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FARMERS' VARIETAL PREFERENCES FOR DURUM WHEAT IN ADA, LUME AND GIMBICHU WOREDAS OF ETHIOPIA

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ABSTRACT

A survey of 144 farmers was undertaken in Ada, Lume and Gimbichu woredas to identify the durum wheat varieties grown by farmers and the quality characteristics they seek in them. Sixty-four percent of the sample farmers were found to have formerly grown 27 durum wheat local varieties but only 5% were growing them now. Aphid attack, lack of seed and susceptibility to rust diseases were given as the main reasons why farmers no longer grow them. In the 1990/91 season, 94% of the sample farmers grew five improved durum wheat varieties: Boohai, Cocorit, Gerardo, Enkoy and Israel. Enkoy and Israel are bread wheats but farmers do not differentiate them from durum wheat. Israel turned out to be the variety farmers rated highly across the three woredas for its yield, desirable grain color, bread quality, strong and long straw, disease resistance, performance in light soil (Gombere), frost resistance and marketability. Although farmers' varietal preferences clearly highlight regional differences, there are varietal characteristics that transcend the three woredas. These are grain size (big), good grain color (amber), early maturity, strong and long straw, straw palatability, food quality (mainly injera, kinche and kolo) and marketability. Farmers' actual allocation of the land in the three woredas fairly closely reflected their varietal preferences.

INTRODUCTION

Ethiopia is sub-Saharan Africa's largest producer of wheat accounting for over half of the total wheat area (Hailu *et al.* 1990). Sixty percent of the total national wheat area (est. 770000 ha) is estimated to be planted with tetraploid wheat. The majority of this consists of land races of which 60% are *T. durum* (Tesfaye 1987).

Durum wheat is produced by peasant farmers on the heavy clay soils (Vertisols) of the highlands at altitudes ranging between 1800 and 2800 m, exclusively under rainfed conditions. The yields are on the average low (less than 1 t/ha) compared to those obtained in other durum wheat-producing countries. One of the major reasons for the low yield of durum wheat in Ethiopia is the wide use of unimproved local cultivars by the peasant farmers (Tesfaye 1987; Hailu *et al.* 1990). From 1967 to 1982, four improved high-yielding varieties of durum wheat, Cocorit 71, Gerardo

VZ466.61/130//G11/"S", LD357 and Boohai, were released for general cultivation in Shewa region. Cocorit 71, Gerardo and Boohai are introductions from CIMMYT while LD357 is from the U.S.A. Under very good management conditions in farmers' fields, these varieties produce yields ranging from 2.5 to 4.0 t/ha, compared to the local cultivars which give 1.5 to 2.5 t/ha under similar conditions (Tesfaye 1988). But despite this, the area under improved varieties is less than 10% (Tesfaye 1987).

The main objective of durum wheat breeding in Ethiopia is to develop new varieties that are superior to the ones currently grown. Emphasis is placed on the development and identification of stable, high yielding disease and insect resistant, and stiff strawed varieties, which are responsive to improved cultural practices (Tesfaye and Getachew 1991).

Durum wheat is consumed in different forms such as dabo (Ethiopian bread), nifro (boiled whole grain, sometimes mixed with pulses), injera (thin bread), kolo (roasted grain), and kinche (crushed kernels, cooked with milk or water and mixed with spiced butter). Most peasant farmers grow durum wheat primarily for food; surplus production above household need is sold.

Straw is mainly used as livestock feed, and as fuel in times of scarcity. At higher elevations where tef (*Eragrostis tef*) is less abundant, the straw may also be used as a component of plaster for the construction of local houses (Tesfaye and Getachew 1991).

The major objectives of this study were to identify the durum wheat varieties grown by farmers and the quality characteristics they seek in them.

RESEARCH DESIGN AND METHODOLOGY

The survey was conducted in three woredas in Shewa region. Ada, Lume and Gimbichu were selected because they are major durum wheat growing areas in the region and also because of their proximity to Debre Zeit Agricultural Research Center (DZARC). A multistage random sampling procedure was used to select eight peasant associations (PAs) from each woreda. A list of the population of farmers in each PA was obtained as the sampling frame. A sample of 120 farmers was drawn with 40 farmers selected from each of the three woredas. In each woreda, reserve farmers were selected to replace the original sampled farmers if we could not find them. At the end, some of the reserve farmers turned up and we had to include them in the sample. Hence, we ended up with a sample of 144 farmers distributed as follows: 52 in Ada woreda, 44 in Lume woreda and 48 in Gimbichu woreda.

