Dr. Taye B.

OAU/STRC

SAFGRAD - ICRISAT

EASTERN AFRICA REGIONAL SORGHUM AND MILLETS NETWORK

(EARSAM)

ANNUAL PROGRESS REPORT FOR 1990

SEMI-ARID FOOD GRAINS RESEARCH AND DEVELOPMENT
PROJECT OF THE SCIENTIFIC-TECHNICAL AND RESEARCH
COMMISSION OF THE ORGANIZATION OF AFRICAN UNITY
(OAU/STRC/SAFGRAD JP 32)

AND

INTERNATIONAL CROPS RESEARCH INSTITUTE
FOR THE SEMI-ARID TROPICS
(ICRISAT)

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Table 37. Preliminary classification of some EARSAM research and testing sites.

Site No.	Days to physiological maturity: Short 60 - 70	Medium 90 - 120	Long 120 - 150 or more
		Distribution of research sites	
1.		Karama (Rwanda)	Rwerere (Rwanda)
2.			Rubona (Rwanda)
3.			
4.	Wad Medani (Sudan)		
5.		Abu Naama (Sudan)	Alemaya (Ethiopia)
6.			
7.			Bako (Ethiopia)
8.			Jimma (Ethiopia)
9.		Nazereth (Ethiopia)	
10.		Melkawerer (Ethiopia)	
11.	Bonka (Somalia)		
12.	Afgoi (Somalia)		
13.		Abu Rein (Somalia)	Munanira (Burundi)
14.			Mosso (Burundi)
15.			
16.		Ilonga (Tanzania)	Lanet (Kenya)
17.			Nanyuki (Kenya)
18.			Katumani (Kenya)
19.			Kakamega (Kenya)
20.			
21.		Alupe/Busia (Kenya)	
22.		Makindu (Kenya)	
23.		Malindi (Kenya)	

Source: Virmani, S.M. 1988. EARSAM 6th Regional Workshop on Sorghum and Millet Improvement held in Mogadishu, Somalia; 20-27 July, 1988. pp.172-176.

ACKNOWLEDGEMENTS

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We also acknowledge with special appreciation the active collaboration by all the national sorghum and millet programs of the region in all our efforts to strengthen the regional network. We also acknowledge combined efforts of ICRISAT and SAFGRAD in strengthening the EARSAM network.

CONTENTS

1.0 PROGRAM DESCRIPTION

Sorghum and millets are amongst the most important cereals in marginal areas of eastern Africa countries. They are also the traditional food crops grown primarily as a subsistence crop on small farms where grain yields are very low; 600 to 1000 kg/ha compared with experiment station yields of 2000 to 4000 kg/ha. Although total sorghum and millets production in eastern Africa increased due to more surface area planted and slight increase in yield per hectare, still food production is not keeping pace with the population growth (3.0%). Thus, this steadily deteriorating food situation continues to affect most eastern Africa countries. There is, therefore, an urgent need to increase sorghum and millet production in order to help alleviate hunger and malnutrition. Many factors, such as biological, environmental, socio-economic, etc. are responsible for the low sorghum and millet grain yields.

The United States Agency for International Development (USAID) provides funds through SAFGRAD project to ICRISAT to implement sorghum and millet improvement in eastern Africa. The Eastern Africa Regional Sorghum and Millets (EARSAM) network includes eight countries: Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Somalia, Sudan and Uganda. The regional office for EARSAM is based in Nairobi, Kenya.

ICRISAT, during the last two phases, encouraged intensive exchange of germplasm and technology transfer among National Agricultural Research Systems (NARS) in the region. In addition, ICRISAT trained many field technicians and scientists at ICRISAT Centre. The gains have been substantial in the improvement of NARS research capabilities and leadership. Thus, ICRISAT is facilitating the attainment of food (sorghum and millets) self-sufficiency in the region.

2. 0 PROGRAM OBJECTIVES, ACHIEVEMENTS AND ACTIVITIES

Objectives of EARSAM are to:

- increase the production of sorghum and millets, thereby contributing to stabilized food supplies in the region, leading to improved nutrition and income for the farmers in drier areas
- assist in and strengthen the research capability of national sorghum and millet programs in the semi-arid zones.

These objectives are achieved by:

- assisting in the development of improved varieties and hybrids along with agronomic practices that will result in higher and more stable production of sorghum and millets in the semi-arid environments,

- organizing and promoting systematic regional testing of available elite breeding material and technology in important ecological zones,

- assisting in training and manpower development,

- providing supplies and facilities needed to upgrade research capabilities,

- organizing regional workshops and monitoring tours in order to report research findings, to interchange ideas and breeding materials and to foster closer national program cooperation,

- encouraging strong national programs to take the lead, in particular areas of collaborative research projects, identified by NARS, that are of regional significance.

2.1. COLLABORATIVE RESEARCH PROJECTS ACHIEVEMENTS

In 1986, sorghum and millet production constraints were identified by NARS steering committee members. Research priorities were formulated and lead research centers appointed to carry out research projects in the region. As a follow up, ICRISAT, through the regional coordinator, developed collaborative projects with NARS lead centers and initiated these projects and transfered specific technologies developed by experts at ICRISAT Center to lead center scientists. In addition, the necessary research supplies were provided by ICRISAT to NARS for the proper execution of each project. The purpose of this collaboration, using NARS' existing scientific skills and research facilities, is to achieve research leadership as equal partners and to strengthen NARS researchers' ability to carry out effective research in the development of technology readily usable by farmers.

2.1.1. Anthracnose project

(In collaboration with IAR, Ethiopia). We evaluated 27 Ethiopian sorghum lines selected as resistant under natural conditions at anthracnose hot spots in Ethiopia in 1989 and 84 anthracnose-resistant lines received from ICRISAT Center. The entries were evaluated under artificial inoculation conditions at anthracnose hot spots Bako and Pawe

following artificial inoculation methods developed at IC. At the flowering stage, 17 Ethiopian and 50 IC genotypes had anthracnose rating up to 3 (on a 1 to 9 rating scale) compared to 9 in susceptible checks. Final observations will be taken at harvest.

2.1.2. Long smut project: (In collaboration with KARI, Kenya). Results on screening a randomly selected group of 19 long-glumed genotypes indicated that 18 lines were resistant to long smut but one was susceptible. This showed that all long-glumed genotypes are not resistant to long smut. Experiments on control of long smut indicated that seed treatment with systemic fungicides Raxil and Bayleton failed to control the disease.

2.1.3. Covered kernel smut: (In collaboration with KARI, Kenya). Longevity of teliospores collected from Kirinyaga and Embu districts were evaluated by laboratory germination tests one year after collection. Data showed that 90% teliospores from Kirinyaga were viable compared to less than 5% teliospores from Embu suggesting that the pathogen Sporisorium sorghi is variable. Research is underway to determine the effectiveness of locally-available systemic fungicides Raxil and Bayleton as seed dressing to control covered kernel smut.

2.1.4. Striga project: (In collaboration with IAR, Ethiopia). In pot experiments, host range of Striga species was studied. Seven samples of Striga hermonthica were compared on 10 crop plants and showed only minor variation in germination behaviour. The sorghum variety used (CK-60B) was more susceptible than the maize (A-511) to most of the S. hermonthica samples while teff and pearl millet (Pennisetum glaucum) were not attacked by any of the samples of Striga. Sorghum was more susceptible to S. asiatica but much less susceptible to Striga aspera compared to maize. In a further pot experiment 13 sorghum varieties were evaluated for resistance to different S. hermonthica and S. asiatica strains. SAR-24, Gambella-1107, N-13, ICSV-1006 and ICSV-1007 were identified as resistant with counts of 20, 14, 20, and 35 Striga plants per pot, respectively compared to 169 and 197 on the susceptible check varieties, CK-60B and IS-9302. Fairly good correlation was noted between Striga count on plants and crop fresh weight. Varieties that supported higher Striga intensity suffered relatively more damage.

Techniques have been developed and routine laboratory germination tests were conducted on all available samples of Striga seeds. These have confirmed that some samples of S. hermonthica collected in 1975 were still viable after 12 years. Comparisons of different varieties for their stimulant exudation have given variable results. However, recently in just a few tests, a good difference was observed between the susceptible check variety, IS-9302 and varieties of high relative resistance, SAR-24, ICSV-1006, ICSV-1007 and Gambella-1107.

2.1.5. Chilo project: (In collaboration with MOA, Somalia). This collaborative project was initiated end of 1989 and Dr. Taneja (ICRISAT entomologist) visited Bonka, Somalia and spent two months in the planning and initiation of the project. ICRISAT Center, at this stage, is in the process of sending the necessary research supplies for the proper implementation of the project. Dr. Taneja made the following achievements and recommendations:

2.1.5.1. Facilities for insect rearing on artificial diet were established and a successful rearing of Chilo partellus was initiated at Bonka research station. The growth, development and reproduction of C. partellus on artificial diet was similar to that on the natural host, sorghum.

2.1.5.2. Chemical protection against stalk borer during the early growth stage (15 days after crop emergence) resulted in significantly low leaf feeding and deadheart formation.

2.1.5.3. In an insect-pest survey in the Bay Region, C.partellus was the only pest recorded in all the 4 districts with infestations ranging between 6 to 60% (deadheart).

2.1.5.4. Carry-over of stalk borers was mainly through the diapausing population in sorghum stalks and stubbles. About 74% of the stalks from the previous 'GU' season contained diapausing larvae and each stalk had an average of 2 larvae with a maximum of 15 larvae/stalk.

2.1.5.5. Stalk borer infestation was about 1.5 to 2 fold on ratoon sorghum at Bonka as well as in the farmers' fields. Larvae were in much advanced stage of development in the ratoon crop, indicating the increase in number of generations (at least 0.5 to 1) per season.

2.1.5.6. Host plant resistance is one of the viable options in stalk borer management that helps in reducing the carry-over of the pest in addition to stabilizing sorghum yields.

2.1.6. Ergot project: (In collaboration with ISAR, Rwanda and IAR, Ethiopia). We identified and selected 15 lines with resistance to ergot at Karama, Rwanda. We also identified and selected 6 ergot resistant lines at Arsi Negele, Ethiopia. In 1990, we increased the seed of the ergot resistant lines received from Rwanda and Ethiopia at Kiboko, Kenya and we organized two sets of observation nurseries of the 21 lines to be evaluated in Rwanda and Ethiopia to confirm their stability of resistance.

2.1.7. Drought project: (In collaboration with ARC, Sudan and KARI, Kenya). Diverse early maturing sorghum genotypes (about 1000) were introduced to Kenya from ARC (Sudan), IAR (Ethiopia), ICRISAT (India), KARI (Kenya) and Texas A & M (USA) and were grown at Kiboko research station during the long rains under rainfed conditions. Drought pressure was excellent which gave the ICRISAT sorghum breeder (Dr. S.Z. Mukuru) an opportunity to select 138 genotypes with drought tolerance for that specific environment. The 138 selected genotypes will be included in the preliminary regional observation nurseries in 1991 for evaluation in the lowland dry areas of Ethiopia, Sudan, Kenya, Somalia and Uganda.

2.1.8. Finger millet blast project: (In collaboration with KARI, Kenya). The finger millet collection (about 960) from Katumani genetic resource unit was planted at Kiboko by Dr. S. Mukuru and evaluated for head blast disease. Kiboko is an excellent hot spot location for the expression of head blast disease. A susceptible check from Ethiopia was grown at every tenth row for comparison. The disease expression was quite satisfactory and 250 genotypes were selected with good level of resistance to head blast disease. The 250 selected genotypes will be included in the preliminary regional observation nurseries in 1991 for evaluation in the "hot spot" areas of eastern Africa.

2.2 EARSAM COOPERATIVE REGIONAL YIELD TRIALS

ICRISAT organized two cooperative regional sorghum trials, and one trial each for finger millet and pearl millet. The following are the trials organized and distributed to EARSAM cooperators in eastern Africa for evaluation during the 1989/90 rainy season:

- EARSAM Elite Sorghum Yield Trial-89 (EESYT-89) Lowland
- EARSAM Elite Sorghum Yield Trial-89 (EESYT-89) Intermediate
- EARSAM Elite Finger Millet Yield Trial-89 (EEFMYT-89)
- EARSAM Elite Pearl Millet Yield Trial-89 (EEPMYT-89)

Data were received in March 1990 and were analyzed at ICRISAT Center and the results are shown on Tables 1 to 35. Table 1 describes weather characteristics of locations where EARSAM cooperative trials were tested in 1989/90.

2.2.1 (EESYT-89) - LOWLAND

This trial was sent to 17 locations and only 12 acceptable data for analysis were received. EESYT-89 lowland consisted of 19 sorghum entries from NARS, 4 from ICRISAT and 2 control entries. The controls were Hageen Durra-1, a hybrid sorghum from Sudan and Seredo, an improved and released sorghum cultivar from Uganda. Table 2 shows the entries and their sources of origin. A 5 x 5 simple lattice design with three replications was used.

Analysed yield data of EESYT-89 lowland for individual location are shown in Tables 3 to 14. Combined analyses of 12 locations is shown in Table 15. Location mean yields ranged from 0.76 t ha^{-1} at Gadambalia to 5.39 t ha^{-1} at Mombasa. We observed significant differences among entries at each location for grain yield, plant height and days to 50% flowering. Seredo produced the highest mean yields across 12 locations followed by ICSV 112, CR:35:5 and KAT/83369.

Location mean days to 50% flowering ranged from 57 days at Kiboko to 87 days at Karama while mean plant height ranged from 1.00m at Gadambalia to 2.10m at Mombasa. IS 2284 was the earliest to reach 50% flowering at each location. At Gadambalia severe drought caused significant reduction in yield.

It is important to note that Gadam Hamam and IS 2284 significantly out-yielded HD-1 (hybrid), whereas at Wad Medani the reverse was true. Except at Melkassa in Ethiopia, IS 2284 was among the lowest yielding entries at most locations.

2.2.2 EESYT - INTERMEDIATE

This trial was sent to 11 locations and only 7 acceptable data for analyses were received. EESYT-89 Intermediate consisted of 13 entries from NARS and 3 controls. The controls were two improved cultivars: Seredo and Serena from Uganda and a sorghum hybrid, ICSH 153 (CSH 11) from ICRISAT Center, India. Table 16 shows the entries and their sources of origin. A simple 4 x 4 lattice design with 3 replications was used. Analysed yield data of EESYT-89 Intermediate for individual location are shown in Tables 17 to 27. Combined analyses of 7 locations is shown in Table 28. Location mean yields ranged from 0.93 t ha^{-1} at Rubona to 3.66 t ha^{-1} at Katumani short rains. We observed significant differences among entries at each location for grain yield, plant height and days to 50% flowering. IS 9302 from Ethiopia produced the highest mean yields across 7 locations followed by Nyirakabuye and Amasugi both from Rwanda. These varieties which are adapted to high altitude environments were among the top high-yielding entries at Murongwe, Arsi Negele, Rubona and Katumani short rains. Seed set of all entries except the three varieties mentioned above at Katumani (long rains) was poor due to extremely low temperatures. Seredo, a lowland/intermediate adapted variety performed poorly at Murongwe, Arsi Negele and Rubona but performed well at other locations. Seredo was among the top high-yielding entries at Katumani (short rains), Kiboko (long rains), Kiboko (short rains) and Ukiriguru. Mean days to 50% flowering ranged from 62 days at Kiboko (short rains) to 110 days at Arsi Negele while plant height ranged from 1.26m at Arsi Negele to 1.76m at Kiboko (short rains). Entries tended to be short and late at cool locations and tall and early at warm locations.

