KARI/CIMMYT MAIZE DATABASE PROJECT

A STANDARDIZED FORMAT FOR ORGANIZING ON-FARM AND EXPERIMENTAL MAIZE RESEARCH DATA IN KENYA

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STANDARDIZED FORMAT FOR ORGANIZING ON-FARM AND EXPERIMENTAL MAIZE RESEARCH DATA IN KENYA

The major objective of the KARI/CIMMYT Maize Data Base (MDB) Project is to establish an information system for maize in Kenya that would enable researchers and policy makers analyze potential impacts of feasible technology and policy interventions in maize production and help them define priorities in maize research. The goal is to exploit potentials for increased productivity in order to enhance growth in domestic maize production to cope with increased food demand resulting from a rapidly growing population. This would help avoid potential structural imbalance in domestic supply and demand for maize that may lead to persistent shortages in the future.

Understanding the various bio-physical and socio-economic factors that interact in maize production is crucial for strategic research planning. Before any interventions are planned, existing knowledge about maize farming systems, production environments, constraints and potential for productivity growth need to be adequately explored, analyzed, and understood by maize researchers, research managers and policy makers.

Experimental research data constitute an important component of the intended data base for Kenya. Considerable effort has been invested in the past on determining maize production problems and developing improved production technologies. From these, valuable research information has been generated and various technologies adopted by maize farmers. While some of this work was published, most of the information ended up unpublished or scattered and hence, hard to trace. As a result, a substantial amount of data from experimental and on-farm trials carried out by maize researchers in Kenya is either lost or remain under-utilized for lack of proper documentation and publication, and due to a high turn-over of researchers and research managers.

Most of the experimental data is kept in paper contributing to a build up of huge amounts of data at the different research centres

archives that are difficult to retrieve specific information from. This form of storing valuable information in data files and annual reports involve a high risk of damage or loss of the entire data base. Moreover, this form also makes the data often unavailable to most people, especially those who are not directly involved in the specific projects generating the data. With the recent advancement in electronic data saving and processing technology, more efficient ways of organizing, storing, and retrieval of large data sets have become available. The use of computers and digital data systems have made the task of preserving and processing valuable information easier and reduced significantly the risk of loss involved. Therefore, one objective of the MDB project is to organize existing maize research data in a digital form in order to preserve existing knowledge and improve accessibility and usefulness of previous research results.

A standardized format has been developed for compiling and organizing data from experimental and on-farm research conducted at the various maize research centres within KARI. In addition to building a uniform structure of experimental research data, this exercise is expected to contribute to the following specific objectives of the MDB project:

a. The compiled information will be organized by site and season to allow for useful inter-regional and inter-temporal comparison of similar experiments and enable analysis of space and time factors as important sources of variation in trial results.

b. Provide basis for planning future maize research at the different centres as researchers and managers will be able to assess the relative emphasis given to various research activities in the past. This will help reveal gaps in previous work and identify under- and over-researched areas and problems. It will thus provide to research managers and planners a tool that will help avoid duplication of effort, better plan future trials, establish more effective monitoring and evaluation procedures, and better allocate research resources.

c. Previous research records will be used to examine whether the maize research program has been addressing farmers needs and generating relevant technologies.

d. Experimental data will be useful in assessing the potential impact of various technology interventions by site and thus define the productivity gap that need to be exploited.

e. Methods and experimental designs employed will be reviewed and examined for appropriateness and adequacy.

f. Integration of the existing research information into a uniform digital data base standardized across centres and seasons will provide an effective medium for communicating research results and interaction between maize researchers and improve accessibility of relevant pieces of experimental research to all users. This will facilitate the incorporation of research data into a spatial frame together with farm survey and other types of data.

The proposed formats presented in the Appendix were discussed in a workshop organized by the MDB project on the 29th of May 1992 at the Agricultural Information Centre, Nairobi.