Farmers were interviewed using a structured questionnaire administered by five enumerators and one supervisor between 5 November and 3 December 1990. Three enumerators were recruited locally and the rest were technical assistants in the Department of Agricultural Economics, DZARC. They all spoke the local language, had completed grade 12 and were familiar with the survey area. The enumerators underwent one week of training both in class and in the field. They pre-tested the questionnaire in the field. Interviews were conducted in farmers' fields where farmers and enumerators identified the varieties being grown. The durum wheat breeder participated in some of the interviews and assisted in identifying various durum wheat varieties.

THE STUDY AREA

The study area comprised three woredas in Shewa administrative region, Ada, Lume and Gimbichu. Ada woreda, about 40 km south-east of Addis Ababa, covers 1750 km^2. The largest part of it (66%) lies above 1800 m (Gryseels and Anderson 1983). Much of the land in Ada is affected by erosion and poor drainage. The annual average rainfall for the 1965-1989 period at Debre Zeit was 820.5 mm

(DZARC 1990). The major soil type is Vertisol. The major crops grown are tef (*Eragrostis tef*), wheat, barley, faba bean, chickpea and lentil (Workneh 1989).

Lume woreda lies north-east of Debre Zeit at an altitude ranging from 1600 to 2100 m. The major soil type is Vertisol. The major crops grown are tef, wheat, haricot bean, maize, chickpea, barley and faba bean.

Gimbichu borders Ada woreda on the northern side of Debre Zeit at an altitude of 2450 m. The annual average rainfall for the 1970-1990 period was 909.59 mm (Gimbichu Weather Station). The major soil type is Vertisol. The major crops grown are wheat, tef, chickpea and faba bean.

FARMER CIRCUMSTANCES

The average size of the family or household was 6.7, 6.8, 6.2 and 6.6 members in Ada, Lume, and Gimbichu and in all woredas combined respectively as shown in Table 1. Except for Gimbichu woreda the average number of adults and children is about the same for Ada and Lume. This also holds for the average age of the household head. Almost all households were headed by males. The formal education of the household head is low in all woredas, averaging 1.5 years, and particularly so in Ada woreda where it averaged only 1.3 years and only 40% of the household heads had had any at all.

Farmers in the survey area measure their land area in local units called "kert" (equivalent to about 0.25 ha). As shown in Table 2, average farm size was 8.3, 11.1, 7.9 and 9.0 kert in Ada, Lume, Gimbichu and all woredas combined, respectively, with 7.3, 9.7, 5.8 and 7.5 kert under cultivation, respectively. Farmers in Gimbichu woreda had the smallest farm sizes on average. In all the woredas, there was on average negligible land set aside for fallowing. The absence of fallowing is a reflection of the density of population and the resulting shortage of land in the survey area.

RESULTS AND DISCUSSION

Durum Wheat Local Varieties

Sixty-three percent of farmers in Ada woreda had formerly grown local varieties while in Lume and Gimbichu it was 43% and 83%, respectively. Sixty-four percent of the surveyed farmers had formerly grown local varieties. Twenty-seven locally named "varieties", listed in Appendix 1, were recorded as having been formerly grown. Seventeen of these were recognized as actual durum wheat varieties (Tesfaye Tesemma, pers. comm.). These names are not necessarily consistent across woredas and some might be synonyms.

In the 1990/91 season, when the survey was undertaken, only 4 and 10% of the farmers were growing local durum wheat varieties in Ada and Gimbichu woredas, respectively. When the three woredas were considered together only 5% of the farmers were growing local durum wheat varieties. No sample farmer was growing local varieties in Lume woreda. The present situation differs significantly from the past as indicated by the percentage of farmers who were formerly growing local varieties. The low percentage of farmers currently growing them in the three woredas is a result of the aggressive activity of the extension wing of the Debre Zeit Agricultural Research Center in the distribution of improved varieties of durum wheat in the region. However, the survey area is in the region where improved durum wheat varieties were released to farmers over two decades ago.

Durum wheat production in the other parts of Ethiopia is still dominated by local varieties (Tesfaye and Getachew 1991; Hailu *et al.* 1990).