It is clear from the data obtained that agroecological zoning in eastern Africa should be refined and preferably based on length of season, temperature and rainfall rather than altitude as we did in the past. For example, Melkassa and Katumani are at about the same altitude above sea level but at critical stages of plant growth minimum temperatures at Katumani (long rains) is much lower than at Melkassa and this causes poor seed setting of lowland adapted sorghums. We suggest the following agroecological zoning (Table 36):

i) Short rainy season, hot and dry.
ii) Int/long rainy season, warm and wet.
iii) Int/long rainy season, cool.

We would then identify suitable improved cultivars for each of the above ecological zones and conduct extensive multilocational testing in each zone to identify adapted cultivars with stable yields.

2.2.3 EEFMYT-89

We distributed 7 sets of EEFMYT-89 trial to EARSAM cooperators and received acceptable data from only 5 locations. A simple 4 x 4 lattice design with 3 replications was used. EEFMYT-89 trial consisted 16 entries from NARS in the region. Table 29 shows the entries and their source of origin.

Analysed yield data of EEFMYT-89 for each location are shown in Tables 30 to 34. Combined analyses of 5 locations is shown in Table 35.

Location mean grain yields ranged from 0.56 t ha^{-1} at Serere, Uganda to 3.08 t ha^{-1} at Alupe, Kenya. We observed significant difference among entries for grain yield, plant height and time to flower at all locations and for head blast resistance at Serere and Alupe. Gule E produced the highest grain mean yields across the 5 locations. Gulu E, P224 and Serere 1 all from Uganda were among the top high-yielding entries at each location. Location mean time to flowering ranged from 65 days at Kabanyolo, Uganda to 87 days at Melkassa, Ethiopia while mean plant height ranged from 67 cm at Katumani, Kenya to 1.10 cm at Alupe, Kenya. Acc # 10007 from Ethiopia was the earliest to flower at all locations. Head blast incidence at Alupe and Serere was high while shoot fly damage was high at Kabanyolo. Entries U 10, P 227 and Engeny were found to have good levels of blast resistance while entries KAT/FM 1, Acc # 100057, Acc # 100008 were least damaged by shoot fly.

2.2.4 EEPMYT-89

We distributed 8 sets of EEPMYT-89 trial to EARSAM cooperators and received no data up to date. However, we received the following explanation from EARSAM cooperators for not sending data for the pearl millet trial:

- Sudan: Severe drought affected the normal development of the plants.
- Uganda: They failed to plant the trial during the long rains (April 1990) and instead the trial was planted in the short rains (August 1990). This delayed the submission of the data.
- Somalia: The trial was planted but due to poor plant establishment, data could not be collected.

- Kenya: The trial was planted and data was collected. The officer in charge, Mr. M'Ragwa, left for U.S.A. for a PhD degree training and did not provide data before leaving. His field assistant cannot trace the data.

- Tanzania: The trial was planted at Ilonga and due to poor germination, no data was collected.

2.3 AGROCLIMATIC ANALYSIS OF EARSAM NETWORK SITES (In collaboration with ICRISAT Center and NARS). A preliminary agroclimatic classification of several EARSAM network sites was developed by Dr. S.M. Virmani (ICRISAT's principal agroclimatoligst). A water balance model for 23 locations based on monthly average rainfall and PE and soil water holding capacity is presented in Table 37. This data-set showed that the average length of the growing season varied from less than 60 days to physiological maturity at locations such as Wad Medani (Sudan), Bonka and Afgoi (Somalia) to 150 days or more at Alemaya (Ethiopia) and Munanira (Burundi). Data presented in Table 37 represents a continnum: one side shows the extreme diversity of the length of growing season, on the other side the sites present a challenge to plant breeders for developing technologies that increase and stabilize sorghum and millet production in the region.

Further water balance studies show that the 23 EARSAM testing sites could be assessed for their relative potential for sorghum production. A plot of maturity classes (days to physiological maturity) and the relative risk of crop failure is shown in Figure 1. It shows that in general, the risk of crop failure in dryland conditions is very high (50-70%) in locations with a length of growing season of 60-70 days. In medium-duration sites (80-100), the relative risk of crop failure due to moisture stress ranges between 20-40%. Areas having a length of growing in excess of 120 days usually provide a secure environment for sorghum production. The relative risk of crop failure is 20% or less.

The testing locations in the EARSAM network can be grouped into 3 classes: a) high risk, short or medium-duration locations where sorghum production can be stabilized only with supplementary irrigation. These locations are No. 4, 11, 12, 5, 10, 16 and 1 (refer to Table 37 for names). b) low risk medium-duration locations (No. 13, 9, 22 and 23) where good soil and water management would allow stable and increased sorghum yields, and c) low risk, long-duration locations (No. 3, 7, 21, 8, 2, 18, 15, 17, 19, 20, 14 and 6) where provision of drainage and fertilizer would be necessary to maintain high sorghum yields. Since these areas are also suited for growing maize, only those areas not suited for maize production in the EARSAM network countries will be devoted to sorghum.

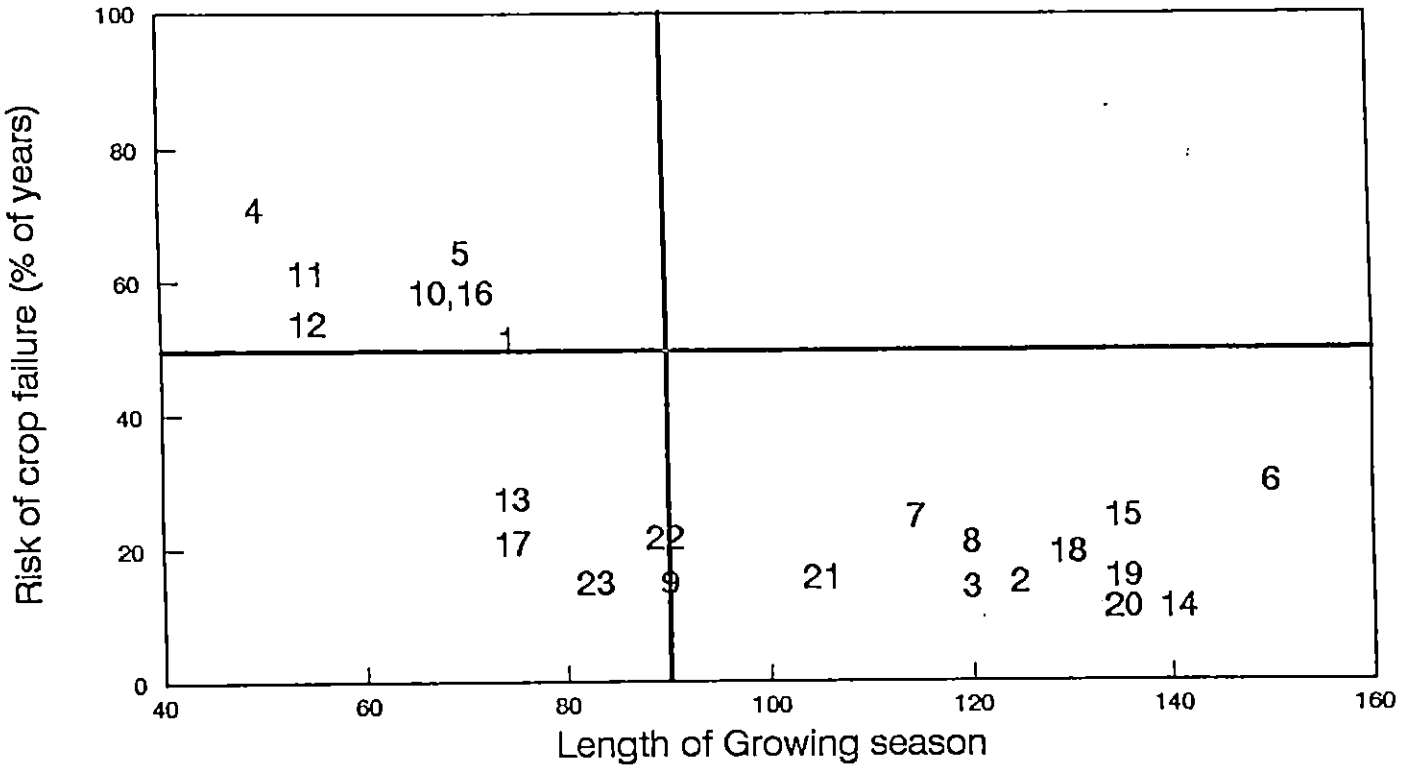

Fig. 1. Length of growing season for various sites

(For site names refer to table 37)

We suggest that in its further phase of expansion, the EARSAM network include one or two locations from each of the different risk clusters. These selected sites could be equipped with automatic weather stations and soil moisture measuring devices for data collection. Collection of such data sets would greatly improve our capability to characterize the EARSAM testing sites more precisely.

2.4 EARSAM GERMPLASM MOVEMENT AND EVALUATION

Germplasm movement and evaluation in the region is an important and integral activity of EARSAM. This topic was thoroughly discussed and minuted by the Steering Committee members in Somalia, July 25, 1988. The model (Figure 2) and format were developed and endorsed. In 1989/90 planting season we organized, evaluated and analysed EARSAM regional advanced elite yield trials. As a follow up under the proposed model, the following experiments in different agroecological zones were agreed upon:

2.4.1 EARSAM Regional Sorghum Preliminary Observation Nursery

Varieties developed by NARS, ICRISAT and other sources were introduced to Kiboko (Kenya) research station for initial evaluation and to increase seed. Promising materials were identified and will be included in the 1990/91 Preliminary Observation Nurseries for evaluation in the following agroecological zones in the region:

2.4.1.1 EARSAM Preliminary Sorghum Observation Nursery (EPSON-1) - 1991. " HOT AND DRY SHORT RAINY SEASON"

The unreplicated one or two row per entry observation nursery will consist of 141 entries plus 6 local checks to be included by each cooperator. The checks will be planted every tenth row of the test entries for comparison. The (EPSON-1)-91 nursery will be evaluated at the following locations in the region:

1) Kiboko (short rains) , Kenya; 2) Kiboko (long rains), Kenya; 3) Katumani (short rains) , Kenya; 4) Marimanti, Kenya; 5) Perkerra , Kenya; 6) Mariakani, Kenya; 7) Bonka, Somalia; 8) Afgoi, Somalia; 9) Jiggiga, Ethiopia; 10) Mieso, Ethiopia; 11) Wad Medani, Sudan; 12) Gadambalia, Sudan; 13) Kotido, Uganda; and 14) Hombolo, Tanzania.

EARSAM regional germplasm movement and evaluation.

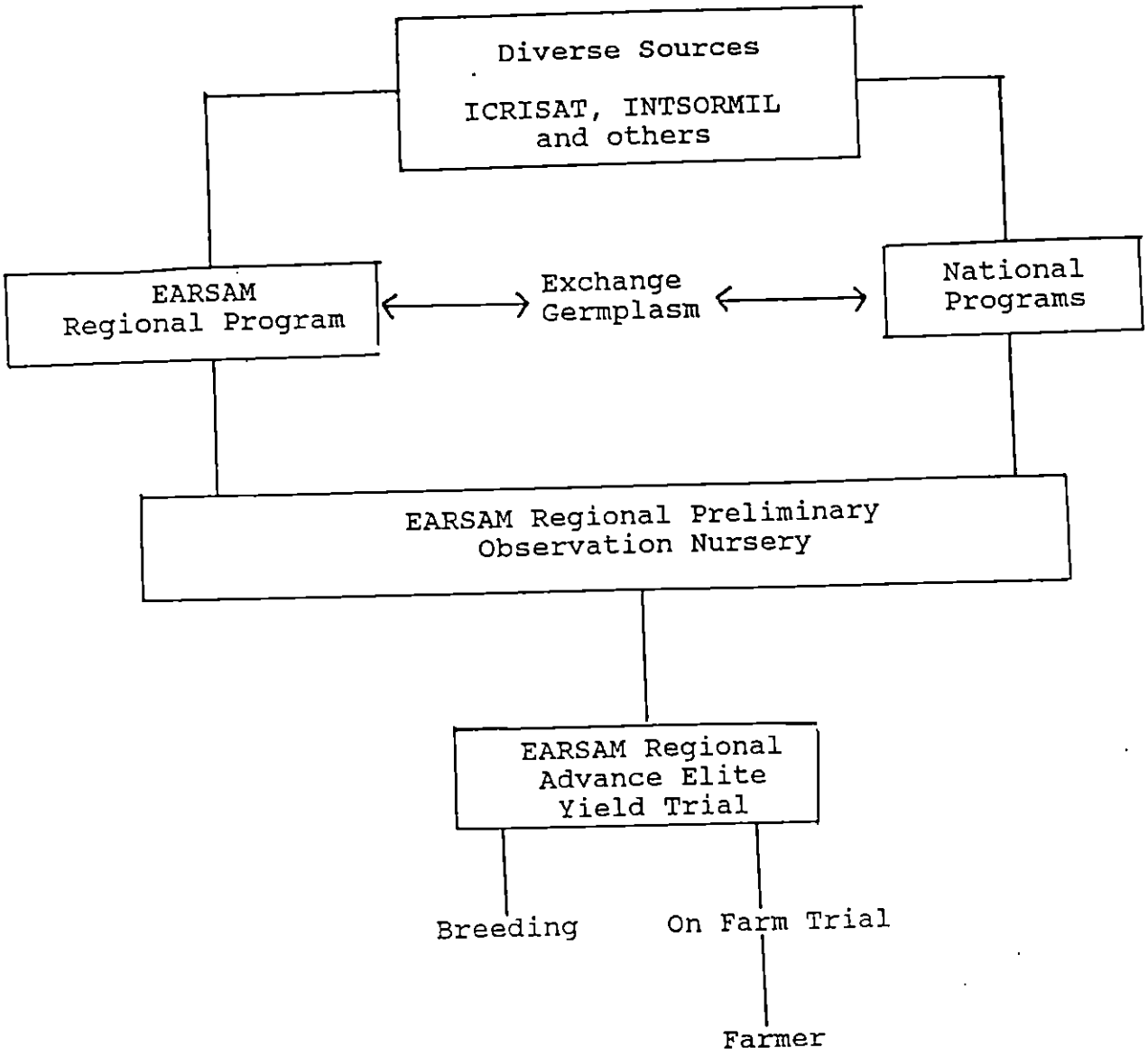

Figure 2

F o r m a t

NURSERY TITLE: EARSAM 1991 SORGHUM A & B LINES OBSERVATION NURSERY

LOCATION: ______________ DATE SOWN : ______________ DATE EMERGED ______________

PLOT NUMBER	ENTRY NUMBER	STAND AFTER THINNING	SEEDLING VIGOUR	SHOOT FLY DAMAGE	STEM BORER DAMAGE	ANTHRACNOSE SCORE	RUST SCORE	LEAF BLIGHT SCORE	STRIGA	TIME TO 50% FLOWERING (DATES)	TIME TO MATURITY (DATES)	PLANT HEIGHT (CM)	PLANT LODGING	GRAIN MOLD SCORE	AGRONOMIC SCORE	GRAIN YIELD SCORE	GRAIN ACCEPTABILITY SCORE	STAND AT HARVEST	BIRD DAMAGE %	OTHER REMAR

2.4.1.2 EARSAM Preliminary Sorghum Observation Nursery (EPSON-2) - 1991. "WARM AND HUMID RAINY SEASON"

The unreplicated one or two row per entry observation nursery will consist of 182 entries plus 6 local checks to be included by each cooperator. The checks will be planted every tenth row of the test entries for comparison. The (EPSON-2)-91 will be evaluated at the following locations in the region:

1) Alupe, Kenya; 2) Mombasa, Kenya; 3) Hombolo, Tanzania; 4) Ukiriguru, Tanzania; 5) Ilonga, Tanzania; 6) Imbo, Burundi; 7) Kirundo, Burundi; 8) Karama, Rwanda; 9) Serere, Uganda; 10) Nazret, Ethiopia; and 11) Wad Medani (irrigated), Sudan.