Members of the maize and socio-economic research programs at KARI, various international agricultural research centres and donor agencies participating in the workshop (see list in appendix), emphasized the need to establish a standardized structure of research data as an essential step towards better planning of research activities and more efficient allocation of research resources. The following format were endorsed by the workshop after making required alterations:

1. Crop management research data format.
2. Plant breeding research data format.
3. A format for organizing regional aggregates data.
4. A format reporting agro-climatic conditions prevailing at the experimental sites for seasons covered in the data base.

All format were precoded and a unified code plan developed for crop management and breeding research data (see Appendix).

The workshop recommended that the data reporting period begin as far back as 1980, since participants thought that recent trends in maize research should be given higher priority considering the resources available for this task from the MDB project. It was also thought that findings of research work prior to 1980 had a better chance of being published and that it would be difficult to recover details of old experimental trials. Moreover, reporting research results prior to 1980 in such detail was considered unnecessary since another project has been launched in KARI to establish a bibliographic data base for all KARI's research history. The mentioned project, Kenya Agricultural Research Database Project, is therefore expected to provide adequate summaries of pre-1980 research results.

Appendix 1:

BREEDING RESEARCH DATA FORM

VARIABLE	CODE (SEE CODE PLAN)
SECTION A: KEYS	
1. Centre	_____
2. Approach	_____
3. Title	_____
	_____
4. Rationale/Objectives	_____
	_____
5. Type of experiment	_____
6. Status of Experiment	_____
7. Site	_____
8. Year	_____
9. Season	_____
10. Cycle	_____
11. Source of funds	_____
12. Principal investigators	_____
13. Assisting researcher(s)	_____
14. (Non-KARI) Collaborator	_____

SECTION B: DESIGN AND RESULTS (see code plan)

15. Design of experiment _____

16. Method of analysis _____

17. Mean separation _____

24. Statement of Conclusions

a. _____

b. _____

c. _____

d. _____

e. _____

Section C: Historical Record of Genetic Technologies (Please enter scale in brackets provided at column head when applicable)

Variety	Date at 75% emergence	Average yield (kg/ha)	Days to 50% silking	Lodging% Stem	Lodging% Root	Blights score ( )	Rust score ( )	Maize streak count ( )	Smuts count/ score ( )	Ear height (cm)	Pest score ( )	Rots %/Score ( )

Appendix 2

CROP MANAGEMENT RESEARCH DATA FORM

VARIABLES	CODE (SEE CODE PLAN)
SECTION A: KEYS	
1. Centre	_____
2. Approach	_____
3. Title	_____
	_____
4. Rationale/Objectives	_____
	_____
5. Type of experiment	_____
6. Status of Experiment	_____
7. Site	_____
8. Year	_____
9. Season	_____
10. Cycle	_____
11. Source of funds	_____
12. Principal investigators	_____
13. Assisting researcher(s)	_____
14. Non-KARI Collaborator	_____

SECTION B: DESIGN AND RESULTS (see code plan)

15. Design of experiment _____

16. Method of analysis _____

17. Mean separation _____

18. Level and type of experimental variables

	18. Factors			
Levels	A	B	C	D
Level 1				
Level 2				
Level 3				
Level 4				
Level 5				
Level 6				
Treatment level generating mean maximum yield				
Mean maximum yield by treatment (kg/ha)				
Statistical significance of treatment effect				
Treatment level combination generating maximum yield				

19. Maximum yield (kg/ha) _____

20. Overall mean yield (kg/ha) _____

21. Interactions:

Treatments	A	B	C	D
A.				
B.				
C.				
D.				

