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Agricultural systems in Ethiopia

Joint publication
of the College of Agriculture,
Haile Sellassie I University, Ethiopia,
and the Agricultural University,
Wageningen, the Netherlands

Centre for Agricultural Publishing and Documentation

Wageningen – 1975

Abstract

WESTPHAL, E. (1975) Agricultural systems in Ethiopia. Agric. Res. Rep. (Versl. landbouwk. Onderz.) 826, ISBN 90 220 0556 9, (x) + 278 p., 16 figs, 103 photographs, 10 maps in separate cover, 9 tables, ZZZ refs, 2 appendices.

The book is the second in a series of publications on Ethiopian useful plants. It treats the agricultural systems in Ethiopia: the seed-farming, ensat-planting and pastoral complex, and shifting cultivation.

Special chapters are devoted to the geography, climate, soils, natural vegetation, ethnic groups and languages, agriculture, markets, food and nutrition, and useful plants. Tables, photographs, and indices on subject and scientific plant names are added; 10 detailed maps are included in a separate booklet.

ISBN 90 220 0556 9

Coverplate: fields in the Chercher Highlands of Hararge with sorghum, t'ef, sweet potato and ch'at (E. Westphal).

To Bauk and Marijn

Contents

Preface

This publication deals with different agricultural systems found in Ethiopia, and is based on field work carried out in Ethiopia (1967-1968) and on literature studies. It attempts the integration of information (including maps) relevant for Ethiopian agriculture into a surveyable whole. Of course, it does not aim at completeness, and suggestions for improvement will be welcome.

The present book is the result of a co-operation between the College of Agriculture at Alemaya, Haile Sellassie I University, and the Department of Tropical Crops and the Laboratory of Plant Taxonomy and Plant Geography, Agricultural University, Wageningen. It appears as a joint publication, the second volume of a series on Ethiopian edible plants.

And because I was amazed they said to me: 'honoured guest, do not be amazed, because in the years that we harvest little we gather enough for three years' plenty in the country; and if it were not for the multitude of locusts and the hail, which sometimes do great damage, we should not sow the half of what we sow, because the yield is incredibly great; so it is sowing wheat, or barley, lentils, pulse, or any other seed. And we sow so much with the hope that even if each of those said plagues should come, some would be spoiled, and some would remain and if all is spoiled the year before has been so plentiful that we have no scarcity'.

From: The Prester John of the Indies. A true relation of the lands of the Prester John, being the narrative of the Portuguese Embassy to Ethiopia in 1520, written by Father Francisco Alvares. Edited by Beckingham, C. F. & G. W. B. Huntingford, vol. 1: p. 189 (1961).

1 Geography

1.1 Geology

Ethiopia is part of the structural unit of the Horn of Africa, also including Arabia, the Red Sea area and the Gulf of Aden. The base of this region consists of intensively folded and faulted Precambrian rocks and is overlain by subhorizontal Mesozoic marine strata and Tertiary basalt traps. This complex has been uplifted in the Upper Eocene as part of the Arabo-Ethiopian swell, across which later on rifting gave rise to the Rift System. The following data are mainly from Mohr (1961, 1962).

Precambrian

Large exposures of Precambrian rocks in Ethiopia belong to a still undifferentiated group called the Crystalline Basement, the Basement Complex, or merely the Basement. It occurs in the peripheral regions of the country, and underlies all younger rocks including those in the central and eastern parts of Ethiopia. It consists of a complex of various metamorphic rocks some of which still show the original sedimentary or igneous character. Almost non-metamorphosed sedimentary rocks and igneous intrusions also occur, together with mineralized hydrothermal veins representing the last igneous manifestations of the Precambrian.

Most of the Basement consists of metamorphic rocks, with schists much more abundant than gneisses. Paraschists predominate over orthoschists. Sandstones, arkoses and limestones are indicated by interbedded psammitic and calcareous schists amongst the phyllites, and the mica and chlorite schists, whereas ironstones are virtually absent. Igneous intrusions are common, especially the acid types, though diorites are not uncommon and even ultra-basic bodies are known. The Basement Complex is presumably of Precambrian age, in view of metamorphosis, the petrography, and the almost complete planation of these rocks before the Mesozoic transgression.

The formation is still found in the northern part of the highlands as far as Eritrea, along the eastern escarpment of the Ethiopian Highlands, in Wellega (where they are associated with concentrations of auriferous quartz), in the southern lowlands, in the Chercher and Harar regions, and in the deep valleys of the Abbay and Didessa rivers (Huffnagel et al., 1961).

Palaeozoic

During the Palaeozoicum no deposition took place in Ethiopia. During this time the Arabo-Ethiopian massif was a stable landmass subject to denudation, ultimately resulting in near-planation of the Precambrian mountain ranges. Where no later sediments have covered the Basement Complex, as in northern Eritrea, the Precambrian rocks have been denuded from the beginning to the present, and the roots of the ancient mountains are now deeply exposed.