2.4.1.3. EARSAM Preliminary Sorghum Observation Nursery EPSON-3) - 1991) "COOL RAINY SEASON"

The unreplicated one or two row per entry observation nursery will consist of 86 entries plus 6 local checks to be included by each cooperator. The checks will be planted every tenth row of the test entries for comparison. The (EPSON-3)-91 will be evaluated at the following locations in the region:

1) Katumani (long rains), Kenya; 2) Lanet, Kenya; 3) Naivasha, Kenya; 4) Rubona, Rwanda; 5) Rwerere, Rwanda; 6) Kirundo, Burundi; 7) Mahwa, Burundi; 8) Karengyere, Uganda; 9) Alemaya, Ethiopia; 10) Arsi Negele, Ethiopia; and 11) Gairo, Tanzania.

2.4.1.4 EARSAM Preliminary Finger Millet Blast Disease Resistance Nursery (FMBN) - 1991

The unreplicated one or two row per entry preliminary blast disease nursery will consist of over 200 entries selected for head blast disease resistance at Kiboko long rains in 1990. Two susceptible checks will be planted every 5 row of the test entries for comparison. The (FMBN)-91 will be evaluated at the following "hot spot" blast locations in the region to confirm their stability of resistance:

1) Alupe, Kenya; 2) Katumani (short rains), Kenya; 3) Kiboko (long rains), Kenya; 4) Kiboko (short rains), Kenya; 5) Kakamega, Kenya; 6) Egerton, Kenya; 7) Miwaleni, Tanzania; 8) Serere, Uganda; 9) Kabanyolu, Uganda; and 10) Pawe, Ethiopia.

2.5. SEVENTH EARSAM REGIONAL WORKSHOP

This workshop was held from 25 to 29 June 1990 in Nairobi, Kenya and was attended by scientists from Burundi (2), Ethiopia (6), Kenya (25), Rwanda (4), Sudan (8), Tanzania (4), Uganda (3), ICRISAT (8), SADCC/ICRISAT (3), Global 2000 (3), IDRC (2), Mali (1), UK (1), USA (3) and KARI/MIAC (4).

The main objective of the workshop was to enable the sorghum and millet researchers of the region to participate in peer review of their programme and to continue effectively to disseminate and share research findings and exchange of germplasm. The other objective of the workshop was to inaugurate ICRISAT/SAFGRAD dryland research facilities developed at Kiboko KARI research station and visit the sorghum and millet research plots. The following actions were taken:

A new steering committee, made up of the following members, was elected for the period 1990-1992:

- G.M. Mitawa (Tanzania, Agronomist, Chairman)
- Barnabas N. Mitaru (Kenya, Nutritionist, Secretary)
- Zenon Kabiro (Burundi, Breeder/Agronomist)
- Celestin Sehene (Rwanda, Breeder/Agronomist)
- M.El Hilu Omer (Sudan, Pathologist)
- M. Hashi (Somalia, Breeder)
- Tadesse Mulatu (Ethiopia, Breeder/Agronomist)
- Joseph Oryokot (Uganda, Agronomist)

On June 25th the workshop participants travelled to Kiboko research station to visit field trials and breeding nurseries of sorghum, pearl and finger millet, groundnut and pigeonpea. About 150 people were expected to attend the field day and instead, over 300 persons showed up. These included about 100 people attending the workshop and the others were local dignitaries, farmers, teachers, school children and Kiboko residents. The crops on the experimental fields were in full flower, and the field visits provided an opportunity for EARSAM and KARI (Kenya Agricultural Research Institute) scientists to demonstrate the excellent research cooperation that exists between ICRISAT's experts and KARI scientists.

The inauguration of the Kiboko research station facilities developed by ICRISAT for eastern Africa was chaired by Dr. C. Ndiritu who made introductory remarks and gave background of ICRISAT-KARI cooperation. He said the "cooperation between ICRISAT and NARS was exemplary". OAU/IBAR was represented by Dr. W. Masiga (Director) who pointed out that Kenya has provided scientific environment to ICRISAT and OAU will provide political umbrella to ICRISAT's efforts in Africa. Dr. Taye Bezuneh, Director of Research, SAFGRAD, gave a historical background of SAFGRAD networks in Africa and disclosed that SAFGRAD will be going into the third

phase. Dr. L.D. Swindale (ICRISAT Director General) appreciated the collaboration between ICRISAT and KARI and the political support provided by OAU/SAFGRAD for strengthening research on sorghum, millets and pigeonpea. He appreciated the excellent cooperation extended by KARI and pointed out that today Kenya is a leader in exporting pigeonpea. The District Agricultural Officer, Mr. Salim, assured that the results of experiments at Kiboko will be used by farmers around. The Minister for Science, Research and Technology, the Hon. G. Muhoho could not attend, and was represented by the Deputy Minister, Hon. Dr. Oluoch. The speech of Hon. G. Muhoho was read by Dr. Oluoch. The Minister emphasized his Government's committment to dryland farming research and maintenance of fragile lands of his country.

It was proposed that the 8th Regional Workshop scheduled for 1992 be held in the Sudan, with Ethiopia as alternate host country. A detailed report is written on this regional workshop and is available on request. The proceeding of the workshop will be published in February, 1991.

2.6. EARSAM STEERING COMMITTEE MEETINGS IN 1990

The newly elected EARSAM committee (S.C) members met twice in 1990 to review and evaluate the network activities.

2.6.1 The sixth EARSAM steering committee meeting

The EARSAM steering committee members met on June 29, 1990 in Nairobi, Kenya. The detail minutes of the 6th EARSAM steering committee meeting are documented and are available on request.

The objectives of the meeting were the following:

2.6.1.1 Election of Chairman and Secretary

Dr. Yilma Kebede presided over the elections. Dr. G.M. Mitawa was elected Chairman and Dr. B.N. Mitaru was elected Secretary of the EARSAM Steering Committee.

2.6.1.2. Collaborative Research Projects

The steering committee members discussed, reviewed and evaluated the 7 collaborative projects and agreed that each lead center scientist should sign the project formats and submit progress report for each project.

2.6.1.3 National Research Support

The regional coordinator reported the financial research support presented by each NARS and the total amount of funds remaining. The SC members decided that each country with an on-going collaborative project will be entitled to receive a maximum of 3,500 US dollars per year. Those countries with no collaborative projects but involved in EARSAM activities will be entitled to receive a maximum of 2000 US dollars per year.

2.6.1.4 Germplasm distribution

A set of lowland early maturing sorghum observation nursery was distributed to all countries in the region except Rwanda.

2.6.1.5 Regional short course

The SC members agreed that in 1991 a short course on breeding techniques and data collection and analyses should be organized for EARSAM field technicians.

2.6.2 The seventh EARSAM steering committee meeting

The EARSAM SC members met again from Oct 15 to 17, 1990 in Nairobi, Kenya. The detail minutes of the 7th EARSAM SC meeting are documented and are available on request.

The objectives of the meeting were the following:

2.6.2.1 Confirmation of the sixth SC minutes

The minutes of the sixth EARSAM SC meeting were confirmed as an accurate record of the deliberations of the meeting.

2.6.2.2 Monitoring tour for 1991

The SC members agreed that the monitoring tour will be replaced by monitoring and evaluation working groups. The SC members agreed on the following working groups: a) Striga, b) Smut and ergot, c) Stem borer, d) Drought.

2.6.2.3 Regional short course in 1991

The SC members agreed on the following as regards the short course:

- Date: May 25 to June 10, 1991
- Topics: Practical breeding techniques and data collection and analysis. Fertilizer apllication, insecticides calibration and disease scoring.

2.6.2.4 Collaborative Research Projects

Each project was reviewed and evaluated and new strategies were developed.

2.6.2.5 National research support

The statement of expenditure as of July 1990 was presented by the regional coordinator for discussion. It was agreed that the balance will be used to finance new collaborative projects and purchase of research supplies for national sorghum and millet research.

2.6.2.6 Observation nurseries for 1991

The SC documented and endorsed the following EARSAM sorghum and millet observation nurseries for 1991:

- EARSAM Preliminary Sorghum Observation Nursery (EPSON-1) -1991 for hot and dry short rainy season.
- EARSAM Preliminary Sorghum Observation Nursery (EPSON-2) - 1991 for warm and humid rainy season.
- EARSAM Preliminary Sorghum Observation Nursery (EPSON-3) - 1991 for cool rainy season.
- EARSAM Preliminary Finger Millet Blast Disease Resistance Nursery (FMBN) - 1991.

The SC members discussed the above nurseries in detail and suggested locations for the nurseries in the different countries in the region.

2.6.2.7 Preparation for the 1992 regional workshop in Sudan

The previous regional workshop recommendations were reviewed by the SC members and the following decisions were taken:

- Date : Oct 15-25, 1992
- Theme: Drought
- Venue: Wad Medani, Sudan
- Deadline : for abstracts and titles of papers will be end of January 1992.
- Paper subsmission: end of May, 1992.

A technical sub-committee was nominated to meet in Feb. 1992 to review all abstracts.

2.6.2.8 Niamey SAFGRAD networks meeting - March 1991

SAFGRAD will be organizing a workshop for all SAFGRAD networks scientists to meet in Niamey, Niger, from March 8 to 13, 1991. The SC members considered this meeting as an important event and nominated 4 participants from EARSAM network:

- Dr. A.G.T. Babiker from Sudan to present a paper on striga.
- Dr. B. Mitaru from Kenya to present a paper on food and feed utilization.
- Dr. G. Mitawa from Tanzania to present a paper on EARSAM: Status and achievement.

2.7 EARSAM MONITORING TOUR IN KENYA AND ETHIOPIA

Right after the SC meeting, a monitoring tour was organized to monitor the collaborative research projects with KARI, Kenya and IAR, Ethiopia. The SC members and the SAFGRAD representatives visited the following projects:

2.7.1 Muguga, KARI, Kenya: The group travelled to Muguga on Oct 17, 1990 to monitor the long and covered smuts collaborative projects.

2.7.2 Holeta, IAR, Ethiopia: The group travelled to Ethiopia on Oct 18, 1990 to monitor the striga collaborative project at Holeta research station.

2.7.3 FAFA Food Industry and Food Research Center:

On Oct 18, 1990 in the afternoon, the group visited the FAFA Food Industry and food Research and Development Center.

2.7.4. Nazreth, IAR, Ethiopia:

On Oct 19, the group travelled to Melkassa research station to monitor the following projects:

2.7.4.1 Sorghum improvement program

2.7.4.2 Stem borer project

2.7.4.3 Anthracnose project

2.7.4.4 Utilization project.

A detailed report is written on this monitoring tour and is available on request.

2.8 RESEARCH, TRAVEL AND CONSULTANCY

The regional corrdinator, in 1990, visited the following countries to coordinate and monitor the EARSAM network activities:

2.8.1 Somalia: V.Y. Guiragossian travelled to Somalia, February 18 to 21, 1990 to monitor and follow up the stem borer collaborative research project on sorghum. Visited Afgoi and Baidoa research stations. Research supply support was provided.

2.8.2 Sudan: V.Y. Guiragossian travelled to Sudan, March 15 to 23, 1990 to monitor the execution of the drought and striga research projects. Visited Wad Mednai research station and delivered two sets of the striga trial and received from ARC the most drought tolerant varieties to be increased at Kiboko for distribution to other EARSAM cooperators.

2.8.3 Tanzania: V.Y. Guiragossian and S.Z. Mukuru travelled to Tanzania, April 30 to May 6, 1990 to interact with Global 2000 scientists in Arusha and visited Ilonga and Hombolo research stations to monitor the sorghum improvement program. We also visited Global 2000 on farm sorghum plots in Dodoma.

2.8.4 Burundi: V.Y. Guiragossian travelled to Burundi - August 7 to 10, 1990 to visit ISABU sorghum program. Assisted in the initial organization of the short course training for the extensionist and provided 2500 US dollars to meet the training costs. In addition, research supplies were provided as requested by ISABU for the sorghum program.

2.8.5 Ethiopia: V.Y. Guiragossian travelled to Ethiopia - August 27 to 29 to organize the EARSAM monitoring tour.

2.8.6 Niger: V.Y. Guiragossian travelled to Niamey Sept 24 to Oct 2, 1990 to attend a meeting on ICRISAT's training program and future plans. Presented a paper on "EARSAM training activities in Eastern Africa: Present status and future needs".

2.8.7 Ethiopia: V.Y. Guiragossian travelled to Ethiopia Oct 18 to 21, 1990 with EARSAM SC members to monitor the collaborative projects.

2.8.8 Tanzania: V.Y. Guiragossian will travel to Arusha, Nov. 15 to 18 to visit Miwaleni research station to plant the finger millet observation nursery.

2.8.9 Uganda: V.Y. Guiragossian and S.Z. Mukuru will travel to Uganda Dec 9 to 16, 1990 to organize the sorghum and finger millet planting and attend the National Scientific Conference on Food and Agriculture in Kampala.

2.9 ATTENDANCE OF WORKSHOPS

The regional coordinator attended the following workshops in 1990:

2.9.1 Kenya: V.Y. Guiragossian attended KARI's national conference on plant and animal biotechnology, February 26 to March 3, 1990 in Nairobi, Kenya.

2.9.2 Tanzania: V.Y. Guiragossian and S.Z. Mukuru attended the Global 2000 workshop, April 30 to May 2, 1990 in Arusha. Joint paper on present and future linkages between Global 2000 and EARSAM was presented.

2.9.3 Kenya: V.Y. Guiragossian organized and attended the 7th EARSAM regional workshop June 25 to 29, 1990 in Nairobi, Kenya.