The reasons why farmers are not presently growing local varieties are shown in Table 3. The most important reason in Ada and Gimbichu woredas is aphid attack while in Lume it is disease, mainly leaf rust. Across the three woredas aphid attack is the most important reason. It is also clear from Table 3 that shortage of seed is an important reason why farmers are not growing local durum wheat varieties. While the susceptibility of the local varieties to disease (leaf and stem rust) and insect attack (aphid) is well recognized (Tesfaye and Getachew 1991), the issue of seed availability as a constraint has not been addressed.

Improved Durum Wheat Varieties

Ninety-six percent of farmers in Ada woreda and all sampled farmers in Lume and Gimbichu had formerly grown improved varieties. Ninety-nine percent when all sampled farmers were considered together.

Farmers indicated that they had formerly grown eight improved durum wheat varieties: Boohai, Cocorit, Gerardo, Enkoy, Israel, Laketch, Marou and Arendeto. Boohai, Cocorit and Gerardo were released between 1967 and 1982. Arendeto (DZ064-118) and Marou (DZ04-688) were developed from land races by mass selection and released to farmers in Shewa region in 1967 (Tesfaye 1987). Enkoy, Israel and Laketch are bread wheat varieties. Enkoy and Laketch are introductions from Kenya and CIMMYT, respectively, while Israel is of unknown origin.

All the surveyed farmers identified these bread wheat varieties as improved durum wheat varieties. Enkoy and Israel appear to be popular varieties with farmers and we have included them together with improved durum wheat varieties in order to assess how farmers rate them vis-a-vis the improved durum wheat varieties, and also to find out what quality characteristics they prefer in them.

In the 1990/91 season, none of the surveyed farmers was growing Laketch, Marou or Arendeto. Eighty-nine percent of the farmers were growing improved durum wheat varieties in Ada woreda, while 100% and 96% were growing them in Lume and Gimbichu, respectively. In the three woredas, 94% of the farmers were growing improved durum wheat varieties. The main reasons given by the 6% of the farmers who were not growing improved varieties were lack of cash to purchase seed (50%) and unavailability of seed (38%).

Table 4 shows the percentage of farmers growing the five varieties, Boohai, Cocorit, Gerardo, Enkoy and Israel, all considered by farmers to be improved durum wheat varieties. These varieties were grown either as sole crops or in combinations. More farmers grow sole varieties in Ada than in Lume and Gimbichu woredas. Overall, more farmers grow at least two varieties. Thus, durum wheat farmers in Ethiopia, as elsewhere, grow several varieties simultaneously in order to exploit different varietal characteristics as they value particular characteristics for different purposes (Haugerud and Collinson 1990). This varietal diversification can also be viewed as an important risk management strategy.

Farmers' allocation of land to various varieties can indicate their importance. Table 5 shows the average area and proportion of total durum wheat area under various varieties in the 1990/91 season. In Ada, more land under improved durum wheat varieties is allocated to Enkoy and Boohai, while in Lume and Gimbichu woredas it is allocated to Israel and Cocorit. In the three woredas, Israel and Cocorit occupy most of the land under improved varieties.

Sources of seed and information about improved varieties might also influence the areas planted under various varieties. Table 6 shows the sources of seed in the woredas. The local market is the

most important, more important in Ada than in Lume and Gimbichu. Extension is another important source. Except for Lume woreda, farmers do not seem to use their own seed.

Extension is the most important source of information on durum wheat varieties in the three woredas as shown in Table 7, especially in Lume woreda. Other farmers are also an important source of information, especially in Ada and Gimbichu woredas.

Farmers' Varietal Preferences

In addition to agronomic characteristics, farmers' preferences also affect their rating of varieties. They rate varieties differently depending on whether they are growing them for home consumption or for the market. In asking farmers to rate the varieties they were growing, we used 25 varietal characteristics that we thought might reflect their preferences. These are shown in Appendix 2 but not in order of preference. Out of the 25 varietal characteristics, 9 were identified as reflecting current breeders' criteria for developing varieties and 5 characteristics were used to reflect the food quality of these varieties. The varieties were first rated across all the 25 characteristics. Second, they were rated using the 9 characteristics of interest to breeders. Third, they were rated using the 5 nutrition characteristics.