Mesozoic

Early in the Mesozoic the Horn of Africa was subject to the first major marine transgression since the end of the Precambrian. This resulted in an extensive south-eastern arm of the Tethys, spreading west over the Arabo-Ethiopian Shield, and over what are at present the coast lands of East Africa as far south as Madagascar. The epeirogenic sinking causing this transgression started in the Triassic, reached its maximum development in the early Upper Jurassic, and by the end of the Mesozoic almost the entire Horn of Africa was again raised above sea level. The following major lithological divisions can be recognised within the Mesozoic rocks of Ethiopia.

The transgressive Adigrat Sandstone facies (Triassic) The beginning of the Mesozoic transgression over the Horn of Africa is everywhere marked by deposits of shallow marine sands, resting unconformably on the underlying Basement Complex. In Ethiopia, this basal Mesozoic sandstone is called the Adigrat Sandstone. It is a transgressive facies ranging from Upper Triassic age in the Ogaden to Lower, or possibly even Middle Jurassic in Tigre and Eritrea. Its thickness in central Ethiopia is ca 500 m, elsewhere it varies between a few meters and 1000 m.

It mainly consists of a white, massive, quartzose sandstone. In the clastic grains, quartz always strongly predominates over feldspar. The cement, usually chalcedonic silica or kaolin, is never abundant as compared with the volume of clastic grains. Where haematite forms the cement, or parts of it, the rocks are yellow, brown, red or violet.

The Adigrat Sandstone is widely distributed; it is found in the Adigrat region and upper Tekkezze basin, along the eastern escarpment between Adigrat and Ankober, and in the valleys of the Abbay, Awash and Upper Webi Shebele (Huffnagel et al., 1961).

The Antalo Limestone facies (Jurassic) Between the Adigrat Sandstone and the Upper Sandstone in Tigre a fossiliferous marine horizon occurs, the Antalo Limestone. It is everywhere present on the Adigrat Sandstone. In northern and central Ethiopia it has never been observed directly on the Basement Complex but it is always underlain by the Adigrat Sandstone; in Hararge direct superposition on the Precambrian rocks is known. The Antalo Limestone Formation comprises many lithological types

of limestone; it includes layers of marl and silt, and occasionally nacreous bands, especially near the top. Its thickness ranges from zero to 800 m.

It is found around Mekele, in the Abbay valley, and over extensive areas of the Eastern Highlands from the Chercher Mountains to the Juba and Webi Shebele valleys (Huffnagel et al., 1961).

The regressive Upper Sandstone facies, and rocks of Cretaceous age The youngest period of the Mesozoic era is marked by the deposition of sandstones, which crop out in the south of the Eastern Highlands and the Ogaden, and by marine limestones on the Arussi high plateau and in the Webi Shebele (Huffnagel et al., 1961). In northern and central Ethiopia the Upper Sandstone is about 300 m thick. It should not be confused with the Nubian Sandstone, which is a continental aeolian type sandstone.

At the end of the Cretaceous, probably all of Ethiopia, except the Ogaden, had emerged above sealevel. This process must have been slow and fairly regular since the regression starting at the end of the Jurassic gave rise to an extensive, monotonous, flat, low-lying plain. Even at present the Mesozoic strata are as a rule sub-horizontal, except in the few localities later on disturbed by intrusions or associated volcanic activity (in Tigre and the Danakil Alps), or by block faulting during the early Cretacean (in Hararge).

Tertiary

The marine sedimentary succession (Eocene to Pliocene) In the Lower Eocene, the sea covering the eastern parts of the Horn of Africa deepened. There was no Eocene transgression re-submerging large areas of land, but at the end of the Cretaceous regions where littoral sands were deposited sank and thus enabled deposition of bare, neritic limestones.

At present the Lower and Middle Eocene limestones are found at 2000 m on the Somali Plateau. Later sediments have never been found more than a few hundred meters above the present sealevel, indicating a great uplift in the Upper Eocene.

Widespread Oligocene deposits were formed in close connection with the present Indian Ocean coast of Somalia. The formation, on a small scale, of their littoral facies began in the early Oligocene in Somalia (during the Miocene in Eritrea) along the Eritrean coast and established lagoonal conditions in what is now the Salt Plain region of Afar.

The Trap Series Together with and immediately after the major uplift of the Horn of Africa, immense quantities of lava reached the surface. In Ethiopia they covered most of the Mesozoic rocks, especially in the north and the centre of the country, and they often reached the rocks of the peripheral parts of the Basement Complex. They covered a monotonous, flat, slightly denuded, laterized surface. The Trap Series consists of a very thick series of lava flows, chiefly plateau basalts (traps).

The magmas supplying the lavas were generally sodic, less common calc-alkaline. Both chemically and mineralogically the basalts are extraordinarily uniform in composition, frequently over thousands of meters thick and over the whole plateaus.

As to their petrography two groups occur. The first is the Ashangi Group, usually consisting of amygdaloidal basalts with zeolite and agate nodules, rarely with sedimentary intercalations, interbedded tuffs and agglomerates. The second is the Magdala Group of compact and rarely amygdaloidal basalts, with numerous interbedded flows of trachyte, and with frequent sedimentary intercalations.

The Trap Series in central Ethiopia generally shows the petrographic succession typical for north Ethiopia: basal basalts of the Ashangi Group overlain by interbedded basalts and more silicic lavas of the Magdala Group. This also applies to this series in south-west Ethiopia. On the Eastern Highlands outcrops of the Trap Series are less frequent and occur more locally than in the Ethiopian Highlands.