2.9.4 Niger: V.Y. Guiragossian attended the workshop on ICRISAT's training programs and future plans, Sept 27-28, 1990 at ISC, Niamey, Niger, and presented a paper on "EARSAM training activities in Eastern Africa and future needs.

2.9.5 Kenya: V.Y. Guiragossian attended KARI's 2nd annual scientific conference, Sept 5 to 7, 1990, in Nairobi, Kenya.

2.9.6 Kenya: V.Y. Guiragossian attended the PTA workshop for Eastern African states, Sept 3 to 4, 1990.

2.9.7 Uganda: V.Y. Guiragossian and S.Z. Mukuru will attend the National Scientific Conference on Food and Agriculture in Kampala.

3.0 NETWORK PROBLEMS

The EARSAM network faces the following problems:

3.1 Data for the regional pearl millet trials were not received from Sudan, Tanzania, Kenya, Uganda and Somalia. Explanation was provided in section EEPMYT-89 by each country for not sending data. In EARSAM countries, finger millet is the predominant millet. However, pearl millet is important in the Sudan, eastern Kenya and central Tanzania only.

3.2 EESYT-89 lowland sorghum trial was distributed to 17 locations and only 12 acceptable data for analyses were received.

EESYT-89 Intermediate sorghum trial was distributed to 11 locations and only 7 acceptable data for analyses were received.

EEFMYT-89 Finger millet trial was distributed to 7 locations and received acceptable data from only 5 locations.

The following are some of the reasons for not receiving 100% data from cooperators:

- Many missing plots
- Some trials were flooded
- Severe drought

- o Poor management at critical stages
- o Soil variability in the experimental areas
- o Lack of storage facilities and poor handling of harvested materials.

3.3 EARSAM striga regional trial was conducted in striga sick plots for evaluation. The incidence of striga was erratic at several locations and therefore, difficult to confirm resistance.

3.4 Few entries in the trials conducted by EARSAM cooperators did not germinate because of poor seed quality. Therefore, to avoid this problem, it was decided to increase seed of all entries in the trials at one location with proper seed treatment and storage.

3.5 The national programs in general, in EARSAM countries, are weak in extending technologies to farmers. In order to initiate interest and assist NARS in this respect, for example, in Burundi in January 1991, EARSAM will organize a short training course for 15 extensionists to receive practical experience on proper management of sorghum crop at all stages of plant development. As a follow up, the extensionists will transfer these technologies to farmers through numerous on-farm demonstrations of the two released white seeded varieties (Gambella-1107 and Tegemeo) for human consumption.

4.0 FUTURE RESEARCH RECOMMENDATIONS

Future research strategies and priorities were discussed by workshop participants in Nairobi, June 1990 and the following research areas were identified and recommended:

4.1 Breeding

- o Genotypes selected from observation nurseries grown and evaluated at appropriate locations should comprise the entries for the regional yield trials.
- o Based on genotype performance and available meteorological data, the sorghum growing environments should be further classified.
- o Specialized nurseries on diseases, drought, insect, Striga and other problems should be organized when possible.

- Interactions among NARS scientists with similar environments should be strengthened.

- Whenever possible, opportunities should be provided to select NARS scientists to visit EARSAM regional yield trials.

- NARS should make greater effort in moving better varieties to the farmers' fields to increase food production.

- Integration of other disciplines (pathology, entomology, physiology, agronomy, etc.) into breeding should be encouraged for sorghum improvement.

- Provision for further support to a targetted and well-focused breeding project to identify and incorporate Striga resistance in sorghum.

- Emphasis should be placed on techniques and concepts of breeding for grain mold/weathering, and drought resistance as well as utilization of photosensitive material and indigenous cultivars. Adoption of breeding strategies that give due consideration to production under minimum inputs (e.g. fertilizer) should be emphasized.

- Recognition of the need to develop experience in breeding for seed parents and development of hybrids.

- Provision of extra assistance from the regional programme or elsewhere to sustain regional expertise in millet.

4.2 Agronomy and farming systems

- Economists should be included in the research projects at an early stage so that they can also have an input in the experimental design process.

- Socio-economic surveys should be encouraged in the region so that any technology generated is relevant to the problems at the farm level.

- More on-farm research should be encouraged with the participation of policy makers, extension staff, researchers and farmers.

- Agronomic packages which are passed to farmers should be relevant and simple and within the resource base of the farmer.

- The following specific areas of research were identified and recommended:

  i) Rotation and intercropping aspects for soil improvement.

  ii) Water conservation and utilization efficiency through using suitable cultivars of sorghum and millet, water harvesting techniques, early planting dates, etc.

  iii) Crop physiology studies should be encouraged so as to understand the mechanism behind drought tolerance and drought escape and also yield advantages, etc.

- Training beyond the level of researchers should be encouraged to include extensionists and farmers through field days.

4.3 Crop protection

- Strategies already adopted be sustained through effective programme support and coordination.

- Experts in the region be given due recognition and encouragement by strengthening their programmes and involving them in consultance work.

- Develop methodologies and initiate yield loss assessment studies as a basis for prioritizing crop protection.

- Strengthen work on host-plant resistance through germplasm collection and introduction and testing of promising materials throughout the region.

- Initiate and support studies of plant virus diseases and their vectors as well as biotypes of important diseases of the region.

- Work should be started to develop integrated "pest" management and crop production packages for various cropping systems and ecological zones.

- Hot spots should be established for rigorous testing of materials that show promising levels of resistance to pests and diseases. With specific sites to be identified by host countries, the hot spots could be established as follows:

  Downy mildew: Tanzania, Rwanda

  Striga: Sudan, Ethiopia

  Viruses: Kenya, Uganda

Covered smuts:		Somalia, Kenya
Ergot	:	Rwanda, Ethiopia
Song smut	:	Sudan, Kenya
Stem borers	:	Uganda, Ethiopia, Somalia
Head blast of: finger millet		Kenya, Uganda
Anthracnose	:	Ethiopia, Tanzania
Shoot fly	:	Uganda, Tanzania

4.4. Utilization

- A food/feed systems approach is strongly recommended. This should involve collaboration with production, marketing and economic inputs with a view towards practical\application for both industry and small-scale uses.
- Products from sorghum and millets from each country should be demonstrated with their method of preparation.
- Industrialists involved in sorghum and millet in the region should be invited to relevant EARSAM workshops. This will help in the adoption and extension of the research products.
- Collaborative research projects in the region should be further encouraged and improved to include exchange of visits, samples and information among the participating researchers.
- In the spirit of a systems approach to the development of sorghum and millets in the region, representation of different disciplines in the steering committee should be given further consideration.

Table 1. : Weather characteristics at locations where regional cooperative trials were tested in 1989.

LOCATIONS	ALTITUDE (m)	RAINFALL (mm)	MINIMUM TEMP. (°C) Range	MINIMUM TEMP. (°C) Mean	MAXIMUM TEMP. (°C) Range	MAXIMUM TEMP. (°C) Mean	CROPPING SEASON (Months)
MOMBASA	12	992		22.0		25.8	4 - 8
WAD MEDANI	400	219	19.3-25.1	22.3	31.0-40.9	37.3	7 - 12
BAIDOA	420	350	19.0-23.0	20.7	26.0-37.5	30.6	4 - 8
GADAMBALIA	-	-	-	-	-	-	8 - 12
ILONGA	500	599	15.0-22.9	19.9	22.6-36.2	29.0	3 - 8
IMBO	830	805	13.4-21.4	18.9	22.4-33.2	30.4	2 - 7
KIBOKO (LR)	950	284	9.2-18.9	16.9	24.0-33.6	28.9	3 - 7
KIBOKO (SR)	950	641	13.5-24.0	17.8	24.5-32.4	28.7	11 - 3
KABANYOLO	1030	-	-	-	-	-	4 - 8
HOMBOLO	1037	588	13.4-20.0	18.0	24.0-32.6	30.4	1 - 6
SERERE	1140	-	-	17.2	-	28.0	3 - 7
ALUPE	1170	1507	15.6-18.7	16.3	24.0-32.9	30.8	3 - 7
UKIRIGURU	1236	665	11.5-18.5	16.3	21.4-32.5	27.1	1 - 5
KARAMA	1347	522	10.5-17.5	15.0	20.5-31.6	26.6	1 - 6
MURONGWE	1470	848	7.6-16.6	12.4	22.0-29.6	26.6	1 - 8
MELKASSA	1500	581	7.4-17.8	14.4	20.8-35.0	28.1	6 - 10
KATUMANI (LR)	1560	285	5.5-14.8	11.4	15.6-27.6	22.5	4 - 9
KATUMANI (SR)	1560	395	10.0-19.2	14.8	20.0-29.1	25.1	11 - 3
RUBONA	1706	783	10.4-16.4	14.1	19.0-27.4	23.6	1 - 6
ARSI NEGELE	1960	-	-	-	-	-	5 - 11

Table 2 : Entries in EARSAM Elite Sorghum Yield Trial - 89 (EESYT-89) Lowland

Entry No.	Entry	Source
1.	5DX 160	Burundi
2.	Dinkmash	Ethiopia
3.	IS 2284	Ethiopia
4.	BTX 629	Ethiopia
5.	M 36121	Ethiopia
6.	KAT/83487	Kenya
7.	KAT/83369	Kenya
8.	Kigufi	Rwanda
9.	1804	Rwanda
10.	PP-290	Somalia
11.	M 90411	Somalia
12.	ICSV 335	ICRISAT
13.	Gadam Hamam	Sudan
14.	CR:35:5	Sudan
15	ICSV 401	ICRISAT
16.	RSAVT-Ent 6	Tanzania
17.	RSAVT-Ent 8	Tanzania
18.	RSAVT-Ent 13	Tanzania
19.	3KX 76/7	Uganda
20.	ICSV 219	ICRISAT
21.	76 T_1 #23 (IS76)	Ethiopia
22.	Framida	Ethiopia
23.	ICSV 112	ICRISAT
24.	Seredo	Control
25.	Hageen Durra1	Control

Appendix Table: 3. Performance of entries in EARSAM Elite Sorghum Yield Trial (EESYT-89) Lowland at Imbo, Burundi, rainy season, 1989

Entry number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flower-ing (days)	Plant Height (m)	Plant Aspect	Disease Score
7	KAT/83369	1.88	157	77	1.63	2	1.50
23	ICSV 112	1.82	152	83	1.53	1	1.58
17	RSAVT-Ent 8	1.62	135	76	1.81	1	2.83
6	KAT/83487	1.62	135	85	1.68	2	1.75
14	CR:35:5	1.60	133	66	1.44	2	1.00
10	PP-290	1.41	117	79	1.47	1	1.11
11	M 90411	1.35	113	87	1.45	1	1.22
21	76 T1#23 (IS76)	1.35	113	77	1.51	2	1.78
9	1804	1.26	105	78	1.49	1	2.00
24	SEREDO	1.24	103	72	1.53	2	2.58
22	FRAMIDA	1.23	103	76	1.56	2	2.86
15	ICSV 401	1.21	101	79	1.63	2	1.64
1	5 DX 160	1.21	101	84	1.60	2	2.61
20	ICSV 219	1.19	100	82	1.61	2	1.64
2	DINKMASH	1.18	99	81	1.61	1	0.84
5	M 36121	1.18	98	66	1.47	3	1.86
13	GADAM HAMAM	1.18	98	71	1.31	2	1.80
4	BTX 629	1.16	97	81	1.16	3	2.78
12	ICSV 335	1.09	91	81	1.59	1	0.84
25	HAGEEN DURRA1	.97	81	85	1.55	2	2.56
18	RSAVT-Ent 13	.87	72	75	1.37	3	2.84
16	RSAVT-Ent 6	.85	71	82	1.54	3	2.19
19	3KX 76/7	.56	47	67	1.41	3	2.75
3	IS 2284	.52	44	61	1.73	5	4.73
8	KIGUFI	.41	35	91	1.91	2	2.06
±:		±.188		±2.7	±0.07	±0.3	±0.25
EAN		1.20		77.6	1.54	2.1	2.05
CV (%)		27		5.9	7.78	23.9	21.07
EFF (%)		107		120.3	116.75	101.2	179.89

Design : Triple lattice (5x5), Net plot size : 7.2 m2
isease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.
lant aspecy score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 4. Performance of entries in EARSAM Sorghum Elite Yield Trial (EESYT-89) Lowland at Melkassa, Ethiopia, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)
24	SEREDO	5.42	202	81	1.65
8	KIGUFI	5.19	193	94	2.27
22	FRAMIDA	4.80	179	74	1.70
14	CR:35:5	4.44	166	77	1.53
13	GADAM HAMAM	4.39	163	71	1.37
7	KAT/83369	3.29	123	81	1.70
3	IS 2284	3.14	117	71	1.80
17	RSAVT-Ent 8	3.11	116	85	1.97
1	5 DX 160	3.11	116	84	1.70
10	PP-290	3.05	114	75	1.32
9	1804	2.99	112	83	1.75
18	RSAVT-Ent 13	2.84	106	73	1.12
4	BTX 629	2.79	104	75	1.10
21	76 T1 #23 (IS 76)	2.58	96	71	1.43
25	HAGEEN DURRA1	2.15	80	73	1.28
2	DINKMASH	2.01	75	72	1.47
20	ICSV 219	1.93	72	72	1.50
15	ICSV 401	1.72	64	72	1.67
5	M 36121	1'41	53	72	1.63
11	M 90411	1.30	49	79	1.42
23	ICSV 112	1.24	46	77	1.50
6	KAT/83487	1.24	46	81	1.67
12	ICSV 335	1.07	40	75	1.50
16	RSAVT-Ent 6	.95	35	86	1.72
19	3KX 76/7	.89	33	74	1.47
SE ±		± .594		± 1.1	±0.06
MEAN		2.68		77.1	1.57
CV (%)		38		2.5	6.64
EFF (%)		97		108.0	99.15

Design : Triple lattice (5x5), Net plot size : 11.25 m2

Appendix Table: 5. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Lowland at Mombasa, Kenya, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)	Plant Aspect
2	DINKMASH	6.42	119	70	2.02	2
7	KAT/83369	6.34	118	64	2.29	1
23	ICSV 112	6.31	117	74	2.23	1
21	76 T1 # 23 (IS 76)	6.17	115	63	1.99	2
20	ICSV 219	6.16	114	71	2.00	1
15	ICSV 401	6.12	114	67	2.07	2
1	5DX 160	5.92	110	70	2.18	2
17	RSAVT-Ent 8	5.91	110	63	2.36	2
9	1804	5.89	109	71	2.26	2
5	M 36121	5.80	108	60	2.43	2
11	M 90411	5.79	107	66	1.77	1
24	SEREDO	5.50	102	61	2.07	2
6	KAT/83487	5.50	102	70	2.41	1
22	FRAMIDA	5.41	100	59	2.30	2
14	CR:35:5	5.38	100	57	1.67	2
12	ICSV 335	5.37	100	72	1.95	2
10	PP-290	5.32	99	66	1.80	1
13	GADAM HAMAM	5.17	96	59	1.36	2
16	RSAVT-Ent 6	5.09	95	63	2.15	3
8	KIGUFI	4.91	91	78	3.34	4
25	HAGEEN DURRA1	4.84	90	66	1.89	3
18	RSAVT-Ent 13	4.44	82	62	1.50	4
19	3KX 76/7	4.21	78	58	1.94	3
4	BTX 629	4.16	77	67	1.47	2
3	IS 2284	2.65	49	57	3.18	4
SE ±		±.371		±1.0	±0.09	±0.2
MEAN		5.39		65.3	2.10	2.0
CV (%)		12		2.5	7.64	20.8
EFF (%)		167		151.8	108.79	100.1

Design : Triple lattice (5x5), Net plot size : 6.0 m2
Plant aspect score on scale of 1 to 5 where 1 = Very good and 2 = Very poor.