22. Economic Analysis: _____(see code plan)

23. Statement of Conclusions

a._____

b._____

c._____

d._____

e._____

Appendix 3

STANDARDIZED CODE PLAN:
CROP MANAGEMENT AND BREEDING

Variable Code	Variable Name	Code Plan			
		Response	Code	Response	Code
1	Centre	Kitale	101	Kakamega	102
		Kisii	103	Katumani	104
		Embu	105	Mtwapa	106
			107		108
2	Approach	On-station exp.	201	OFR-Trial	202
		OFR-Demo	203	OFR-Verification	204
		Laboratory	205	Glass house	206
			207		208
3	Title	Text			
4	Rationale/ Objectives	Text			
5	Type of Experiment	Tillage	501	Planting	502
		Fertility	503	Weed Control	504
		Insect control	505	Soil Conservation	506
		Water management	507	Variety	508
		Cropping system	509	Harvest	510
		Post-harvest	511	Stress	512
		Soils	513	Organic matter	514
		Germplsm acquisit	515	Germplasm charact	516
		Germplsm evaluat	517	Yield evaluation	518
		Variety Devlpmt.	519	Recombin. Block	520
		Genetic study	521	Breeding method	522
			523		524
6	Status of experiment	Ongoing (NPT)	601	Completed	602
		Abandoned	603		604
			605		606
7	Site	Kitale	701	Chorlim	702
		Endebes	703	Moi University	704
		Kapsabet	705	Kisii	706
		Kakamega	707	Molo	708
		Njoro	709	Lanet	710
		Ol'Joro Orok	711	Shamata	712
		Ngano	713	Maridas	714

Variable Code	Variable Name	Code Plan			
		Response	Code	Response	Code
7	Site	Njabini	715	Gathanje	716
		Embu	717	Alupe	718
		Wanguru	719	Japata	720
		Muguga	721	Kirinyaga	722
		Sang'alo	723	Murinduko	724
		Kaguru	725	Taita Hills	726
		Kitui	727	Kampi ya Mawe	728
		Kiboko	779	Murinduko	730
		Mwea Tebere	731	Marimanti	732
		Mtwapa	733	Msabaha	734
		Magarini	735	Mpeketoni	736
		Ribe	737	Kambe	738
		Baobab	739	Matuga	740
		.	741	.	742
		.	.	.	.
		.	.	.	.
			799		798
8	Year	1980	880	1981	881
		1982	882	1983	883
		.	884	.	885
		.	886	1988	898
		1991	899		
9	season	Long-rains	901	Short-rains	902
10	cycle	Selection	1001	Evaluation	1002
		Recombination	1003	_____	1004
		_____	1005	_____	1006
11	funding	Government	1101	Project	1102
		< 75% government	1103	<50% government	1104
		< 25% government	1105		1106
12	principal investig.	Name	Name	Name	Name
13	assisting researche	Name	Name	Name	Name
14	Collabo-rating institu-tion	Name	Name	Name	Name

Variable Code	Variable Name	Code Plan			
		Response	Code	Response	Code
15	Design of Experiment	Factorial	501	Randomized complete BD	1502
		Split plot	503	No design	1504
		_____	505	_____	1506
16	Method of Analysis	Not analyzed	601	ANOVA	1602
		Two-way ANOVA	603	Regression	1604
		_____	605	_____	1606
17	Mean seperation	Duncan multiple range (DMR)	701	New DMR	1702
		LSD	1703	Orthozonal	1704
		Pair F-test	705	_____	1706
18	Factors (expt. varibales)	Tillage	1801	Sowing date	1802
		Sowing method	1803	Popul./spatial arrangement	1804
		Weed control	1805	Manual weeding	1806
		Mech. weeding	1807	Chemical weeding	1808
		N-fertilizer	1809	P-fertilizer	1810
		Organic fert.	1811	Other fert. 1	1812
		Other fert.2	1813	Fert. appl. time	1814
		Fert. placement	1815	Varity	1816
		Insect control	1817	Type of pesticide	1818
		Level of pestic.	1819	Cropping system	1820
		Harvest	1821	Post-harvest/ storage	1822
		Water manag. 1	1823	Water manag. 2	1824
		Soil conserv. 1	1825	Soil conserv. 2	1826
		Physiology 1	1827	Physiology 2	1828
		Stress 1	1829	Stress 2	1830
		Soils 1	1831	Soils 2	1832
1801	Tillage levels	_____	1	_____	2
		_____	3	_____	4
1802	Sowing date	(Day.month 00.00)			
1803	Sowing method	Broadcast	1	Seed drill	2
		row/hill	3	random	4
		_____	5	_____	6
1804	Population	(plant/ha)			