Tectonic phenomena of the Tertiary

1. Uplift of the Ethiopian Swell together with Arabia and the intervening regions now occupied by the Red Sea and the Gulf of Aden, occurred on an immense scale after the late Mesozoic to early Tertiary regression of the sea towards the south-east (not to be confused with the late Mesozoic and early Tertiary emergence). It may have been closely connected with the first eruptions of plateau basalts, the uplifted and uparched and fissuring landmass permitting the ascent of magma to form the Trap Series upon the newly elevated swell. The uplift in the Middle Eocene in Somalia has been at least 2500 m; the total flexure of the basement complex in the Horn of Africa has been at least 5000 m. Arabia and the Horn of Africa were uplifted as one unit, the Red Sea and Gulf of Aden rifts not yet being in existence.

After the Upper Eocene uplift and the Oligocene eruptions of the Trap Series came the formation of a complex pattern of major fractures giving rise to downfaulted strips (or rifts) in the Miocene. These rifting movements were related to, though not coincident with, the axes of maximum uplift, and separated the once continuous Ethiopian and Eastern Highlands.

2. The Tertiary-Quaternary tectonic formations known as the Rift System is one of the largest structural features of the earth's crust, extending over more than 6000 km from Mozambique to Syria. It consists of a complex pattern of narrow belts of parallel faulting, sunken strips of land (graben) between a system of faults resulting in the characteristic rift valleys. The northward extension of the western Rift beyond Lake Albert is uncertain, whereas the Gregory Rift extends northwards through East Africa into the Lake Rudolf basin. The system of fractures then continues north—north-east across Ethiopia forming the main Ethiopian Rift before opening out into the complex sunken region of Afar. Afar represents the intersection of the African Rift System, the Gulf of Aden Rift, and the Red Sea Rift; both the two last rifts are much broader than the typical rifts of the Rift system.

The Ethiopian Rift System is divided into the Lake Rudolf Rift, the Chew Bahir Rift, the main Ethiopian Rift running continuously from Lake Chamo to Afar, and

the Afar depression. Its age has been estimated to be similar to that of the Rift System in comparable areas. In most of Ethiopia, the extrusion of the Trap Series had ended by the Miocene. It is considered that Afar was formed during the Lower Miocene. The Main Ethiopian Rift was probably formed at a later age like the Gregory Rift in Kenya.

There is evidence of a border zone of westwards downthrown faults limiting the Ethiopian Highlands to the west, as well as of considerable tectonic activity on the Highlands themselves.

For currently available information on the eastern rift in Eastern Africa (including Ethiopia) see the review of Baker et al. (1972).

Quaternary

Owing to the very varied morphology of the Horn of Africa, deposits of many different types have been formed during this period. Especially in the Rift System, their sequence is complicated by the occurrence here and there of volcanic rocks, including lavas of very varied petrography.

The Marine Deposits The conglomerate facies of the Red Sea and the Gulf of Aden coasts of the Horn of Africa was probably formed during the Pluvial periods. Towards the old shorelines it gives place to marine sands and then to limestones. Early in the Pliocene, the sea invaded Afar from the north. Tectonic uplift during the Pluvials at the end of the Pleistocene caused the isolation of the Afar region. Postpluvial desiccation led to recession of the isolated waters, evaporate deposition and terrace formation.

The Continental Deposits The main types of continental Quaternary deposits found in Ethiopia are partly Pluvial (with glacial and glaciofluvial deposits on the highest mountains, lacustrine deposits in the Rift System and the Lake Tana basin, and fluviatile deposits including pebble beds, on the plateaus), partly Interpluvial with aeolian sands and rubbles, loess, calcrete and ferricrete surfaces, and some minor gypsum deposits.

The Aden Volcanic Series The volcanic rocks, which are post-dated to the formation of the Rift System in Ethiopia, are termed Aden Volcanic Series. Most of them occur only in the Rift System itself, though some isolated eruptions are known from the high plateau, especially south of Lake Tana. The Aden Volcanic Series is therefore of post-Miocene age, and active volcanoes in the Ethiopian Rift System prove that its formation has not yet been completed. The petrography of the Aden Volcanic Series lavas in Ethiopia indicates an alkaline olivine basalt magma as its source, possibly partly hyperalkaline silicic lavas and pyroclasts.

The freshly preserved volcanic structures of Ethiopia are largely restricted to the Rift System. The cones are rarely over 1000 m high, much smaller than the older

volcanoes of the Trap Series and the giant volcanoes of the East African Plateaus. South of the Awash river volcanic structures are rare in the Ethiopian Rift System. To the north and in Afar they are very abundant and tend to occur along alignments connected with major boundary faults of the Rift System, indicating continuing tectonic instability. Secondary volcanic activity in the form of fumaroles and hot springs are abundant on the floor of the Ethiopian Rift System, and are most commonly associated with recent volcanic phenomena. On the high plateaus hot springs may emerge through the Trap Series, usually at the bottom of valleys, sometimes through Basement Complex rocks.

