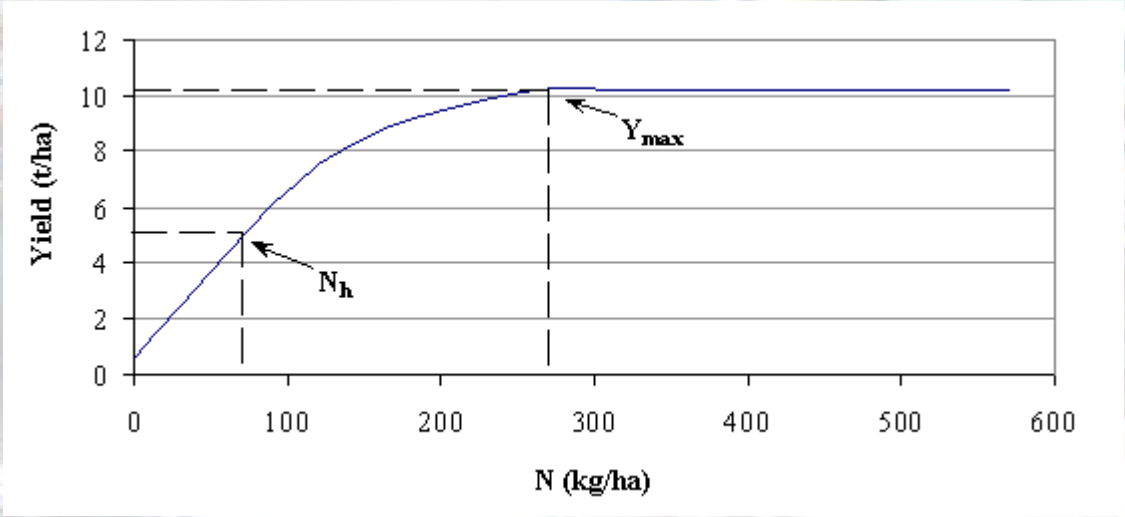


Decision Support Systems

- A DSS is a system under the control of one or two decision makers
- Assist decision making
- Compliment intrinsic knowledge
- Give rise to what if scenarios and step by step guides
- Generate questions
- Improve awareness
- 2 development phases