Given that in Ethiopia durum wheat is cultivated under a wide range of agro-ecological conditions and the crop requirements vary widely, breeding strategy is to develop specific varieties for specific conditions or areas (Tesfaye 1988). Hence, we considered by woreda farmers' ratings of their varieties and then pooled their ratings across the three woredas to ascertain whether there were varieties and varietal characteristics that transcended area specificity in terms of farmers' preferences.

The 25 varietal characteristics were given equal weight and hence the maximum number of points a variety could get using these characteristics was 25. Table 8 shows the ratings of the five varieties across the three woredas. In Ada, Cocorit is rated slightly higher than Boohai, but not significantly so. Cocorit received especially high ratings (80% and over) from farmers for its good grain color, lodging resistance, food quality (bread, injera, kolo, nifro) and straw palatability. Boohai was highly rated for its big grain, long straw, good grain color, food quality (bread, kolo, nifro, kinche) and marketability. Gerardo was highly rated for its injera quality. Israel was highly rated for its yield, strong straw, early maturity, good grain color and food quality (bread). Enkoy was highly rated for its yield and early maturity.

In actual practice, farmers' allocation of land to various varieties in Ada woreda differed (see Table 5) from their ratings. Enkoy was allocated more land relative to other varieties, followed by Boohai. This might be because farmers attach more value to Enkoy's high yield and early maturity characteristics.

Furthermore, farmers in Ada woreda seem to hold more Enkoy seed for home consumption, which could be used later for seeding if they lack improved seed (Gebrehiwot, Extension supervisor in Ada, pers. comm.). Also, at present, the Ethiopian Seed Corporation is mainly supplying seeds of Enkoy and Boohai varieties (Worede Woldemariam 1990).

In Lume woreda (Table 8), Israel is rated slightly higher than Cocorit, though not significantly so. Sample farmers did not grow Gerardo in the 1990/91 season in Lume woreda. Israel received high ratings for its food quality (bread) and long straw. Cocorit was highly rated for its big grain and food quality (injera). Boohai received high ratings for its good grain color, food quality (kinche) and marketability. Enkoy was, on the whole, rated very low.

The actual allocation of land to these varieties (see Table 5) was in conformity with the farmers' ratings of them. More land was allocated to Israel; next was Cocorit.

In Gimbichu woreda, farmers rated Israel higher than Boohai and Cocorit, which were rated almost the same, as shown in Table 8. Israel was highly rated for its yield, strong and long straw, disease resistance, performance in light soil (Gombere), frost resistance and marketability. Cocorit received high ratings for its big grain, food quality (bread, kolo) and straw palatability. Gerardo was highly rated for food quality (kolo) and straw palatability. Boohai, although rated almost the same as Cocorit on the aggregate, was not highly rated on any individual characteristics. Enkoy was rated low. Actual allocation of land to various varieties by farmers reflected their ratings (Table 5). More land was allocated to Israel; next was Cocorit.

As shown in Table 8, Israel was rated higher than Boohai and Cocorit, which are rated almost the same in the three woredas. Enkoy is rated lowest, just as it was in each woreda. Israel was highly rated for its strong and long straw. Boohai was highly rated for its big grain, good grain color, food quality (kinche) and marketability. Cocorit received high ratings for its food quality (injera, kolo) and straw palatability. Gerardo was highly rated for its food quality (injera) and straw palatability. Enkoy received high ratings for its early maturity.

As indicated earlier, durum wheat breeders emphasize the development and identification of stable, high-yielding, disease and insect tolerance, and stiff-strawed varieties (Tesfaye and Getachew 1991). Breeders also recognize that durum wheat fetches a higher price in the local market than bread wheat because of its large and vitreous grain and its amber grain color (Tesfaye 1987).

These characteristics, recognized by breeders as important, were used by farmers to rate the five varieties in the three woredas (see Appendix 2. The straw characteristics included quantity, length, strength and palatability.

Table 9 shows farmers' ratings of the five varieties using the nine characteristics that are considered important by durum wheat breeders across the three woredas. In Ada, Boohai is rated higher than the rest, then Israel. Boohai received high ratings for its big grain, good grain color and long straw. Israel was highly rated for its yield and strong straw. Cocorit received high ratings for its good grain color and straw palatability. Enkoy was highly rated for its yield. Gerardo was rated low.

In Lume (Table 9), Israel is rated higher than the rest, followed by Cocorit. Gerardo was not grown in the 1990/91 season. Israel was highly rated for its long straw, Cocorit for its big grain, and Boohai for its good grain color. Enkoy received very low ratings.