1.2 Topography and topographic regions

Characteristic for the Ethiopian topography is the great difference between the hot lowlands (the k'olla) and the cool highlands (the woyna daga and the daga) separated by the Riftvalley. Some disagreement exists in literature on the names of the main physiographic regions. Logan (1946) distinguished the Ethiopian Plateau, the Somali Plateau, the Riftvalley, the Danakil and Afar Plains, and the Sudan Plains. Delli-quadri's (1958) classification is similar: the Ethiopian Highlands (the Ethiopian Massif, the Harar Massif, the Ethiopian Piedmont or Eastern Slopes), the Ethiopian Graben (the southern and northern section), and the Coastal Plains and Lowlands (the Red Sea coastal plain and the Sudan lowlands). In 'The Agriculture of Ethiopia' (1954) the division is: Red Sea Coastal Plain, Lava Plateaus, Blue Nile Valley, Riftvalley, Somali Plateau, Crystalline Highlands, and Sudan Plains. Last (1962) favoured three major physical units: the Western Highlands and high Plateaus, the Eastern Highlands and Plateaus, and the Riftvalley with the Afar Lowlands.

The main physiographic regions distinguished here are:
the Ethiopian Highlands
the Abbay Trough
the Eastern Highlands and the Somali Plateau
the Riftvalley (including the Danakil region)
the Coastal Plains
the Sudanese Lowlands (including the Western Foothills and the Omo Trough)

Each region can be subdivided into several natural units as follows (see the relief map and the geographical map as well).

The Ethiopian Highlands

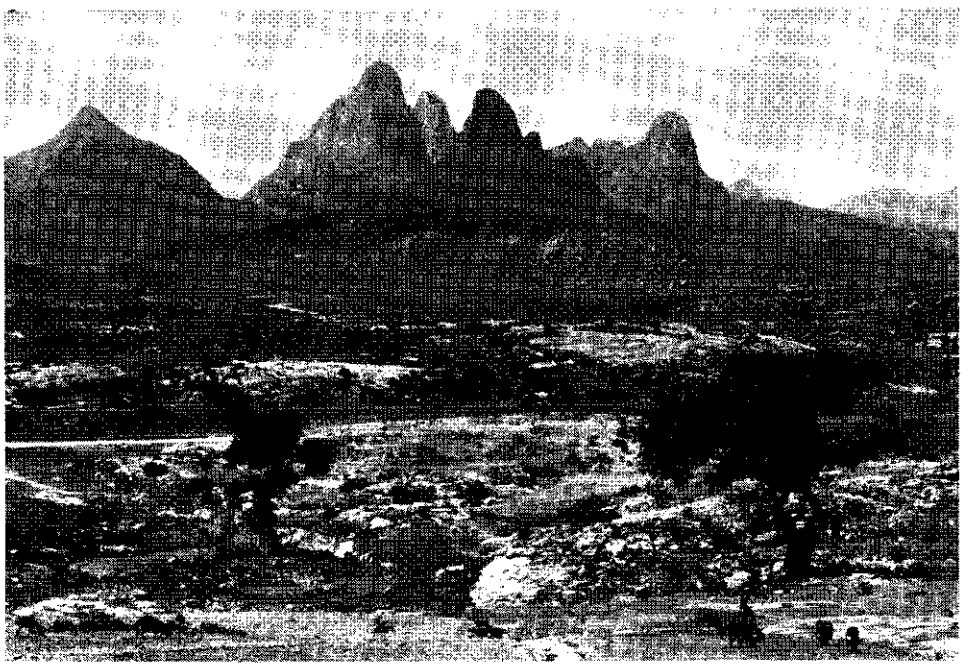
The Ethiopian Highlands extend from Eritrea in the north to Kenya in the south. Except for their northern part, which continues into the Sudan, they are entirely surrounded by escarpments. The eastern escarpment approximately follows the meridian of 40° from Eritrea till the Awash river; from there it curves south—south-west and continues to the Kenyan border. In the north it rises to 2100-2400 m and dominates, like a wall, the lowlands east of it some 1200 m below. In the centre it is

broken by the Awash valley, about 1000 m lower. In the south the escarpment is less high and near the Kenyan border the average elevation is ca 1500 m. The western escarpment is in general less high and abrupt, and is considerably more broken. Only in Kefa, the Bani Shangul area and west of Lake Tana it is comparable with the eastern escarpment. Elsewhere it is not well marked and is more interrupted by rivers draining into the Nile valley. The plateau itself is a high and dissected tableland at an elevation of 1500-1800 m, though considerable parts of it are much higher, especially in the north, where it reaches over 4000 m and more. The mountains of Kefa and Jima stand out in the south. Erosion has been considerable, giving rise to steep, sometimes more than 1000 m deep valleys, and isolated flat-topped massifs called 'ambas' (Logan, 1946). The following physical units can be distinguished (Last, 1962).

Photograph 1. Amba-like rocks, Tigre.