Appendix Table: 6. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Lowland at Katumani, Kenya, short rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flower-ing (days)	Plant Height (m)	Plant Aspect	Disease Score
13	GADAM HAMAM	5.35	139	68	1.50	3	2.00
22	FRAMIDA	5.23	136	71	1.57	2	1.00
7	KAT/83369	4.64	210	75	1.73	2	0.94
9	1804	4.59	119	78	1.63	2	1.02
24	SEREDO	4.58	119	77	1.38	2	0.97
25	HAGEEN DURRA1	4.52	117	77	1.48	4	1.29
17	RSAVT-Ent 8	4.49	116	79	1.85	2	1.02
5	M 36121	4.41	114	70	1.63	2	1.30
21	76 T1 # 23 (IS 76)	4.37	113	74	1.42	3	1.61
3	IS 2284	4.29	111	71	1.46	4	1.35
10	PP-290	4.15	108	74	1.36	4	0.98
2	DINKMASH	3.96	103	78	1.64	3	1.05
20	ICSV 219	3.87	200	77	1.55	3	1.03
23	ICSV 112	3.70	96	77	1.62	3	1.03
14	CR:35:5	3.63	94	69	1.46	3	0.98
4	BTX 629	3.49	91	77	1.29	2	0.98
6	KAT/83487	3.33	86	76	1.60	3	0.92
15	ICSV 401	3.26	85	78	1.75	3	1.05
19	3KX 76/7	3.22	83	69	1.56	4	1.03
1	5 DX 160	3.19	83	78	1.43	3	1.06
11	M 90411	3.19	83	81	1.37	3	1.00
12	ICSV 335	3.10	80	78	1.51	4	1.00
16	RSAVT-Ent 6	2.87	74	79	1.56	3	1.03
8	KIGUFI	2.78	72	86	2.05	4	1.02
18	RSAVT-Ent 13	2.22	58	77	1.28	3	1.02
SE ±		±.645		±1.1	±0.07	±0.5	±0.12
MEAN		3.86		75.6	1.55	2.9	1.12
CV (%)		29		2.4	7.31	29.6	19.07
EFF (%)		92		99.9	100.74	105.8	108.50

Design : Triple lattice (5x5), Net plot size : 4.80 m2
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.

Appendix Table: 7. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) at Kiboko, Kenya, long rainy season, 1989

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)
14	CR:35:5	4.33	134	50	1.51
7	KAT/83369	4.10	127	60	1.67
24	SEREDO	4.06	126	59	1.63
10	PP-290	3.95	122	60	1.55
12	ICSV 335	3.90	120	62	1.52
23	ICSV 112	3.88	120	64	1.64
5	M 36121	3.73	115	54	1.56
13	GADAM HAMAM	3.69	114	51	1.25
21	76 T1 #23 (IS 76)	3.66	113	56	1.30
6	KAT/83487	3.55	110	64	1.82
22	FRAMIDA	3.45	107	54	1.65
11	M 90411	3.29	102	63	1.52
25	HAGEEN DURRA1	3.23	100	57	1.52
17	RSAVT-Ent 8	3.18	98	63	1.92
2	DINKMASH	3.15	98	61	1.55
1	5DX 160	3.11	96	64	1.55
20	ICSV 219	3.10	96	61	1.55
15	ICSV 401	2.90	90	61	1.73
18	RSAVT-Ent 13	2.74	85	57	1.29
4	BTX 629	2.58	80	60	1.22
16	RSAVT-Ent 6	2.46	76	58	1.78
19	3KX 76/7	2.40	74	52	1.45
8	KIGUFI	2.33	72	66	2.17
9	1804	2.26	70	63	1.63
3	IS 2284	1.83	57	46	1.84
SE ±		±.316		± 0.5	±0.05
MEAN		3.23		58.6	1.59
CV (%)		17		1.6	5.60
EFF (%)		115		95.2	93.43

Design : Triple lattice (5x5), Net plot size : 4.80 m2

Appendix Table: 8. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Lowland at Kiboko, Kenya, short rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% flowering (days)	Plant Height (m)	Plant Aspect
6	KAT/83487	5.41	135	61	1.94	1
5	M 36121	5.23	131	48	1.80	1
23	ICSV 112	5.22	131	62	1.77	2
15	ICSV 401	5.03	126	61	1.73	2
7	KAT/83369	5.02	126	60	1.92	1
21	76 T1 #23 (IS 76)	4.81	121	51	1.51	3
20	ICSV 219	4.78	120	61	1.66	2
12	ICSV 335	4.71	118	62	1.65	2
14	CR:35:5	4.71	118	50	1.51	2
22	FRAMIDA	4.31	108	52	1.89	3
11	M 90411	4.17	105	64	1.53	2
10	PP-290	4.16	104	60	1.55	2
24	SEREDO	4.12	103	61	1.72	3
25	HAGEEN DURRA 1	4.05	102	57	1.50	3
19	3KX 76/7	3.89	97	49	1.45	3
2	DINKMASH	3.66	97	61	1.71	3
13	GADAM HAMAM	3.59	90	51	1.24	2
4	BTX 629	3.44	86	61	1.22	3
3	IS 2284	3.42	86	43	2.08	4
17	RSAVT-Ent 8	3.35	84	63	1.96	3
9	1804	3.28	82	66	1.86	4
16	RSAVT-Ent 6	3.04	76	55	1.45	4
1	5DX 160	3.01	75	66	1.84	4
18	RSAVT-Ent 13	2.63	66	52	1.30	4
8	KIGUFI	.52	13	79	2.26	5
SE ±		±.456		±0.8	±0.05	±0.3
MEAN		3.99		57.1	1.68	2.6
CV (%)		20		2.4	5.62	21.6
EFF (%)		113		90.4	115.12	103.1

Design : Triple lattice (5x5), Net plot size : 4.80 m2
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 9. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Lowland at Baidoa, Somalia, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% flowering (days)		Plant Height (m)	Plant Aspect
12	ICSV 335	2.84		152	69	1.52	1.33
10	PP-290	2.54		135	64	1.52	1.67
4	BTX 629	2.33		125	69	1.17	2.33
13	GADAM HAMAM	2.31		123	57	1.37	2.00
25	HAGEEN DURRA 1	2.25		120	70	1.43	2.17
24	SEREDO	2.33		119	67	1.57	1.67
20	ICSV 219	2.20		118	65	1.52	2.33
2	DINKMASH	2.19		117	70	1.50	2.17
5	M 36121	2.03		109	62	1.85	1.67
14	CR:35:5	1.99		106	57	1.50	1.33
23	ICSV 112	1.89		101	70	2.45	1.33
9	1804	1.88		101	74	1.43	1.83
8	KIGUFI	N/D		N/D	N/D	N/D	N/D
7	KAT/83369	1.84		99	67	1.62	1.67
19	3 KX 76/7	1.81		97	60	1.60	2.33
6	KAT/83487	1.78		95	73	1.45	1.33
18	RSAVT-Ent 13	1.66		89	64	1.32	2.67
15	ICSV 401	1.63		87	61	1.67	1.33
22	FRAMIDA	1.50		80	69	1.63	2.50
16	RSAVT-Ent 6	1.49		80	69	1.38	2.50
17	RSAVT-Ent 8	1.40		75	69	1.65	1.67
11	M 90411	1.39		74	69	1.33	1.83
21	76 T1 #23 (IS 76)	1.31		70	60	1.43	1.83
3	IS 2284	1.26		67	56	2.07	2.83
1	5 DX 160	1.23		66	73	1.52	2.50
SE±		±.147			±0.69	±0.06	±0.34
MEAN		1.87			66	1.52	1.95
CV (%)		14			1.8	6.59	30.02

Design : RBD Analysis (Entry # & Missing) ; Net plot size : 6.0 m2
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.
N/D = No Data Produced

Appendix Table: 10. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Lowland at Gadambalia, Sudan, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Plant Height (m)	Plant Aspect
13	GADAM HAMAM	1.69	223	1.32	1.00
3	IS 2284	1.61	212	1.62	1.67
14	CR:35:5	1.08	143	1.17	3.00
6	KAT/83487	1.08	143	1.05	4.33
11	M 90411	.94	124	1.15	2.67
25	HAGEEN DURRA 1	.94	124	1.20	3.33
5	M 36121	.92	121	1.30	3.67
21	76 T1 # 23 (IS 76)	.92	121	1.17	3.33
18	RSAVT-Ent 13	.86	113	1.07	4.00
7	KAT/83369	.86	113	1.27	4.33
10	PP-290	.78	102	1.12	4.33
8	KIGUFI	N/D	100	0.87	5.00
15	ICSV 401	.75	99	1.23	3.00
1	5DX 160	.67	88	1.08	5.00
20	ICSV 219	.67	88	1.07	4.00
19	3KX 76/7	.64	84	1.25	3.67
12	ICSV 335	.63	82	1.13	4.00
24	SEREDO	.61	80	1.18	3.33
22	FRAMIDA	.47	62	1.20	3.67
23	ICSV 112	.47	62	1.10	5.00
2	DINKMASH	.44	58	1.07	3.67
9	1804	.42	55	0.92	5.00
17	RSAVT-Ent8	.42	55	1.30	3.33
16	RSAVT-Ent 6	.25	33	1.18	4.33
4	BTX 629	.17	22	1.05	4.33
SE±		±.199		±0.07	±0.54
MEAN		.76		1	3.72
CV (%)		45		10.1	25.36

Design : RBD Analysis (Entry # 8 Missing)
Net Plot size : 6.0 m2
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.
N/D = No Data Produced

Appendix Table: 11. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) at Wad Medani, Sudan, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)	Plant Aspect
25	HAGEEN DURRA 1	5.27	161	65	1.56	1
23	ICSV 112	5.06	155	80	1.66	1
15	ICSV 401	4.90	150	66	1.76	2
2	DINKMASH	4.85	149	69	1.59	2
11	M 90411	4.79	147	72	1.53	2
12	ICSV 335	4.59	140	75	1.68	2
6	KAT/83487	4.44	136	75	1.89	2
14	CR:35:5	4.34	133	79	1.74	2
13	GADAM HAMAM	3.89	119	80	1.54	2
4	BTX 629	3.84	118	70	1.31	2
20	ICSV 219	3.61	111	73	1.61	3
5	M 36121	3.56	109	71	1.92	3
21	76 T1 # 23 (IS 76)	3.02	92	69	1.54	3
16	RSAVT-Ent 6	3.00	92	71	1.76	3
3	IS 2284	2.90	89	69	2.75	5
24	SEREDO	2.82	86	73	2.06	4
18	RSAVT-Ent 13	2.49	76	70	1.17	4
9	1804	2.47	76	87	1.76	4
19	3KX 76/7	2.40	73	80	1.77	4
10	PP-290	2.31	71	75	1.51	3
1	5DX 160	1.93	59	90	2.24	5
7	KAT/83369	1.80	55	85	2.44	3
22	FRAMIDA	1.77	54	85	2.27	4
17	RSAVT-Ent 8	1.12	43	86	2.32	4
8	KIGUFI	.50	15	76	2.53	4
SE±		±.413		±0.9	±0.08	±0.6
MEAN		3.27		75.6	1.84	2.9
CV (%)		22		2.1	7.97	38.8
EFF (%)		122		100.2	100.55	94.5

Design : Triple lattice (5x5), Net plot size : 8.0 m2
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 12. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Lowland at Hombolo, Tanzania, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flower-ing (days)	Plant Height (m)
1	5dx 160	4.58	156	82	1.57
9	1804	4.22	144	81	1.58
23	ICSV 112	4.04	138	77	1.54
24	SEREDO	3.82	131	78	1.54
6	KAT/83487	3.47	118	81	1.44
17	RSAVT-Ent 8	3.38	115	79	1.56
7	KAT/83369	3.33	114	78	1.64
2	DINKMASH	3.16	108	78	1.46
14	CR:35:5	3.11	106	70	1.33
20	ICSV 219	3.00	102	78	1.57
16	RSAVT-Ent 6	3.00	102	67	1.58
22	FRAMIDA	2.98	102	73	1.51
19	3KX 76/7	2.96	101	69	1.43
15	ICSV 401	2.91	99	68	1.50
4	BTX 629	2.89	99	79	2.25
25	HAGEEN DURRA 1	2.89	99	80	1.84
13	GADAM HAMAM	2.78	95	64	1.25
18	RSAVT-Ent 13	2.67	91	71	1.42
11	M 90411	2.36	80	78	1.47
12	ICSV 335	2.31	79	81	1.33
21	76 T1 # 23 (IS 76)	2.22	76	68	1.26
8	KIGUFI	2.00	68	71	1.50
3	IS 2284	1.98	68	64	1.64
5	M 36121	1.67	57	73	1.52
10	PP-290	1.47	50	81	1.27
SE ±		±.321		±2.4	±0.12
MEAN		2.93		74.9	1.48
CV (%)		19		5.5	14.15
EFF (%)		98		117.0	103.27

Design : Triple lattice (5x5), Net plot size : 7.50 m2

ppendix Table: 13. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Lowland at Ilonga, Tanzania, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)	Plant Aspect	Disease Score Grey Leaf Spot	
1	5DX 160	2.67	154	71	1.84	1	3.33	4.47
12	ICSV 335	2.66	154	75	1.83	1	1.83	2.83
8	KIGUFI	2.51	145	87	2.20	2	2.83	4.18
20	ICSV 219	2.47	143	72	1.80	1	1.67	1.41
9	1804	2.43	141	71	1.83	1	5.00	4.67
2	DINKMASH	2.20	127	72	1.78	1	2.00	2.82
23	ICSV 112	2.16	125	76	1.69	1	2.67	3.02
10	PP-290	2.05	118	69	1.51	3	5.00	1.43
6	KAT/83487	2.00	115	70	1.82	1	3.83	2.21
17	RSAVT-Ent 8	1.92	111	69	1.79	2	5.00	4.42
24	SEREDO	1.82	105	60	1.53	2	4.67	3.52
11	M 90411	1.68	97	72	1.59	2	2.33	2.30
15	ICSV 401	1.63	94	67	1.62	2	2.00	3.39
7	KAT/83369	1.61	93	68	1.61	2	4.67	3.50
22	FRAMIDA	1.55	90	61	1.73	3	5.00	3.90
25	HAGEEN DURRA 1	1.55	89	69	1.56	2	4.33	4.90
14	CR:35:5	1.49	86	60	1.50	2	4.00	2.07
16	RSAVT-Ent 6	1.34	78	69	1.54	3	4.67	4.73
13	GADAM HAMAM	1.34	77	59	1.40	2	5.00	3.19
4	BTX 629	1.22	70	69	1.29	3	5.00	4.14
21	76 T1 # 23 (IS 76)	1.21	70	60	1.51	2	4.33	4.67
18	RSAVT-Ent 13	1.21	70	67	1.29	4	5.00	4.79
5	M 36121	1.18	68	60	1.61	3	4.00	3.74
19	3KX 76/7	.71	41	60	1.48	3	4.83	3.90
3	IS 2284	.63	36	54	1.97	4	5.00	4.29
SE ±		±.196		±1.3	±0.04	±0.3	±0.65	±0.70
MEAN		1.73		67.4	1.65	2.1	3.92	3.54
CV (%)		20		3.3	4.40	21.6	28.51	34.01
EFF (%)		104		97.0	86.94	120.1	99.13	104.25

Design : Triple lattice (5x5), Net plot size : 7.50 m2
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.