In Gimbichu woreda, Israel was rated higher than the rest; next was Gerardo (Table 9). Israel was highly rated for its yield, strong and long straw, and disease resistance, and Cocorit for its big grain and straw palatability. Boohai and Enkoy were not highly rated on any individual characteristics.

Farmers' ratings of the five varieties in the three woredas are shown in Table 9. Again, Israel is rated higher than the rest followed by Boohai. Israel was highly rated for its strong and long straw. Boohai received high ratings for its big grain and good color. Cocorit and Gerardo received high ratings for their straw palatability. Enkoy received low ratings.

Overall, these varieties received low ratings for yield and for disease and pest tolerance. The exceptions in Gimbichu woreda were Israel which was highly rated for yield and disease resistance, and Enkoy in Ada woreda for yield.

Peasant farmers in Ethiopia produce durum wheat mainly for food, although they sell any surplus. Thus, it was important to get farmers' ratings of the five varieties using food quality characteristics. These are shown in Appendix 2. Table 10 shows farmers' ratings of the five varieties using food quality characteristics across the three woredas. In Ada, Cocorit was rated higher than the rest followed by Boohai. Cocorit was highly rated for its bread, injera, kolo and nifro qualities. Boohai received high ratings for its bread, kolo, nifro and kinche qualities. Gerardo was highly rated for its injera quality. Israel received high rating for its bread quality. Enkoy was rated low.

In Lume woreda (Table 10), Cocorit and Boohai were rated the same, followed by Israel. Gerardo was not grown in the 1990/91 season. Cocorit was highly rated for its injera quality and Boohai for its kinche quality. Israel received high rating for its bread quality. Enkoy received low ratings.

In Gimbichu woreda (Table 10), Cocorit was rated slightly higher than Gerardo but not significantly. Cocorit was highly rated for its bread and kolo qualities and Gerardo for its kolo quality. Boohai, Enkoy and Israel received low ratings.

In the three woredas (Table 10), Boohai and Cocorit were rated almost the same, followed closely by Gerardo. Boohai was highly rated for its kinche quality and Cocorit for its injera and kolo qualities. Gerardo received a high rating for its injera quality. Enkoy and Israel received low ratings.

CONCLUSIONS

Although farmers' preferences for improved durum wheat varieties highlight regional differences, it is also clear that some varieties such as Israel are greatly preferred across the three woredas. This variety, as indicated earlier, is a bread wheat, even though farmers in Ada, Lume and Gimbichu woredas do not recognize it as such and regard it as one of their improved durum wheat varieties. Durum wheat breeders might want to look closely at the characteristics of Israel that make it so much preferred by farmers. From our survey, these would appear to be yield, good grain color, good bread quality, strong and long straw, disease resistance, performance in light soil (Gombere), frost tolerant and marketability.

The survey results also indicate that there are characteristics that farmers prefer in the five varieties that transcend specific areas. These are size of grain (big), good grain color (amber), early maturity, strong and long straw, straw palatability, food quality (mainly injera, kinche and kolo) and marketability. Again, these are important characteristics that breeders will want to consider when developing varieties for wide farmer acceptability.

On the whole, these varieties were rated low for yield and for disease and pest resistance with the exception of Israel for yield and disease resistance and Enkoy for yield. However, breeders are putting emphasis on development of varieties that have high and stable yield and good disease and insect tolerance. The farmers' ratings of the five varieties that reflected their preferences were also very closely matched by their practice in terms of allocation of land to various varieties.

The survey results also indicated that the main source of seed for farmers is the local market. Availability of seed in the local market can influence the varieties that farmers will grow. At present, the Ethiopian Seed Corporation is distributing seeds of only Boohai and Enkoy. Enkoy was highly rated by farmers on only its yield and early maturity, and yet it was grown by farmers in the three woredas, and even allocated more land in Ada than any other variety. Availability of Enkoy seed might be the explanation.

Diversification of varieties in Ada, Lume and Gimbichu woredas is an important farmer strategy. The farmer reduces risk by simultaneously growing a number of varieties, and, hence, increases variability in the characteristics they prefer.

In this survey, the characteristics or criteria that were used by farmers in rating the five varieties that indicated their preferences were given equal weight. Thus, it was not possible to tell which characteristic was considered more important than another (i.e. was yield more important than injera quality or was disease resistance more important than marketability). Thus, further research could determine the ranking of criteria affecting farmers' varietal preferences.