Decision Support Systems

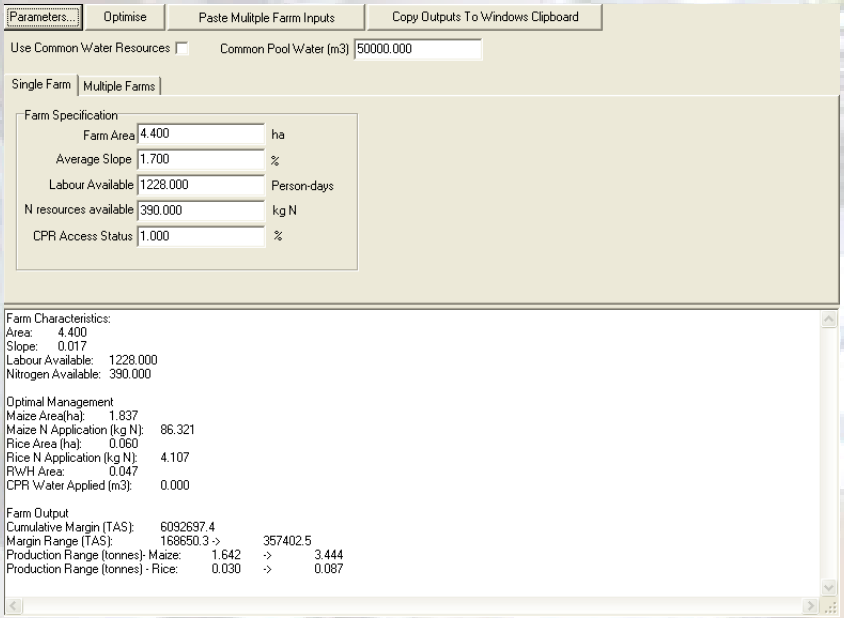


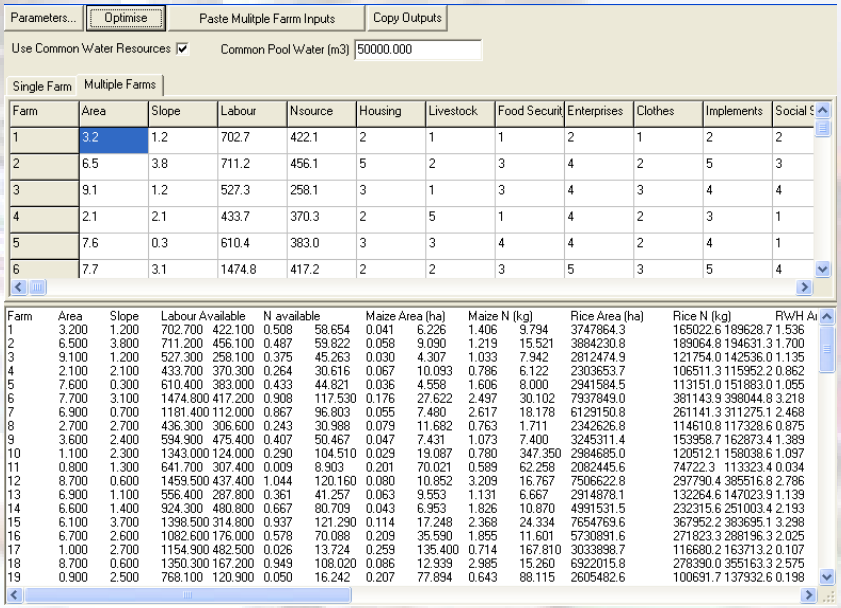
$$Yield_N = Y_{max}\left(1 - e^{-0.69(N_a/N_h)}\right)$$

$$SHI = \frac{\sum_i SEf_i * W_{SEfi}}{\sum_n \sum_i SEf_i * W_{SEfi}}$$

SHI social hierarchy index
SEf is the wealth index, ranging between 1 and 5 that is associated to poverty and wealth respectively.
WSEf is the weighing factor. The higher it is more the influential the factor is on the estimation of the Social Hierarchy Index.
i is the number of socio-economic factors.
n is the number of farms in the community.

Decision Support Systems





- Parameters set for a single farm are via the on-screen options
- Output clearly viewed

- Multiple farms, parameters inputted via importing a spreadsheet
- Results subsequently generated

Decision Support Systems

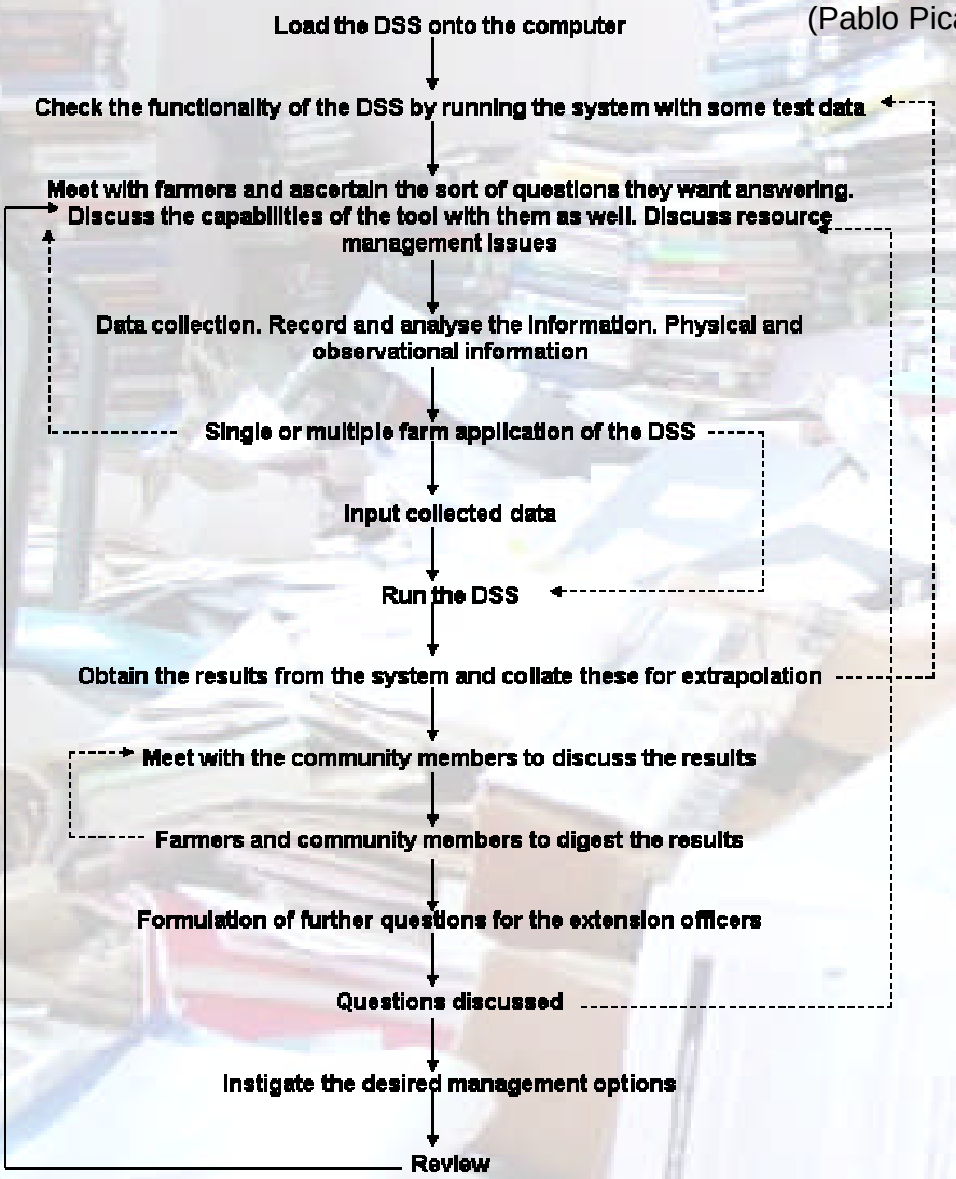
Run 1	Input and output values		
Farm Characteristics:			
Area:	1	(hectares)	
Slope:	0.01	(slope percentage)	
Labour Available:	500	(person days)	
Nitrogen Available:	50	(kg N)	
Optimal Management			
Maize Area(ha):	0.706	(optimal management	
Maize N Application (kg N):	36.072	options for the two	
Rice Area (ha):	0.039	crops)	
Rice N Application (kg N):	2.754		
RWH Area:	0.003		
CPR Water Applied (m3):	0	(Additional water)	
Farm Output		(outputs/ranges)	
Cumulative Margin (TAS):	2545318.8		
Margin Range (TAS):	70380.4	->	149983.8
Production Range (tonnes)- Maize:	0.673	->	1.412
Production Range (tonnes) - Rice:	0.02	->	0.059