Appendix Table: 14. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Lowland at Karama, Rwanda, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)	Plant Aspect	Disease Score (Rust)	(Leaf Blight)
1	5DX 160	3.82	251	88	1.43	3	3.37	2.00
8	KIGUFI	3.74	246	105	1.97	3	2.14	1.33
9	1804	3.10	203	88	1.37	3	4.07	2.33
24	SEREDO	2.35	155	80	1.08	3	2.73	1.67
17	RSAVT-Ent 8	2.10	138	82	1.63	3	4.15	4.00
12	ICSV 335	1.93	127	83	1.20	3	3.54	1.33
20	ICSV 219	1.72	113	83	1.18	4	3.27	1.33
22	FRAMIDA	1.61	106	67	1.22	4	4.05	3.00
15	ICSV 401	1.57	103	83	1.06	4	3.15	1.67
25	HAGEEN DURRA 1	1.48	97	83	1.07	5	3.67	2.00
13	GADAM HAMAM	1.45	95	70	1.02	3	3.98	2.33
10	PP-290	1.43	94	81	1.07	4	3.00	1.67
2	DINKMASH	1.39	92	81	1.11	4	2.68	1.67
21	76 T1 # 23 (IS 76)	1.38	91	79	1.00	4	2.94	1.33
19	3KX 76/7	1.31	86	67	1.09	4	4.15	1.67
5	M 36121	1.16	76	70	0.97	4	2.70	1.33
18	RSAVT-Ent 13	1.11	73	86	1.37	5	4.58	1.67
7	KAT/83369	1.06	70	81	1.21	4	2.37	1.67
14	CR:35:5	.86	56	76	1.10	4	2.30	1.33
23	ICSV 112	.77	50	77	1.10	4	2.84	2.00
6	KAT/83497	.76	50	93	1.19	4	1.88	2.00
4	BTX 629	.75	49	80	0.94	4	3.05	4.33
11	M 90411	.73	48	83	1.18	5	2.67	2.33
3	IS 2284	.29	19	66	1.22	5	3.47	1.33
16	RSAVT-Ent 6	.17	11	98	1.36	3	2.94	1.33
SE ±		±.320		±3.1	±0.09	±0.4	±0.34	±0.36
MEAN		1.52		81.2	1.21	3.9	3.19	1.95
CV (%)		37		6.7	12.58	19.1	18.57	31.82
EFF (%)		107		99.4	100.85	96.0	142.91	88.18

Design : Triple lattice (5x5), Net plot size : 6.0 m2
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible

Table 15: Mean Grain Yields (t ha-1) of entries in the EARSAM Elite Sorghum Yield Trial (EEYST-89)[1] Lowland at 12 locations in eastern Africa, rainy seasons. 1989.

ENTRY	[2] MEAN	IMBO BURUNDI	MELKASSA ETHIOPIA	KATUMANI (SR) KENYA	KIBOKO (LR) KENYA	KIBOKO (SR) KENYA	MOMBASA KENYA	KARAMA RWANDA	BAIDOA[3] SOMALIA	GADAMBALIA[3] SUDAN	WAD MEDANI SUDAN	HOMBOLO TANZANIA	ILONGA TANZANIA
SERODO	3.57	1.24 (10)[4]	5.42 (1)	4.58 (5)	4.06 (3)	4.12 (13)	5.50 (12)	2.35 (4)	2.23 (6)	.61 (18)	2.82 (16)	3.82 (4)	1.82 (11)
ICSV 112	3.42	1.82 (2)	1.24 (20)	3.70 (14)	3.87 (6)	5.22 (3)	6.31 (3)	.77 (20)	1.89 (11)	.47 (20)	5.06 (2)	4.04 (3)	2.16 (7)
CR:35:5	3.39	1.60 (5)	4.44 (4)	3.63 (15)	4.33 (1)	4.71 (9)	5.38 (15)	.86 (19)	1.99 (10)	1.08 (3)	4.34 (8)	3.11 (9)	1.49 (17
KAT/83369	3.31	1.88 (1)	3.29 (6)	4.64 (3)	4.10 (2)	5.02 (5)	6.34 (2)	1.05 (18)	1.84 (14)	.86 (10)	1.80 (22)	3.33 (7)	1.61 (14
GADAM HAKAH	3.28	1.18 (17)	4.39 (5)	5.35 (1)	3.69 (8)	3.59 (17)	5.17 (18)	1.45 (11)	2.31 (4)	1.69 (1)	3.89 (9)	2.78 (17)	1.34 (19
5DX 160	3.25	1.21 (13)	3.11 (8)	3.19 (20)	3.11 (16)	3.01 (23)	5.92 (7)	3.82 (1)	1.23 (25)	.67 (14)	1.93 (21)	4.58 (1)	2.67 (1)
1804	3.25	1.26 (9)	2.99 (10)	4.59 (4)	2.26 (24)	3.28 (21)	5.89 (9)	3.09 (3)	1.88 (12)	.42 (22)	2.47 (18)	4.22 (2)	2.43 (5)
FRAMIDA	3.24	1.23 (11)	4.80 (3)	5.26 (2)	3.45 (11)	4.31 (10)	5.41 (14)	1.62 (8)	1.50 (19)	.47 (19)	1.77 (23)	2.98 (12)	1.55 (15
DINKMASH	3.22	1.18 (15)	2.01 (15)	3.97 (12)	3.15 (15)	3.86 (16)	6.42 (1)	1.39 (13)	2.19 (8)	.44 (21)	4.85 (4)	3.16 (8)	2.20 (6)
ICSV 219	3.18	1.19 (14)	1.93 (16)	3.87 (13)	3.10 (17)	4.78 (7)	6.16 (5)	1.72 (7)	2.20 (7)	.67 (15)	3.61 (11)	3.00 (10)	2.47 (4)
KAT/83487	3.13	1.62 (4)	1.24 (21)	3.31 (17)	3.55 (10)	5.41 (1)	5.50 (13)	.76 (21)	1.78 (16)	1.08 (3)	4.44 (7)	3.47 (5)	2.00 (9)
ICSV 401	3.13	1.21 (12)	1.72 (17)	3.26 (18)	2.90 (18)	5.03 (4)	6.12 (6)	1.57 (9)	1.63 (18)	.75 (13)	4.90 (3)	2.91 (14)	1.63 (13
76 T1 #23	3.08	1.35 (8)	2.58 (13)	4.37 (9)	3.66 (9)	4.81 (6)	6.17 (4)	1.38 (14)	1.31 (23)	.92 (8)	3.02 (13)	2.22 (21)	1.21 (21
ICSV 335	3.07	1.09 (19)	1.07 (22)	3.10 (21)	3.90 (5)	4.71 (8)	5.37 (16)	1.93 (6)	2.84 (1)	.63 (17)	4.59 (6)	2.31 (20)	2.66 (2)
RSAVT - Ent 8	3.02	1.62 (3)	3.11 (8)	4.49 (7)	3.18 (14)	3.35 (20)	5.91 (8)	2.10 (5)	1.40 (21)	.42 (23)	1.12 (24)	3.38 (6)	1.92 (10
M 36121	2.93	1.18 (16)	1.42 (18)	4.41 (8)	3.73 (7)	5.23 (2)	5.80 (10)	1.16 (16)	2.03 (9)	.92 (7)	3.56 (12)	1.67 (24)	1.18 (23
PP - 290	2.93	1.14 (6)	3.05 (9)	4.15 (11)	3.95 (4)	4.16 (12)	5.32 (17)	1.43 (12)	2.52 (2)	.78 (11)	2.31 (20)	1.47 (25)	2.05 (8)
M 90411	2.87	1.35 (7)	1.30 (19)	3.19 (20)	3.29 (12)	4.17 (11)	5.79 (11)	.73 (23)	1.39 (22)	.94 (5)	4.79 (5)	2.36 (19)	1.68 (12
BTX 629	2.63	1.16 (18)	2.79 (12)	3.49 (16)	2.58 (20)	3.44 (18)	4.16 (24)	.75 (22)	2.33 (3)	.17 (25)	3.84 (10)	2.89 (15)	1.22 (20
KIGUFI	2.49	.41 (25)	5.19 (2)	2.78 (23)	2.33 (23)	.52 (25)	4.91 (20)	3.74 (2)	0	0	.50 (25)	2.00 (22)	2.51 (3)
RSAVT - Ent 13	2.32	.87 (21)	2.84 (11)	2.22 (24)	2.74 (19)	2.63 (24)	4.40 (22)	1.11 (17)	1.66 (17)	.86 (9)	2.49 (17)	2.67 (18)	1.21 (22
RSAVT - Ent 6	2.28	.85 (22)	.95 (23)	2.87 (22)	2.46 (21)	3.04 (22)	5.09 (19)	.17 (25)	1.49 (20)	.25 (24)	3.00 (14)	3.00 (11)	1.34 (18
3KX 76/7	2.25	.56 (23)	.89 (24)	3.22 (19)	2.40 (22)	3.89 (15)	4.21 (23)	1.31 (15)	1.81 (15)	.64 (16)	2.40 (19)	2.96 (13)	.71 (20
IS 2284	2.17	.52 (24)	3.14 (7)	4.29 (10)	1.83 (25)	3.42 (19)	2.65 (25	.29 (24)	1.26 (24)	1.61 (2)	2.90 (15)	1.98 (23)	.63 (25
HAGEEN DURA-1	3.10	.97 (20)	2.15 (14)	4.52 (6)	3.23 (13)	4.05 (14)	4.84 (21)	1.48 (10)	2.25 (5)	.94 (6)	5.27 (1)	2.89 (16)	1.55 (16
SE	.129	.188	.595	.645	.316	.457	.371	.321	.148	.199	.413	.321	.196
TRIAL MEAN	2.98	1.20	2.68	3.86	3.23	3.99	5.39	1.52	1.87	.76	3.27	2.93	1.73
CV (%)		27	38	29	17	20	12	37	14	45	22	19	20

1 Triple Lattice (5x5) design. Net Plot size ranged from 4.8 m to 11.25 m.

2 Mean yield excludes yields at Baidoa, Somalia and Gadambalia, Sudan.

3 RBD Analysis used. No yield data of Kigufi at Baidoa, Somalia and Gadambalia, Sudan.

4 Entry ranking at each location in parenthesis

Table 16 : Entries in the EARSAM Elite Sorghum Yield Trial - 89 (EESYT-89) Intermediate

Entry No.	Entry	Source
1.	82 HPYT-# 6	Ethiopia
2.	85 MW 5340	Ethiopia
3.	85 BK 6136	Ethiopia
4.	84 MK/4/38	Ethiopia
5.	IS 8193	Kenya
6.	Amasugu	Rwanda
7.	Nyirakabuye	Rwanda
8.	TSX 183/2/2/1/1	Tanzania
9.	TSX 142/6/2/1/3	Tanzania
10.	4MS 27/101	Uganda
11.	4MX 11/9/2	Uganda
12.	IS 9302	Ethiopia
13.	3ZX 379/2	Uganda
14.	Seredo	Control
15.	Serena	Control
16.	ICSH 153 (CSH11)	Control

ppendix Table: 17. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Intermediate at Murongwe, Burundi, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)	Plant Aspect	Disease Score (Ergot)
7	NYIRAKABUYE	2.57	177	103	2.02	2.0	3.0
12	IS 9302	2.27	158	100	1.80	1.3	2.6
6	AMASUGI	2.05	141	90	2.17	1.0	2.0
5	IS 8193	1.69	117	89	1.63	1.0	2.0
2	85 MW 5340	1.61	111	110	1.55	1.0	2.3
14	SEREDO	1.55	107	132	1.43	3.0	3.6
3	85 BK 6136	1.41	97	108	1.54	2.3	2.6
10	4MX 27/101	1.34	92	82	1.21	2.0	3.0
4	84 MK/4/38	1.24	85	132	1.55	1.0	2.0
11	4MX 11/9/2	1.20	83	88	1.46	1.3	2.3
15	SERENA	1.18	82	86	1.42	4.0	4.0
1	82 HPYT-# 6	1.03	71	104	1.99	2.0	2.6
13	3ZX 379/2	.78	54	88	1.14	5.3	4.0
9	TSX 142/6/2/1/3	.38	26	86	1.35	5.0	5.0
SE ±		± .230		±1.12	±0.14	±0.52	±0.30
MEAN		1.45		100.0	1.59	2.31	2.95
CV (%)		28		1.9	15.72	38.83	17.69

Design : RBD analysis with 14 entries (entry #8 and 6 field data were missing)
Net plot size : 6.0 m2
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 18 Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) at Melkassa, Ethiopia short rainy season, 1989/90.

Entry Number	Entry Name	Grain Yield t ha-1	Grain Yield % of trial mean	Time to 50% Flowering (d)	Plant height (m)
2	ACC # 100008	2265.64	164	77	1.04
4	KAT/FM-1	2079.38	151	84	1.10
15	SERERE CROSS 14-4	2065.10	150	90	1.03
9	GULU E	2050.24	149	91	1.06
1	ACC # 100007	1780.46	129	76	0.95
10	P 224	1555.38	113	92	1.05
7	SERERE 1	1535.92	111	91	0.93
14	ENDING	1473.89	107	89	0.96
3	ACC # 100057	1365.18	99	86	0.99
8	ENGENY	1331.25	96	93	0.98
12	SERERE CROSS 18-44	1098.29	80	92	0.88
16	SERERE CROSS 25-8	1053.83	76	92	0.93
13	SERERE CROSS 10	1005.29	73	96	0.97
5	IKHULULE	604.24	44	93	0.95
6	P 227	499.21	36	93	0.84
11	U 10	316.71	23	100	0.92
SE+/-		281.33		1.4	0.04
MEAN		1380.00		89.6	0.97
CV (%)		35.31		2.6	7.96
EFF (%)		105.95		100.5	117.82

Design : Triple lattice (4x4), Net plot size : 7.5 m2

Appendix Table: 19. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Intermediate at Arsi Negel, Ethiopia, rainy season, 1989.