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Table 1. Family household characteristics of durum wheat farmers in Ada, Lume and Gimbichu woredas, 1990/91.

Variable	Ada (n=52)	Lume (n=44)	Gimbichu (n=48)	All (n=144)
Average no. in household	6.7	6.8	6.2	6.6
Average no. of adults over 14 yrs	3.2	3.6	3.5	3.4
Average no. of children less than 14 yrs	3.5	3.2	2.7	3.1
Average age of household head (yrs)	44	45	47	45
Average no. of years of formal education for household head	1.3	1.5	1.7	1.5
Male-headed household (%)	98	98	96	97
Female-headed household (%)	2	2	4	3
Household heads with any formal education (%)	40	52	56	49

Table 2. Average land use pattern of the durum wheat farmers in Ada, Lume and Gimbichu woredas, 1990/91(area in kert)[a].

Land use pattern	Ada (n=52)	Lume (n=44)	Gimbichu (n=48)	All (n=144)
Land under cultivation	7.3	9.7	5.8	7.5
Fallow land	0.1	0.6	0.2	0.3
Grazing land	0.9	0.7	1.7	1.1
Others	0	0	0.1	0
Total farm size	8.3	11.1	7.9	9.0

[a] 4 kert = 1 hectare.

Table 3. Reasons for not growing local durum wheat varieties this year in Ada, Lume and Gimbichu woredas.

Reasons	% of farmers			
	Ada (n=50)	Lume (n=44)	Gimbichu (n=42)	All (n=136)
Shortage of seed	26	14	21	21
Shortage of land	0	16	5	6
Disease problem (rust)	0	21	16	15
Aphid problems	28	6	39	26
Shortage of seed and disease problems	14	7	5	7
Shortage of seed and aphid problems	18	21	4	13
Others[a]	14	16	9	11

Percentage totals may differ from 100% because of rounding.

[a] low yield, susceptibility to lodging, frost and low marketability.

Table 4. Percentage of farmers growing improved durum wheat varieties in Ada, Lume and Gimbichu woredas, 1990/91 season.

Varieties	Ada (n=46)	Lume (n=44)	Gimbichu (n=46)	All (n=136)
Boohai	20	11	0	10
Cocorit	4	9	9	7
Gerardo	9	0	2	4
Enkoy	17	2	4	8
Israel	4	27	9	13
Number of varieties:				
Only one variety	54	49	24	42
Two varieties	40	34	63	46
Three varieties	4	18	10	12
Four varieties	0	0	2	1

Percentage totals may differ from 100% because of rounding.

Table 5. Average area and proportion of total durum wheat area under various varieties in Ada, Lume and Gimbichu woredas, 1990/91 season.

Woreda	Variety				
	Boohai	Cocorit	Gerardo	Enkoy	Israel
Ada					
N	21	7	14	24	4
Average area (kert)	1.2	1.1	1.4	1.1	1.1
Proportion of total durum wheat area (%)	30	9	24	32	5
Lume					
N	18	22	0	13	21
Average area (kert)	1.0	1.4	0	0.9	1.8
Proportion of total durum wheat area (%)	18	31	0	12	38
Gimbichu					
N	4	24	7	14	39
Average area (kert)	0.6	1.5	1.8	1.4	2.2
Proportion of total durum wheat area (%)	2	23	8	13	55
All					
N	43	53	21	51	64
Average area (kert)	1.1	1.4	1.5	1.1	2.0
Proportion of total durum wheat area (%)	14	22	9	17	38

Percentage totals may differ from 100% because of rounding.

Table 6. Sources of seed for durum wheat improved varieties planted in Ada, Lume and Gimbichu woredas, 1990/91 season.

Source	% of farmers			
	Ada (n=47)	Lume (n=44)	Gimbichu (n=46)	All (n=137)
Own	6	16	2	8
Local market	68	32	41	47
Extension	19	11	17	18
Own/local market	4	27	15	15
Own/extension	0	5	11	5
Extension/local market	2	9	13	8

Percentage totals may differ from 100% because of rounding.

Table 7. Sources of information about improved durum wheat varieties in Ada, Lume and Gimbichu woredas.