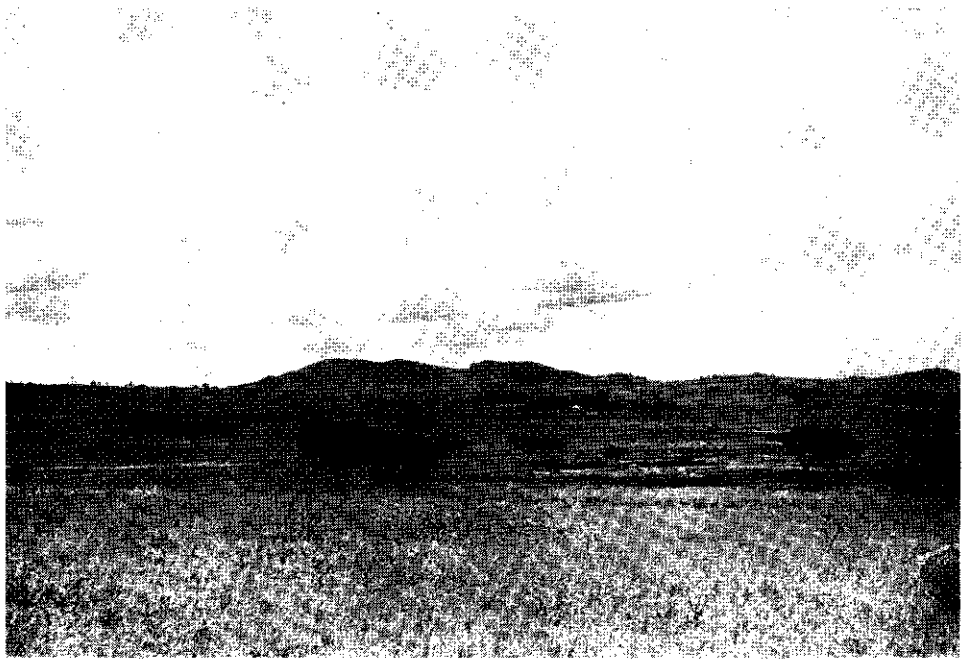
Photograph 2. Mountains east of Asmara, Eritrea.

(1) *The Northern Highlands* are between the lower course of the Barka river and the coastal plain of Eritrea, roughly north of 16° latitude. They are much eroded remnants of the old crystalline block with strongly decomposed granitic rocks.
(2) *The Plateau of Eritrea*, between the basins of the Barka river and the Tekkezze river is the most northern remnant of the plateau basalts. It is bisected by the upper basin of the Mareb and lies partly in Eritrea (Asmara Plateau, Upper Anseba Highlands, Basalt Plateau, Western Slopes, Eastern Highlands and Upper Mareb Trough (Abul-Hagag, 1961)), and in the northern part of Tigre. The rivers have cut broad valleys down to the sedimentary rocks, but considerable areas of flat plateau capped by basalt have remained.
(3) *The Plateau of Tigre* is situated south-east of the upper course of the Mareb river, and north-east of the Tekkezze river. It is a much eroded area with a varied geological composition, and largely consists of sandstones and limestones as the plateau basalts have been eroded from all but the highest points of its eastern margin. This erosion has resulted in poor soils.
(4) *The Massifs of east Begemdir and west Wollo* are isolated plateau blocks capped by basalts and surrounded by deep gorges. Within each of these massifs smaller tablelands, known as 'ambas', isolated by river-eroded gorges, are characteristic. Some of the massifs are
(a) the Simen Massif in the north-east of Begemdir, bounded in the east and the north by the Tekkezze, with the Ras Dashan (4620 m);



Photograph 3. Mountains between Adua and Adigrat, Tigre.

(b) the Guna Massif south of the Simen complex in south-east Begemdir, and north of the Abbay, with Mount Guna (4281 m);
(c) the Lasta Massif (including Waag) in north-west Wollo, north of the Tekkezze, with Mount Abuna Yosef (4194 m);
(d) the Amara Saint Massif in south-west Wollo, between the Bashillo and the Wachit rivers, with the Amba Farit (3978 m).
(5) *The Lake Tana Basin* comprises the plains surrounding Lake Tana (at 1830 m) such as the Dembea and the Foggera Plains north-east of it. It forms the upper drainage basin of the Abbay. It covers some 3250 km^2.
(6) *The Gojam Massif* has as its centre the Choke Mountains with the Ras Birhan (4154 m) and the Amedamit (3619 m). The Abbay has carved its upper gorge around it in the north-east, the east and the south.
(7) *The Western Margins* in west Begemdir and Gojam show an eroded region forming the watershed between the drainage area of Lake Tana and that of the rivers Angereb, Gendua, Rahed, Dinder and Balas. These rivers have cut deep trenches isolating various mountain groups such as the Welquait-Weldebba, Tseggede, Chilga, Tagussa Agaumeda, Wembera and the Belaya mountains, which make up the western edge of the plateau lands.
(8) *The Shoan Plateau,* mostly above 2000 m, extends westwards into east Wellega and forms a crescent-like region draining into the Abbay. Its surface consists of



Photograph 4. High-plateau region south-east of Addis Abeba, Shoa.