- Example results from single farm and multiple farm model runs
- Variation viewed in the results
- All variables listed and numerical values assigned

Farm	1	2	3	4	5	6	7	8	9	10
Area	5.5	8.2	9.9	7.8	5.8	1	1.2	3.8	9.1	3.9
Slope	3.4	3.7	0.6	3.8	3.4	0.6	2.4	2.4	2.2	3.6
Labour Available	499.8	1198.3	686.1	1172.8	1015.6	1271.9	1382.1	410.2	1025.6	724.8
N available	403.8	110.4	414.6	151.9	470.6	371.5	233.2	247.1	458	127
Maize Area (ha)	0.309	0.869	0.447	0.725	0.715	0.012	0.014	0.271	0.62	0.544
Maize N (kg)	38.769	99.513	52.451	91.484	86.541	39.02	4.892	32.531	73.271	67.225
Rice Area (ha)	0.062	0.087	0.066	0.15	0.077	0.234	0.322	0.039	0.149	0.025
Rice N (kg)	9.742	10.559	9.021	25.18	10.55	80.566	174.93	6.787	25.171	3.535
RWH Area (ha)	0.854	2.12	1.471	1.975	1.793	0.754	0.862	0.735	1.864	1.277
CPR Water Applied (m3)	11.001	35.718	12.525	11.861	17.996	449.26	192.68	7.977	8.99	11.092
Total Margin	2688693	6494250	3465009.5	6391962.4	5565649.8	2237561	3598655	2206543	5485626	4032076.2
Min. Margin	132105.1	317693.6	137334.7	311139.2	272287.8	75316.8	137313.1	105912.8	264519.6	194831.8
Max. Margin	134632.9	325101.1	178137.7	320454.7	278663.5	132010	195290.2	110779	275374	201998.1
Min. Maize Production (t)	1.105	2.906	1.212	2.598	2.472	0.039	0.059	0.934	2.149	1.869
Max Maize Production (t)	1.105	2.962	1.544	2.598	2.51	0.058	0.07	0.948	2.149	1.929
Min. Rice Production (t)	0.144	0.181	0.108	0.342	0.167	0.476	0.876	0.084	0.331	0.053
Max. Rice Production (t)	0.161	0.193	0.158	0.405	0.184	0.841	1.255	0.107	0.403	0.061

Summary

"Computers are useless they only give you answers"
(Pablo Picasso)



- A successful DSS was produced that fulfilled the requirements set by our Tanzanian Partners
- Various strategies for development were investigated and combined to form a single approach
- The importance of quantitative and qualitative data was expressed
- Potential for combining data types expressed and developed

The Future

PODIUM

Want to help Africa? Then get off their backs

Richard Dowden

From a speech at the Royal Geographical Society by the Director of the Royal African Society

BECAUSE AFRICA looks poor and has weak institutions, we imagine that Africa is weak. We think it needs saving. We like to believe that if we bring our money, our knowledge, our skills to Africa, we can lift it out of its misery. Our strength, wisdom and kindness will lead Africans out of darkness and into a better world – a world like ours.