Variable Code	Variable Name	Code Plan			
		Response	Code	Response	Code
1805	Weed control	Manual	1	Mechanical	2
		Chemical	3	_____	4
		_____	5	_____	6
1806	Manual weeding	(number of times)			
1807	Mechanical weeding	_____	1	_____	2
		_____	3	_____	4
		_____	5	_____	6
1808	Chemical weeding	_____	1	_____	2
		_____	3		4
		_____	5	_____	6
1809	N-fertlizer	kg/ha			
1810	P-fertlizer	kg/ha			
1811	orgnic fert.	kg/ha			
1812	othr fert.1	kg/ha			
1813	othr fert.2	kg/ha			
1814	fertlizer appl. time	_____	1	_____	2
		_____	3	_____	4
		_____	5	_____	6
1815	fertilizer placement	_____	1	_____	2
		_____	3	_____	4
1816	Variety	_____	1	_____	2
		_____	3	_____	4
1817	Insect Control	_____	1	_____	2
		_____	3	_____	4
1818	Type of pesticide	_____	1	_____	2
		_____	3	_____	4
1819	Level of pesticide	_____	1	_____	2
		_____	3	_____	4
1820	Cropping system	_____	1	_____	2
			3	_____	4
1821	Harvest	_____	1	_____	2
		_____	3	_____	4

Variable Code	Variable Name	Code Plan			
		Response	Code	Response	Code
1822	Post-harvest		1		2
			3		4
1823	Water managemt1		1		2
			3		4
1824	Water managemt2		1		2
			3		4
1825	Soil conserv.1		1		2
			3		4
1826	Soil conserv.2		1		2
			3		4
1827	Physiology1		1		2
			3		4
1828	Physiology2		1		2
			3		4
1829	Stress1		1		2
			3		4
1830	Stress2		1		2
			3		4
1831	Soils 1		1		2
			3		4
1832	Soils 2		1		2
			3		4
1833			1		2
			3		4
.					
.					
1899			1		2
			3		4
19	Maximum yield	kg/ha			

Variable Code	Variable Name	Code Plan			
		Response	Code	Response	Code
20	Overall mean yield	Kg/ha			
21	Interactions	High Signific(5%) +ve interaction	2101	High Signific(5%) -ve interaction	2102
		Signif. +ve (10%)	2103	Signif. -ve (10%)	2104
		Insignif. +ve	2105	Insignif. -ve	2106
22	Economic analysis	Performed	2201	Planned-not completed	2202
		_____	2203	_____	2204
23	Statement of conclusion	Text			

Appendix 4

DESCRIPTION OF EXPERIMENTAL AND OFR SITES

Year _____

Site Code	Site Name	Temperature (°C)			Rainfall (mm) Mean annual	Moisture Availab. Index	Altitude m ASL	Soil Type (clay, loam sand)	AEZ
		Max	Min	Mean					
701	Kitale								
702	Chorlim								
707	Endebess								
704	Moi Univ.								
705	Kabsabet								
706	Kisii								
707	Kakamega								
708	Molo								
709	Njoro								
710	Lanet								
711	Ol'Joro orok								
712	Shamata								
713	Ngano								
714	Maridas								
715	Njabini								
716	Gathanje								
717	Embu								
718	Alupe								
719	Wanguru								
720	Japata								
721	Muguga								
722	Kirinyaga								
723	Sang'alo								
724	Murinduko								
725	Kaguru								
726	Taita Hills								
727	Kitui								
728	Kampi ya Mawe								
729	Kiboko								
730	Murinduko								
731	Mwea Tebere								
732	Marimanti								

Site Code	Site Name	Temperature (°C)			Rainfall (mm) Mean annual	Moisture Availab. Index	Altitude m ASL	Soil Type (clay, loam, sand)	AEZ
		Max	Min	Mean					
733	Mtwapa								
734	Msabaha								
735	Magarini								
736	Mpeketoni								
737	Ribe								
738	Kambe								
739	Baobab								
740	Matuga								
741	.								
.	.								
799	.								