Photograph 5. View from Debre Sina northwards, Shoa.

plateau basalts into which the important tributaries of the Abbay (the rivers Guder, Muger, Jamma and Wachit) have cut deep gorges isolating smaller tablelands like that of Menz and Merebete. The high eastern margins (with the Abuya Myeda of 4000 m) form the watershed of the Nile drainage basin.
(9) *The South-western Highlands*, south of the Abbay Trough, are relatively small mountain remnants, rounded in form, with few areas above 2500 m, and dissected by mature river valleys. The region is in a much more advanced stage of erosion and characteristic for it is a pattern of interlocking drainage. The rivers like the Dabus, Didessa, Baro, Gilo, Akobo, Omo/Gibbe, Gojeb, Gibbe Jima and Gibbe Ennarya, rising in the high rainfall region of south-west Ethiopia, flow throughout the year and have cut broad valleys which contrast with the deep gorges of the northern plateaus. In general, the eastern part still retains its cover of plateau basalts whereas the western fringes expose the crystalline basement. The highest point is Tullu Wallel (3301 m) in west Wellega.
(10) *The High South-eastern Margins* lie on the east side of the south-western Highlands and constitute several massifs like Gurage (Mt Gurage, 3719 m), Kambatta, Wollamo, and Gamu Highland (Mt Tola, 4200 m).

The Abbay Trough

(11) *The Abbay Trough* is an impressive gorge which forms a formidable barrier to the north-south communication on the plateau. In some places the Abbay has cut nearly 2000 m below the general level of the plateau, and exposes rocks down to the basement complex. With a width of 50-100 km towards the Sudanese border, it can be considered as a separate physical unit (Last, 1962).

The Eastern Highlands and the Somali Plateau

This region is bounded on the west and north by a continuous escarpment running in a wide curve from the Kenyan border to north Somalia; its southern part (about 1800 m high) forms the eastern wall of the Riftvalley. The escarpment rises northwards and attains its maximum elevation of over 3000 m near the Chilalo Massif in Arussi. It decreases in height in north-eastern direction, with an average elevation of 2400 to 1800 m from the Chilalo Massif to near Jijiga. The outer face of the escarpment is abrupt and high and varies from 600-1200 m above the adjoining country. In some places in the south-west and central parts there is also a distinct rise from the Somali Plateau towards the crest of the escarpment, which gives it the character of an outer crest. This crest has been heavily eroded and in some places it has the appearance of isolated massifs such as the Harar, Ahmar, Chercher, Gugu and Chilalo Mountains. From its escarpment, the Somali Plateau gently slopes south-eastwards to the Indian Ocean. Only the higher portions of the plateau are in Ethiopia; heavy erosion has given rise to large massifs and ranges of hills. The main rivers have cut deep gorges of which that of the Webi Shebele is the deepest (over 1000 m below the level of the

Photograph 6. Cultivation on level shelves of a valley in the Gara Muletta area, Hararge.

Photograph 7. Huts and sorghum/maize fields close to the edge of the escarpment near Kersa, Hararge.

plateau). Furthermore, erosion has resulted in a series of more or less parallel ranges or, more precisely, narrow plateaus running towards the south-east and separated by the valleys of the Dawa Parma, Ganale Doria, Webi Gestro and Webi Shebele rivers (Logan, 1946).

The following physical units can be distinguished (Last, 1962).

(12) *The Chain of the South-eastern Highlands* is capped by basaltic rocks and is bounded in the west and north-west by a fault escarpment. It has been eroded into a narrow chain of highlands by the river systems draining towards the south-east. The erosion by the headstreams of the Webi Shebele has isolated a number of smaller mountain groups, the Chercher, Gugu and Chilalo Massifs, and the mountains of Sidamo. The highest peak is Mt Kaka in the Chilalo Massif (4200 m). Occasionally, the chain broadens into a plateau, notably from Sire to Robi between the Gugu and Chilalo Massifs.

(13) *The Bale Massif* is an extensive highland region between the upper courses of the Webi Shebele and the Ganale Doria. It forms a rather isolated area to the east of Yirga Alem and separated from the main chain of the south-eastern Highlands by the two mentioned river valleys. The Massif is the largest area of very high country in Ethiopia, most of it is above 3000 m with several peaks of which Mt Batu (4307 m) is the highest.

(14) *The Harar High Plateau* lies north-east of the main valley of the Webi Shebele. It largely consists of limestones and earlier sedimentary rocks which have been exposed by erosion. The plateau is well over 1000 m, slopes gently to the south, and is drained by the left bank tributaries of the Webi Shebele such as the Galetti, Ramis, Mojo, Gobele, Erer, Dakata and Fafan rivers.