ıtry umber	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flower-ing (days)	Plant Height (m)	Plant Aspect	Disease Score (Ergot)	(Stem borer)
12	IS 9302	5.02	283	117	1.52	1.50	2.33	1.32
6	AMASUGI	5.52	254	111	2.00	2.50	1.50	1.08
7	NYIRAKABUYE	3.33	188	112	2.02	2.17	1.17	1.22
1	82 HPYT-# 6	3.17	179	125	1.10	2.67	3.33	2.59
3	85 BK 6136	2.82	159	127	1.23	2.83	3.33	3.05
4	84 MK/4/38	2.69	152	152	1.13	3.83	3.50	2.79
2	85 MW 5340	1.54	87	137	1.18	3.17	3.50	2.41
10	4MX 27/101	1.07	60	92	1.03	4.00	3.50	2.91
13	3ZX 379/2	.96	54	107	0.95	4.17	3.33	2.14
5	IS 8193	.73	41	96	1.28	4.00	2.50	1.55
14	SEREDO	.66	37	102	1.32	3.67	1.17	1.51
15	SERENA	.56	32	92	1.05	4.33	1.00	1.25
11	4MX 11/9/2	.40	23	108	1.17	4.00	4.33	1.81
9	TSX 142/6/2/1/3	.37	21	103	1.28	3.67	4.50	2.95
16	ICSH 153 (CSH 11)	.30	17	99	1.17	5.00	4.33	1.99
8	TSX 183/2/2/1/1	.26	15	107	0.78	4.00	2.67	3.09
ıE ±		±.447		±0.9	0.10	0.2	0.36	0.35
.IEAN		1.77		110.7	1.26	3.5	2.88	2.10
CV (%)		44		1.5	13.17	11.2	21.55	28.87
ıFF (%)		88		77.9	83.08	98.8	90.08	158.44

Design : Triple lattice (4x4), Net plot size : 7.50 m2
Disease and Insect score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 20. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Intermediate at Kiboko, Kenya, Long rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)
14	SEREDO	3.79	135	58	1.62
16	ICSH 153 (CSH 11)	3.57	127	61	1.85
8	TSX 183/2/2/1/1	3.34	119	62	1.19
15	SERENA	3.27	116	56	1.46
5	IS 8193	2.6	116	60	1.67
9	TSX 142/6/2/1/3	3.22	115	66	1.52
11	4MX 11/9/2	3.09	110	64	1.68
13	3ZX 379/2	3.01	107	64	1.30
12	IS 9302	2.91	104	60	1.85
7	NYIRAKABUYE	2.79	99	64	2.30
6	AMASUGI	2.77	99	73	2.40
3	85 BK 6136	2.64	94	70	1.67
10	4MX 27/101	2.51	90	58	1.36
2	85 MW 5340	2.39	85	67	1.62
4	84 MK/4/38	1.96	70	67	1.94
1	82 HPYT-# 6	.38	14	74	2.20
SE		.325		1.1	0.08
MEAN		2.81		64.0	1.73
CV (%)		20		2.9	7.97
EFF (%)		103		101.5	113.33

Design : Triple lattice (4x4), Net plot size : 4.80 m2

ppendix Table: 21. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Intermediate at katumani, Kenya, short rainy season, 1989.

Entry umber	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flower-ing (days)	Plant Height (m)	Plant Aspect
12	IS 9302	5.98	164	82	1.85	1
14	SEREDO	4.52	124	75	1.52	2
5	IS 8193	4.46	122	75	1.60	3
16	ICSH 153 (CSH 11)	4.39	120	73	1.59	3
10	4MX 27/101	4.37	120	77	1.30	1
11	4MX 11/9/2	4.34	118	79	1.58	1
15	SERENA	4.33	118	70	1.39	2
7	NYIRAKABUYE	4.24	116	83	2.02	2
9	TSX 142/6/2/1/3	3.93	107	79	1.59	2
13	3ZX 379/2	3.65	100	73	1.42	2
3	85 BK 6136	3.36	92	93	1.50	2
2	85 MW 5340	2.82	77	94	1.29	2
8	TSX 183/2/2/1/1	2.58	71	76	2.26	3
6	AMASUGI	2.53	69	96	1.91	3
4	84 MK/4/38	2.08	57	93	1.45	3
1	82 HPYT-# 6	.96	26	77	1.73	4
SE		.465		2.5	0.07	0.3
MEAN		3.66		80.9	1.56	2.3
CV (%)		22		5.4	7.73	20.2
EFF (%)		105		108.6	101.51	94.0

Design : Triple lattice (4x4), Net plot size : 4.80 m 2
Plant aspect on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 22. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Intermediate at Kiboko, Kenya, short rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	Grain Yield % of trial mean	Time to 50% Flowering (d)	Plant Height	Plant Aspect
14	SEREDO	4.34	153	61	1.77	3.3
15	SERENA	4.22	149	58	1.83	3.6
11	4MX 11/9/2	3.74	132	63	2.00	3.6
13	3ZX 379/2	3.27	115	63	1.47	4.0
9	TSX 142/6/2/1/3	3.02	107	63	1.53	3.0
10	4MX 27/101	2.80	99	50	1.70	4.3
2	85 MW 5340	2.57	91	65	1.60	4.0
3	85 BK 6136	2.55	90	65	1.57	3.0
5	IS 8193	2.51	89	63	1.87	4.0
16	ICSH 153 (CSH 11)	2.49	88	55	1.50	4.6
4	84 MK/4/38	2.40	85	65	1.93	3.3
8	TSX 183/2/2/1/1	2.13	75	62	1.30	3.3
7	NYIRAKABUYE	2.12	75	74	2.57	4.0
12	IS 9302	1.50	53	55	2.00	4.0
SE		.396		1.03	0.05	0.29
MEAN		2.83		62	1.76	3.74
CV (%)		24		2.9	5.35	13.35

Design : RBD analysis with 14 entries (Data of entry 1 and 6 missing)
Net plot size : 4.80 m2
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 23. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) at Alupe, Kenya short rainy season, 1989/90.

Entry Number	Entry Name	Grain Yield t ha-1	Grain Yield % of trial mean	Time to 50% Flowering (d)	Plant aspect score	dis-ease score (head blast)
10	P 224	4112.79	134	76	1	2.31
8	ENGENY	399.03	130	78	1	1.61
7	SERERE 1	3969.52	129	72	2	2.03
6	P 227	3860.01	125	78	1	1.49
16	SERERE CROSS 25-8	3674.32	119	74	2	2.27
12	SERERE CROSS 18-44	3630.51	118	68	2	3.29
11	U 10	3626.43	118	77	2	1.44
9	GULU E	3624.56	118	74	2	2.23
15	SERERE CROSS 14-4	3311.22	108	72	2	2.39
14	ENDING	3184.60	103	66	2	2.27
5	IKHULULE	3003.34	98	76	2	3.35
13	SERERE CROSS 10	2895.04	94	78	2	2.02
4	KAT/FM-1	1998.02	65	58	2	2.75
3	ACC # 100057	1697.63	55	66	2	4.58
1	ACC # 100007	1440.45	47	56	2	2.53
2	ACC # 100008	1237.09	40	57	2	3.11
SE+/-		410.62		0.9	0.1	0.31
MEAN		3078.47		70.4	1.8	2.48
CV (%)		23.10		2.3	7.8	21.83
EFF (%)		100.41		101.6	107.4	103.86

Design : Triple lattice (4x4), Net plot size : 3 m2
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 24. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Intermediate at Ukiriguru, Tanzania, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)	Plant Aspect	Disease Score Leaf Blight	Disease Score Long smut	Disease Score Rust
14	SEREDO	2.39	132	71	1.47	1.16	0.00	2.67	1.67
15	SERENA	2.04	132	71	1.33	1.70	0.00	2.33	3.82
11	4MX 11/9/2	1.90	123	76	1.46	0.96	0.00	3.00	2.21
16	ICSH 153 (CSH 11)	1.88	121	78	1.46	1.74	0.33	1.67	2.03
5	IS 8193	1.75	113	74	1.46	3.21	1.33	3.00	1.88
13	3ZX 379/2	1.70	110	77	1.11	1.67	0.00	3.33	2.12
12	IS 9302	.66	107	83	1.48	2.96	0.00	2.67	2.00
8	TSX 182/2/2/1/1	1.59	103	75	1.10	2.21	0.00	2.00	1.06
7	NYIRAKABUYE	1.54	99	85	2.01	1.98	0.33	2.33	0.94
10	4MX 27/101	1.52	98	74	1.09	2.62	0.00	3.00	2.91
2	85 MW 5340	1.48	95	89	1.27	1.88	0.67	2.67	1.27
3	85 BK 6136	1.28	83	87	1.17	2.25	1.00	1.33	1.70
9	TSX 142/6/2/1/3	1.16	75	80	1.27	1.48	1.00	1.33	1.82
4	84 MK/4/38	1.14	74	88	1.40	4.17	0.00	2.00	2.30
6	AMASUGI	.88	57	97	1.25	4.68	1.00	2.00	1.24
1	82 HPYT-# 6	.67	56	97	1.62	4.67	0.00	2.00	1.03
SE		.178		1.5	0.11	0.4	0.36	0.33	0.23
MEAN		1.55		81.4	1.37	2.5	0.35	2.33	1.88
CV (%)		20		3.2	14.22	31.6	176.30	24.48	21.38
EFF (%)		100		107.6	100.27	122.1	86.56	96.60	147.76

Design : Triple lattice (4x4), Net plot isze 7.50 m2
Disease Score on scale of 1 to 5 where 1 = Resistant, 5 = Very poor.
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 25. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) Intermediate at ISAR Rubona, Rwanda, rainy season, 1989.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant Height (m)	Disease Score Rust	Leaf Blight
6	AMASUGI	2.01	218	107	1.79	1.61	1.66
2	85 MW 5340	1.81	195	122	1.23	2.39	1.37
3	85 BK 6136	1.32	143	123	1.30	2.38	2.00
7	NYIRAKABUYE	1.15	125	104	1.88	1.65	1.67
12	IS 9302	1.07	115	103	1.41	1.38	1.35
1	82 HPYT-# 6	.98	106	129	1.76	1.65	1.66
11	4MX 11/9/2	.91	98	93	1.22	1.99	2.00
5	IS 8193	.88	95	95	1.42	1.31	1.97
14	SEREDO	.85	91	80	0.99	2.72	2.03
4	84 MK/4/38	.83	89	124	1.55	1.62	1.63
13	3ZX 379/2	.76	83	93	0.89	1.67	2.34
9	TSX 142/6/2/1/3	.68	74	98	1.32	1.99	2.35
10	4MX 27/101	.66	72	85	1.02	1.64	1.65
15	SERENA	.49	53	85	1.15	2.05	2.02
8	TSX 183/2/2/1/1	.30	32	94	0.85	2.67	2.34
16	ICSH 153 (CSH 11)	.10	11	100	1.26	1.97	2.65
SE		.262		3.6	0.08	0.4	0.45
MEAN		.93		102.3	1.32	1.9	1.92
CV (%)		49		6.1	10.49	32.4	40.97
EFF (%)		101		105.5	94.45	101.0	100.21

Design : Triple lattice (4x4), Net plot size : 6.00 m2
Local control : Entry # 16
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.

Appendix Table: 26. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT-89) at Serere, Uganda short rainy season, 1989/90.

Entry Number	Entry Name	Grain Yield t ha-1	Grain Yield % of trial mean	Time to 50% Flowering (d)	Plant height (m)	Plant aspect score	Disease score (head blast)[Y]
7	SERERE 1	877.78	156	68	0.81	3	3.00
12	SERERE CROSS 18-44	822.22	146	65	0.73	4	3.33
9	GULU E	788.89	140	69	0.76	3	2.00
11	U 10	733.33	131	79	0.84	1	1.33
10	P 224	700.00	125	75	0.80	1	1.00
15	SERERE CROSS 14-4	644.44	115	69	0.72	4	3.33
14	ENDING	644.44	115	70	0.74	3	2.00
8	ENGENY	622.22	111	77	0.78	2	1.33
13	SERERE CROSS 10	600.00	107	74	0.83	2	1.33
16	SERERE CROSS 25-8	511.11	91	75	0.76	3	2.33
6	P 227	433.33	77	78	0.77	3	1.33
5	IKHULULE	522.22	75	76	0.84	3	3.00
4	KAT/FM-1	366.67	65	58	0.72	5	5.00
1	ACC # 100007	300.00	53	54	0.73	5	5.00
3	ACC # 100057	288.89	51	63	0.60	5	3.67
2	ACC # 100008	233.33	42	56	0.69	5	5.00
SE+/-		76.29		1.3	0.03	0.4	0.47
MEAN		561.81		69.1	0.76	3.2	2.75
CV (%)		23.52		3.2	7.98	23.6	29.89
EFF (%)		82.82		122.0	109.68	107.7	91.07

Design : Triple lattice (4x4), Net plot size : 3 m2
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.

Appendix Table: 27. Performance of entries in the EARSAM Elite Sorghum Yield Trial (EESYT) at Makerere, Uganda short rainy season, 1989/90.

Entry Number	Entry Name	Grain Yield t ha-1	Grain Yield % of trial mean	Time to 50% Flowering (d)	Plant stand per plot	Shoot-fly (% tiller damage)
4	KAT/FM-1	1003.05	155	50	38.35	4
14	ENDING	914.65	141	71	31.54	17
7	SERERE 1	876.03	135	65	34.37	12
2	ACC # 100008	851.37	131	52	42.68	4
9	GULU E	827.33	127	64	37.14	17
1	ACC # 100007	764.56	118	50	43.67	3
12	SERERE CROSS 18-44	692.79	107	57	37.61	20
3	ACC # 100057	664.76	102	57	31.78	5
15	SERERE CORSS 14-4	650.80	100	57	38.41	18
10	P 224	613.27	94	72	34.48	17
16	SERERE CROSS 25-8	493.14	76	71	36.29	18
8	ENGENY	475.99	73	70	41.98	15
6	P 227	437.02	67	80	26.18	23
5	IKHULULE	420.91	65	70	38.57	20
11	U 10	395.40	61	71	42.16	29
13	SERERE CROSS 10	306.27	47	80	37.78	16
SE+/-		82.28		0.5	1.55	2.6
MEAN		649.21		64.8	37.06	14.8
CV (%)		21.95		1.3	7.23	24.6
EFF (%)		101.15		110.0	109.23	88.2

Design : Triple lattice (4x4), Net plot size : 5 m2

Table 28.: Mean Grain Yield (t ha-1) of entries in EARSAM Elite Sorghum Yield Trial (EESYT-89)[1] Intermediate at - 7 locations in eastern Africa, rainy seasons, 1989.