Source	% of farmers			
	Ada (n=45)	Lume (n=36)	Gimbichu (n=45)	All (n=126)
Extension	49	75	47	56
Other farmers	22	14	22	20
Other farmers/extension	24	6	22	18
Grain merchant	2	3	7	4
Radio	2	3	2	2

Percentage totals may differ from 100% due to rounding.

Table 8. Variety ratings by farmers across all characteristics in each of three woredas, 1990/91 (out of 25 points).

Variety	Ada	Lume	Gimbichu	All
Cocorit	13.9	12.6	11.2	12.2
Boohai	13.6	11.3	11.3	12.4
Gerardo[a]	12.4	0	10.6	11.9
Israel	11.3	12.7	14.9	14.0
Enkoy	8.6	5.4	8.1	7.6

[a] Not grown in Lume woreda during the 1990/91 season.

Table 9. Variety ratings by farmers across breeders' criteria in each of the three woredas, 1990/91 (out of 9 points).

Variety	Ada	Lume	Gimbichu	All
Cocorit	3.4	4.8	4.0	4.5
Boohai	5.9	4.4	3.3	5.0
Gerardo[a]	4.8	0	4.4	4.7
Israel	5.0	5.5	6.4	6.0
Enkoy	3.0	2.4	3.2	2.9

[a] Not grown in Lume woreda during the 1990/91 season.

Table 10. Variety ratings by farmers across food quality criteria in each of the three woredas, 1990/91 (out of 5 points).

Variety	Ada	Lume	Gimbichu	All
Cocorit	4.2	3.2	3.4	3.4
Boohai	3.8	3.2	3.0	3.5
Gerardo[a]	3.3	0	3.2	3.3
Israel	1.8	3.1	2.4	2.6
Enkoy	0.8	0.3	1.6	0.9

[a] Not grown in Lume woreda during the 1990/91 season.

Appendix 1. Local durum wheat varieties formerly grown by farmers in Ada, Lume and Gimbichu woredas.

Variety name	Number of farmers	Woreda
* Kore	2	Ada
* Gellano (Enatet)	5	Ada
* Selale (Tikur Sinde)	1	Ada
* Gojame (Tikure)	4	Ada
Ofene	3	Ada
* Gebre	1	Ada
Bukak	3	Ada
* Geja	1	Ada
* Azaze	1	Ada
*** Bawunde	1	Ada
* Gufare	1	Ada
Kinteno	2	Ada
Mate	3	Lume
* Kulubo	1	Lume
* Gellano	3	Lume
* Selale (Tikur Sinde)	2	Lume
Hottosali	1	Lume
Ofene	1	Lume
Loko	1	Lume
* Bukak	2	Lume
* Abesha Sinde	1	Lume
* Giru	1	Lume
Gnaran Kulae	1	Lume
* Selale (Tikur Sinde)	1	Gimbichu
Shernet	1	Gimbichu
* Gojam Gura	1	Gimbichu
* Aybo	1	Gimbichu
* Gojame (Tikure)	3	Gimbichu
** Aja	1	Gimbichu
* Kurkure	1	Gimbichu
* Set Akuri	1	Gimbichu
Aya Tsedeke	1	Gimbichu
* Goshu Genber	1	Gimbichu
Kinteno	1	Gimbichu

Varieties without asterisks before them were not recognized. Farmers who had grown various combinations of these varieties are not included.

* Recognized by durum wheat breeder as local durum wheat variety.

** Recognized by durum wheat breeder as emmer wheat.

*** Recognized by durum wheat breeder as bread wheat.

Appendix 2. Characteristics used by farmers in rating the five varieties in Ada, Lume and Gimbichu woredas, 1990/91.

1.	Yield
2.	Large grain
3.	Good grain color
4.	Straw quantity
5.	Strong straw
6.	Long straw
7.	Straw palatability
8.	Pest tolerance
9.	Disease resistance
10.	Early maturity
11.	Lodging resistance
12.	Shattering resistance
13.	Shrivelling resistance
14.	Weed suppressant
15.	Yield without fertilizer
16.	Performance in light soil (Gombere)
17.	Frost tolerance
18.	Drought resistance
19.	Marketability
20.	Storability
21.	Bread quality
22.	Injera quality
23.	Kolo quality
24.	Nifro quality
25.	Kinche quality

Not in order of preference.

1-9 : characteristics considered by breeders.

21-25 : food quality characteristics.