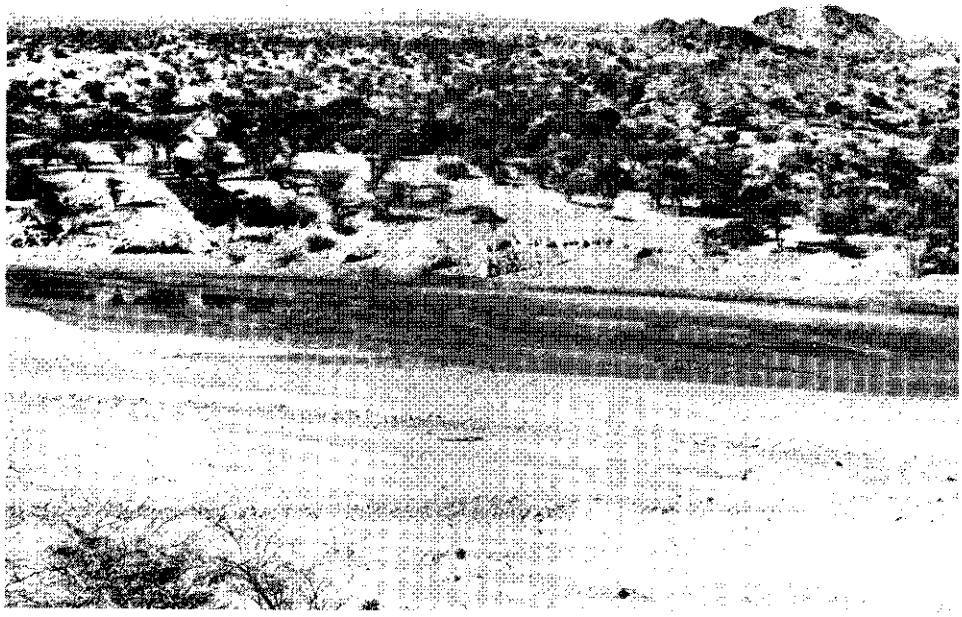
(15) *The Ogaden Low Plateau* is a continuation of the Harar high Plateau, but it is almost entirely below 1000 m (in the extreme south-east the 500 m contour is crossed), and it consists of later sediments through which patches of the basement rock appear. It is a very dry region, crossed by wadis which drain into the Webi Shebele.

(16) *The Webi Shebele Trough* has been carved across the Ogaden low Plateau and separates the plateaus south of Harar from its continuation south-east of the Bale Massif.

(17) *The Sidamo-Borana Plateau* is, to the east, the counterpart of the Harar high Plateau. The general elevation is above 1000 m. In the east the limestone country gives way to the granite and other basement rocks of the west. The Plateau slopes gently to the south.

The Riftvalley (including the Danakil region)

The southern part of the Riftvalley runs in general towards the north-north-east and is enclosed in the east and the west by the escarpments of the Eastern and Ethiopian Highlands, respectively. It contains several lakes. The floor of the valley slopes gradually southwards from an average elevation of nearly 1800 m north of Lake Ziwai



Photograph 8. Armucale wadi north-east of Dire Dawa in the Riftvalley, Hararge.

to about 900 m at Lake Chew Bahir. In general the floor of the valley is from 600 to 900 m below the crest of the escarpments forming its walls, although locally there are considerably higher isolated parts. North of Lake Ziwai, the Riftvalley swings to the north-east and then opens out into the Danakil Plains. It is drained by the Awash River. These plains are bound by the northern escarpment of the Eastern Highlands, the eastern escarpment of the Ethiopian Highlands, and the Danakil Alps near the Red Sea coastal region. This region consists of a series of sand and lava plains dipping to the north-east and reaching their lowest point along a line running roughly parallel to the coast from the Gulf of Zula to the Gulf of Tajura some 50—80 km inland. In some places along this general line the plains are below the sea level. East of this depression zone is a broken range of volcanic mountains, the Danakil Alps, running parallel to the coast and increasing in height towards the south. The highest point is Mt Musa Ali (about 2000 m). These mountains are much eroded and the entire area is characterized by numerous isolated rocky peaks (Logan, 1946).

The following physical units can be distinguished (Last, 1962).

(18) *The Riftvalley Lake District* in which the Riftvalley has a normal shape, is bounded by parallel fault lines on the east and the west. Lakes Ziwai, Abayita, Langano, Shala, Awasa, Abaya and Chamo occupy the floor of this trough. Its width varies between 40 and 60 km. At its southern end, south of Lake Chamo, the structure is somewhat confused since Lake Chew Bahir lies in a parallel trough at a much

lower elevation. According to Nowack (1954, quoting Schottenloher's conclusions on the position of the Konso Plateau south of Lake Chamo), there are several troughs parallel to the Riftvalley. The Konso region, a natural extension of the Gamu Highland, which is part of the High South-eastern Margins, partly blocks the Riftvalley south of Lake Chamo. Here the valley narrows into that of the Sagan river and continues further to the south.

West of the Konso region, the trough in which Lake Chew Bahir is situated continues to the north into the Zala-Uba trough between the Gamu Highland to the east and the Bako Highland to the west. Along the western side of the Bako Highland another trough is found, the Omo Trough, which continues to the south to Lake Rudolf.

(19) *The Awash River Basin* is found north of the Lake District where the lines of faulting diverge and the Riftvalley broadens into the lowland plains of Dankalia. This southern part of the lowland plain is drained by the Awash. This river basin can be divided into three subregions: the Upper Awash Basin between the sources of the river on the Shoan Plateau and the point, where it descends into the Riftvalley, the Middle Awash Valley where the river passes across the Riftvalley near Awash Station, and the Awash River Plains where the river meanders through the southern part of the Danakil Plain before it enters Lake Abbe.

(20) *The Northern Danakil Region* is more complicated than its southern counterpart. The faulting has created a number of subregions of which the Kobar Sink (more than 100 m below sea level) and the Danakil Alps (parallel to the Red Sea coastline) are the most significant. Evidence of recent volcanic activity has been found in this region. Recent lava flows, active cones and fissures dominate the area.