ENTRY	MEAN[2]	MURONGWE[3]	ARSI NEGELE	KATUMANI(SR)	KIBOKO(LR)	KIBOKO(SR)[3]	UKIRIGURU	RUBONA
IS 9302	3.33	2.29 (2)[4]	5.02 (1)	5.98 (1)	2.91 (9)	1.50 (14)	1.66 (7)	1.07 (5)
NYIRAKABUYE	2.61	2.57 (1)	3.33 (3)	4.24 (8)	2.79 (10)	2.12 (13)	1.54 (9)	1.16 (4)
AMASUGI	2.54	2.05 (3)	4.52 (2)	2.53 (14)	2.77 (11)	0	.88 (15)	2.01 (1)
SEREDO	2.44	1.55 (6)	.66 (11)	4.52 (2)	3.79 (1)	4.34 (1)	2.39 (1)	.85 (9)
85 BK 6136	2.28	1.41 (7)	2.82 (5)	3.36 (11)	2.64 (12)	2.55 (8)	1.28 (3)	1.32 (3)
IS 8193	2.21	1.69 (4)	.73 (10)	4.46 (3)	3.26 (5)	2.51 (9)	1.75 (5)	.88 (8)
SERENA	2.14	1.18 (11)	.56 (12)	4.33 (7)	3.27 (4)	4.22 (2)	2.04 (2)	.49 (14)
4 MX 11/9/2	2.13	1.20 (10)	.40 (13)	4.34 (6)	3.09 (7)	3.74 (3)	1.90 (3)	.91 (7)
4 MX 37/101	2.03	1.34 (8)	1.07 (8)	4.37 (5)	2.51 (13)	2.80 (6)	1.52 (10)	.66 (13)
3 ZX 379/2	2.02	.78 (13)	.96 (9)	3.65 (10)	3.01 (8)	3.27 (4)	1.70 (6)	.76 (11)
85 MW 5340	2.01	1.61 (5)	1.54 (7)	2.82 (12)	2.39 (14)	2.57 (7)	1.48 (11)	1.81 (2)
TSX 142/6/2/13	1.87	.38 (14)	.37 (14)	3.93 (9)	3.22 (6)	3.02 (5)	1.16 (13)	.68 (12)
84 MK/4/38	1.74	1.24 (9)	2.69 (6)	2.08 (15)	1.96 (15)	2.40 (11)	1.14 (14)	.83 (10)
TSX 183/2/2/1/1	1.61	0	.26 (16)	2.58 (13)	3.34 (3)	2.13 (12)	1.59 (8)	.30 (15)
82 HPYT-1 # 6	1.27	1.03 (12)	3.17 (4)	.96 (16)	.38 (16)	0	.87 (16)	.98 (6)
ICSH 153	2.14	0	.30 (15)	4.39 (4)	3.57 (2)	2.49 (10)	1.88 (4)	.10 (16)
SE	±.157	±.230	±.446	±.465	±.326	±.396	±.179	±.262
LOCATION MEAN	2.14	1.45	1.77	3.66	2.81	2.83	1.55	.93
CV (%)		28	44	22	20	24	20	49

1 : Triple Lattice (4x4) design - Net Plot size ranged from 4.80 m² to 7.50 m²

2 : Mean Yield excludes grain yields at Murongwe, Burundi and Kiboko (SR), Kenya

3 : RBD analysis used. No yield data of TSX 183/2/2/1/1 and 82 HPYT-1 # 6 at Murongwe and Kiboko (SR) respectively.

4 : Entry ranking at each location in parenthesis.

Table 29: Entries in the EARSAM Elite Finger Millet Yield trial - 89 (EEFMYT-89)

Entry No.	Entry	Source
1.	ACC # 100007	Ethiopia
2.	ACC # 100008	Ethiopia
3.	ACC # 100057	Ethiopia
4.	KAT/FM1	Katumani, Kenya
5.	IKHULULE	Alupe, Kenya
6.	P 227	Serere, Uganda
7.	Serere 1	Serere, Uganda
8.	Engeny	Serere, Uganda
9.	Gulu E	Serere, Uganda
10.	P 224	Serere, Uganda
11.	U 10	Serere, Uganda
12.	Serere Cross 18-44	Serere, Uganda
13.	Serere Cross 10	Serere, Uganda
14.	Ending	Serere, Uganda
15.	Serere Cross 14-4	Serere, Uganda
16.	Serere Cross 25-8	Serere, Uganda

Appendix Table: 30 . Performance of entries in the EARSAM Elite Finger Millet Yield Trial (EEFMYT-89) at katumani, Kenya, rainy season, 1989/90

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flower-ing (days)	Plant Height (m)	Plant aspect score	Dis-ease score (blast)
4	KAT/FM 1	3.21	128	71	0.74	2	2.00
9	GULU E	3.10	123	83	0.73	2	1.67
10	P 224	2.89	115	82	0.76	2	1.33
8	ENGENY	2.82	112	84	0.68	3	2.00
14	ENDING	2.78	111	78	0.64	2	1.00
11	U 10	2.71	108	84	0.73	3	1.67
7	SERERE 1	2.57	102	81	0.64	2	1.00
13	SERERE CROSS 10	2.53	101	86	0.59	3	1.33
2	ACC # 100008	2.47	98	67	0.72	3	2.00
15	SERERE CROSS 1404	2.38	95	81	0.66	3	1.67
1	ACC # 100007	2.34	93	62	0.73	2	2.00
16	SERERE CROSS 25-8	2.32	92	83	0.66	3	1.67
3	ACC # 100057	2.24	89	75	0.60	3	2.00
12	SERERE CROSS 18-44	2.24	89	81	0.57	3	1.33
6	P 227	2.15	86	85	0.63	2	1.00
5	IKHULULE	1.43	57	84	0.70	3	2.00
SE		.407		1.4	0.03	0.3	0.27
MEAN		2.51		79.3	0.67	2.5	1.60
CV (%)		28		3.1	6.93	23.0	29.92
EFF (%)		114		91.6	123.60	101.6	94.84

Design : Triple lattice (4x4), Net plot size : 4 m2
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 31. Performance of entries in the EARSAM Elite Finger Millet Yield Trial (EEFMYT-89) at Makerere, Uganda, First rainy season, 1989/90.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Shoot-fly (% tiller damage)
4	KAT/FM 1	1.00	155	50	4
14	ENDING	.91	141	71	17
7	SERERE 1	.86	135	65	12
2	ACC # 100008	.85	131	52	4
9	GULU E	.83	127	64	17
1	ACC # 100007	.76	118	50	3
12	SERERE CROSS 18-44	.69	107	57	20
3	ACC # 100057	.66	102	57	5
15	SERERE CORSS 14-4	.65	100	57	18
10	P 224	.61	94	72	17
16	SERERE CROSS 25-8	.49	76	71	18
8	ENGENY	.48	73	70	15
6	P 227	.44	67	80	23
5	IKHULULE	.42	65	70	20
11	U 10	.40	61	71	29
13	SERERE CROSS 10	.31	47	80	16
SE		.082		0.5	2.6
MEAN		.65		64.8	14.8
CV (%)		22		1.3	24.6
EFF (%)		101		110.0	88.2

Design : Triple lattice (4x4), Net plot size : 5 m2

Appendix Table: 32. Performance of entries in the EARSAM Finger Millet Yield Trial Trial (EEFMYT-89) at Melkassa, Ethiopia, rainy season, 1989/90.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant height (m)
2	ACC # 100008	2.27	164	77	1.04
4	KAT/FM 1	2.08	151	84	1.10
15	SERERE CROSS 14-4	2.07	150	90	1.03
9	GULU E	2.05	149	91	1.06
1	ACC # 100007	1.78	129	76	0.95
10	P 224	1.56	113	92	1.05
7	SERERE 1	1.54	111	91	0.93
14	ENDING	1.47	107	89	0.96
3	ACC # 100057	1.37	99	86	0.99
8	ENGENY	1.33	96	93	0.98
12	SERERE CROSS 18-44	1.10	80	92	0.88
16	SERERE CROSS 25-8	1.05	76	92	0.93
13	SERERE CROSS 10	1.01	73	96	0.97
5	IKHULULE	.60	44	93	0.95
6	P 227	.50	36	93	0.84
11	U 10	.32	23	100	0.92
SE		.281		1.4	0.04
MEAN		1.38		89.6	0.97
CV (%)		35		2.6	7.96
EFF (%)		106		100.5	117.82

Design : Triple lattice (4x4), Net plot size : 7.5 m2

Appendix Table: 33. Performance of entries in the EARSAM Elite Finger Millet Yield Trial (EEFMYT-89) at Alupe, Kenya, short rainy season, 1989/90.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant aspect score	dis-ease score (blast)
10	P 224	4.11	134	76	1	2.31
8	ENGENY	3.99	130	78	1	1.61
7	SERERE 1	3.96	129	72	2	2.03
6	P 227	3.86	125	78	1	1.49
16	SERERE CROSS 25-8	3.67	119	74	2	2.27
12	SERERE CROSS 18-44	3.63	118	68	2	3.29
11	U 10	3.63	118	77	2	1.44
9	GULU E	3.62	118	74	2	2.23
15	SERERE CROSS 14-4	3.31	108	72	2	2.39
14	ENDING	3.18	103	66	2	2.27
5	IKHULULE	3.00	98	76	2	3.35
13	SERERE CROSS 10	2.90	94	78	2	2.02
4	KAT/FM 1	2.00	65	58	2	2.75
3	ACC # 100057	1.70	55	66	2	4.58
1	ACC # 100007	1.44	47	56	2	2.53
2	ACC # 100008	1.24	40	57	2	3.11
SE		.410		0.9	0.1	0.31
MEAN		3.08		70.4	1.8	2.48
CV (%)		23		2.3	7.8	21.83
EFF (%)		100		101.6	107.4	103.86

Design : Triple lattice (4x4), Net plot size : 3 m2
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.
Plant aspect score on scale of 1 to 5 where 1 = Very good and 5 = Very poor.

Appendix Table: 34. Performance of entries in the EARSAM Finger Millet Yield Trial (EEFMYT-89) at Serere, Uganda, short rainy season, 1989/90.

Entry Number	Entry Name	Grain Yield t ha-1	% of trial mean	Time to 50% Flowering (days)	Plant height (m)	Plant aspect score	Disease score (blast)
7	SERERE 1	.88	156	68	0.81	3	3.00
12	SERERE CROSS 18-44	.82	146	65	0.73	4	3.33
9	GULU E	.79	140	69	0.76	3	2.00
11	U 10	.73	131	79	0.84	1	1.33
10	P 224	.70	125	75	0.80	1	1.00
15	SERERE CROSS 14-4	.64	115	69	0.72	4	3.33
14	ENDING	.64	115	70	0.74	3	2.00
8	ENGENY	.62	111	77	0.78	2	1.33
13	SERERE CROSS 10	.60	107	74	0.83	2	1.33
16	SERERE CROSS 25-8	.51	91	75	0.76	3	2.33
6	P 227	.43	77	78	0.77	3	1.33
5	IKHULULE	.52	75	76	0.84	3	3.00
4	KAT/FM 1	.37	65	58	0.72	5	5.00
1	ACC # 100007	.30	53	54	0.73	5	5.00
3	ACC # 100057	.29	51	63	0.60	5	3.67
2	ACC # 100008	.23	42	56	0.69	5	5.00
SE		.076		1.3	0.03	0.4	0.47
MEAN		.56		69.1	0.76	3.2	2.75
CV (%)		24		3.2	7.98	23.6	29.89
EFF (%)		83		122.0	109.68	107.7	91.07

Design : Triple lattice (4x4), Net plot size : 3 m2
Disease score on scale of 1 to 5 where 1 = Resistant, 5 = Susceptible.

Table 35: Mean grain yields (t ha-1) of entries in the EARSAM Elite Finger Millet Yield Trial (EEFMYT - 89)[1] at 5 locations in eastern Africa, rainy season, 1989.

	MEAN	MELKASSA	ALUPE	KATUMANI (SR)	KABANYOLO	SERERE
GULU E	2.08	2.05 (4)	3.62 (8)	3.10 (2)	.83 (5)	.79 (3)
P 224	1.98	1.56 (6)	4.11 (1)	2.89 (3)	.61 (10)	.70 (5)
SERERE 1	1.97	1.54 (7)	3.97 (3)	2.57 (7)	.88 (3)	.88 (1)
ENGENY	1.85	1.33 (10)	3.99 (2)	2.82 (4)	.48 (12)	.62 (7)
SERERE CROSS 14 - 14	1.81	2.07 (3)	3.31 (9)	2.38 (10)	.65 (9)	.65 (6)
ENDING	1.80	1.47 (8)	3.18 (10)	2.78 (5)	.91 (2)	.64 (6)
KAT/FM 1	1.73	2.08 (2)	2.00 (13)	3.21 (1)	1.00 (1)	.37 (12)
SERERE CROSS 18 - 44	1.70	1.10 (11)	3.63 (6)	2.24 (14)	.69 (7)	.82 (2)
SERERE CROSS 25 - 8	1.64	1.05 (12)	3.67 (5)	2.32 (12)	.49 (11)	.51(9)
U 10	1.56	.33 (16	3.63 (7)	2.71 (6)	.40 (15)	.73 (4)
P 277	1.48	.50 (15)	3.86 (4)	2.15 (15)	.44 (13)	.43 (10)
SERERE CROSS 10	1.47	1.01 (13)	2.90 (12)	2.53 (8)	.31 (16)	.60 (8)
ACC # 100008	1.41	2.27 (1)	1.24 (16)	2.47 (9)	.85 (4)	.23 (15)
ACC # 100007	1.33	1.78 (5)	1.44 (15)	2.34 (11)	.76 (6)	.30 (13)
ACC # 100057	1.25	1.37 (9)	1.70 (14)	2.24 (13)	.66 (8)	.29 (14)
IKHULULE	1.18	.60 (14)	3.00 (11)	1.43 (16)	.42 (14)	.42 (11)
SE	±.130	±.201	±.411	±.406	±.082	±.076
TRIAL MEAN	1.64	1.38	3.08	2.51	.65	.56
CV (%)		35	23	28	22	24

1 : Triple Lattice design. Net plot size ranged from 3.0 m² to 7.5 m²
2 : Entry ranking at each location in parenthesis

Table 36. Agroecological zoning for eastern Africa countries

Short rainy season hot and dry	Int/long rainy season warm and wet	Int/long rainy season cool
Kiboko (LR) Kenya	Alupe (Kenya)	Katumani (Kenya)
Kiboko (SR) Kenya	Mombasa (Kenya)	Lanet (Kenya)
Marimanti (Kenya)	Ilonga (Tanzania)	Naivasha (Kenya)
Perkerra (Kenya)	Hombolo (Tanzania)	Nanyuki (Kenya)
Mariakani (Kenya)	Ukiriguru (Tanzania)	Rwerere (Rwanda)
Hombolo (Tanzania)	Serere (Uganda)	Rubona (Burundi)
Mieso (Ethiopia)	Imbo (Burundi)	Mahwa (Burundi)
Jiggiga (Ethiopia)	Kirundo (Burundi)	Kirundo (Burundi)
Wad Medani (Sudan)	Karama (Rwanda)	Karengyere (Uganda)
Gadambalia (Sudan)	Nazareth (Ethiopia)	Arsi Negele (Ethiopia)
Afgoi (Somalia)	Wad Medan (Sudan)	Alemaya (Ethiopia)
Kotido (Uganda)		
Bonka (Somalia)		

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