This is the missionary approach to Africa and it's quite prevalent these days. Its roots lie in the Christian missionaries who marched into Africa in the 19th century. Much of the colonial service had a similar idea when Britain and other European countries tried to rule Africa. Its successors today are the aid agencies, the modern missionaries.

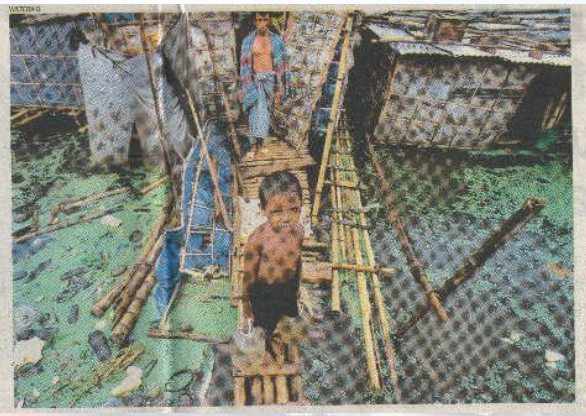
The problem with this approach to Africa is that it has not worked. Billions of pounds worth of aid has poured into Africa in the past 50 years. I suggest as a starting point that the development of peoples, of societies, can only be done by those people themselves. It cannot be done by outsiders. Outsiders can support, but they cannot impose unless they want to take over the governance of the whole continent. We've tried that – it was called the British Empire and it didn't work.

So stop feeding money to European cows and spreading it on fields of cotton and corn that can be grown far more cheaply in Africa. Get rid of the agricultural subsidies that make a mockery of our proclaimed faith in the free market. Stop keeping African goods out of our markets. Allow Africans to earn a living in the world. We should, in short, get off their backs.

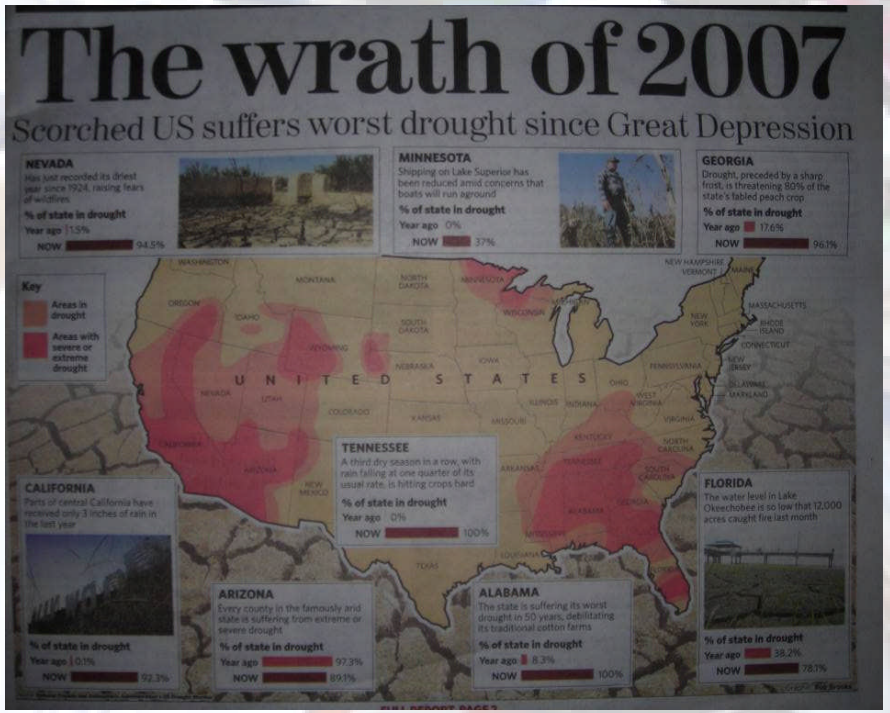
Rainwater harvesting must be promoted

The landless state of many in Bangladesh adds to their woes, says **Renata Rubnikowicz**

IT IS hard to believe that a country such as Bangladesh could have a water problem. If anything, it would seem to have too much of the wet stuff. population lives below the poverty line. In rural areas, they try to make a living growing rice, but there is too little land to support everyone. Many



Bangladesh suffers from its very low-lying status. In rural areas just 10 per cent of the population has access to proper lavatory facilities



THANKYOU!

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