Appendix 5

FORMAT FOR ORGANIZING REGIONAL AGGREGATES DATA

1. District _____

2. Year _____

Variable	Division						
	1	2	3	4	5	6	7
1. Total land (ha)							
2. % arable land							
3. % land under maize							
4. % maize area under small scale							
5. Total Population(000)							
6. Total production (Tonnes)							
7. Important maize pests							
8. Important maize diseases							
9. Important weeds on maize							
10. Major maize growing season (months)							
11. Minor maize growing season (months)							
12. Major competing enterprises							
13. Enterprises intercropped with maize							
14. Number of main grain mills							

Variable	Division						
	1	2	3	4	5	6	7
15. Total Milling capacity							
16. Number of main soils							
17. Total storage capacity							
18. Number of NCPB depots							
19. Number of main private maize traders							
20. Number of whole sale seed suppliers							
21. Number of whole sale fertilizer distributors							
22. Number of extension officers							
23. Number of public credit institutions							
24. Number of private credit agencies							
25. Kms. of all weather roads (Km)							

Appendix 6

A list of participants of the MDB Project Workshop on: "Building A Digital Data Base for Maize Research in Kenya" held at the Agricultural Information Centre on May 29th, 1992, Nairobi, Kenya.

NAME	DESIGNATION	ADDRESS
1. Muriuki Ann (Mrs.)	R.O.	KARI-NARL
2. Veronicah W. Munyi(Mrs.)	R.O.	KARI-NARL
3. Festus Muriithi	R.O.	KARI-Embu
4. Linus Muriithi	R.O.	KARI-Embu
5. John Ojiem	R.O.	KARI-Embu
6. Duncan T. Kirubi	R.O.	KARI-Embu
7. Jane Ininda	R.O.	KARI-Muguga
8. Wycliffe W. Kiiya	R.O.	KARI-Kitale
9. J.M.A. Ngeny	R.O.	KARI-Kitale
10. M. Ngunjiri	Social Econ.	CIP
11. S.K. Gathama	R.O.	KARI-Mtwapa
12. S.A.N. Moruri	A.M.A.	KARI-Kisii
13. S.N. Mugo	R.O.	KARI-Katumani
14. J.M. Ongaro	R.O.	KARI-NARL
15. B.D.S. Salasya	R.O.	KARI-Kakamega
16. M.D.A. Mudeheri	R.O.	KARI-Kakamega
17. R.M. Otsyula	R.O.	KARI-Kakamega
18. F.R. Arias	Agronomist	CIMMYT
19. Ruth M.A. Onyango	R.O.	KARI-Kitale
20. Henry M. Wakhonya	Agronomist	KARI-Kakamega
21. Alphonse K. Labosu	Breeder	KARI-Kitale
22. S.N. Maobe	Agronomist	KARI-Kisii
23. A.N. Mbabu	Researcher	KARI-ISNAR
24. R.H. Hassan	Economist	KARI/CIMMYT
25. A.M. Mailu	AD/crops	KARI
26. A.G.O. Okech	Economist	KARI
27. J.K. Lynam	Rockefeller	Nairobi
28. M.A. Mulaa(Mrs.)	Entomologist	KARI-Kitale
29. M. Wafula	Ag. CD	KARI-Katumani
30. Mwangi Gatheru	Biometrician	KARI-Katumani
31. Lawrence M. Kimotho	R.O.	KARI-Katumani
32. K. Njoroge	Maize Breeder	KARI-Muguga
33. L.T. Emping	AD/MIAC	KARI-MIAC
34. D.D. Karanja	Economist	KARI/CIMMYT