The Coastal Plains

(21) *The Red Sea Coastal Plains* border in the north immediately the east of the plateau, south of Massawa the Danakil Alps, as a narrow strip along the shore. They consist of recent marine sediments and coral reef formations (Last, 1962).

The Sudanese Lowlands (including Western Foothills and Omo Trough)

Along the foot of the western escarpment of the Ethiopian Highlands are the plains of the Sudan. At the base of the escarpment they are some 1000 m above sea level and they slope gradually in a general westerly direction to the valley of the Nile (Logan, 1946).

The following physical units can be distinguished (Last, 1962).

(22) *The Western Foothills and Plains* form a transition zone between the northern plateau regions and the Sudanese Plains. They consist of the eroded remnants of the western edge of the plateau. In the north, river erosion has created wide plains (the Barka and the Gash-Setit lowlands), to the south, between the Setit and the Abbay lowlands, the plains are narrow and separated by long spurs of highland.

(23) *The Baro/Akobo Plains* are structurally part of the Sudanese Plains. The edge of the western escarpment is steep and the plains below consist of thick deposits of recent alluvium covering a basement of crystalline rocks.
(24) *The Omo Trough* extends north from the delta of the Omo river over some 200 km as far as the southern fringes of the mountains of Gimirra. The trough is part of the Riftvalley structures and is bounded on the west and east by fault lines. The southern end of the trough is occupied by Lake Rudolf.

1.3 Hydrography

The drainage pattern is the result of the uplifiting during the Tertiary Period, which created the Riftvalley and consequently the two separate highlands. The general slope of the Ethiopian Highlands is towards the Sudan, whereas that of the Eastern Highlands is towards the Indian Ocean. Along the eastern edge of the Ethiopian Highlands a major watershed separates the drainage westwards to the Sudan from the drainage eastwards into the Riftvalley. Similarly, a major watershed following the crest of the Eastern Highlands separates the drainage south-eastwards towards the Indian Ocean from the drainage into the Riftvalley.

The Ethiopian Highlands are drained by the westward flowing rivers (like the Tekkezze, Angereb, Atbara, Abbay, Baro and Akobo, which form part of the Nile drainage basin) and the eastward flowing rivers draining into the Riftvalley. The south-western part of the Ethiopian Highlands is drained by the left bank tributaries of the Abbay, the Baro-Akobo river system and the Gibbe-Omo river system. The latter occupies a closed basin and drains into Lake Rudolf.

The Riftvalley and the Afar lowlands drain almost entirely into a number of basins of inland drainage, of which the largest is the Awash basin.

The south-eastern part of the Eastern Highlands is drained by the headwaters of the Webi Shebele and the Fafan, but the main stream of the Webi Shebele does not reach the Indian Ocean. The south-western part of the Eastern Highlands is drained by the Webi Gestro, the Ganale Doria and the Dawa Parma, which unite into the Juba that drains into the Indian Ocean.

The seasonal streams of south-west Borana disappear in an area with semi-arid conditions situated west of the Juba drainage basin and east of the Sagan drainage basin.

The rivers of north and north-east Ethiopia are seasonal streams. The Mareb/Gash was once part of the Nile drainage system, but now disappears through a number of distributaries into the Sudanese desert. In the rainy season the Barka reaches the Red Sea.

The eastern escarpment north of Dese is drained by a number of small seasonal streams flowing into the Kobar Sink; the eastern escarpment of the Eritrean plateau north of Massawa is drained by a number of short wadis flowing directly into the Red Sea. The same applies to some seasonal streams in the coastal region of south-east Eritrea (Last, 1962).

Most of the rivers are short, run through deep and narrow canyons in their upper course, and are influenced by rainfall fluctuations. In general these rivers are not navigable, and only some are perennial. Extensive areas with an arid climate profit from the rivers entering the highlands, such as those flowing from the eastern escarpment of the Ethiopian Highlands and from the Eastern Highlands. In reaching the arid plains they dry up or are lost in swamps. In the Ethiopian territory no stream of any importance reaches the sea (Huffnagel et al., 1961).

In order of total annual volume the major rivers rank as follow: (1) Abbay, (2) Tekkezze/Angereb, (3) Baro/Akobo, (4) Omo, (5) Webi Shebele, (6) Ganale Doria/Webi Gestro/Dawa Parma, (7) Awash, (8) Mareb/Gash, (9) Barka, (10) Sagan (Last, 1961).

Some lakes play an important role in storing water and feeding it to the rivers (Lake Tana, Lake Ashangi). Most, however, are closed basins and function as final collectors (e.g. the Riftvalley lakes). According to Huffnagel et al. (1961), they often have the character of swamp and salt water areas (e.g. Lake Chew Bahir, Lake Abbe, Lake Asale).

2 Climate

In the past, the climate of Ethiopia has considerably impressed many foreign travellers. Schweinfurth (1868) exclaimed that 'das Klima des Hochlandes ist eins der glücklichsten, welche man auf dem Erdboden kennt. Alles vereinigt sich in demselben, was der organischen Natur ihr Dasein zu erleichtern vermag'[1]. How true this remark is will become apparent from the following.

The country is situated between 3 and 18 °N, entirely within the tropics, and on the eastern margins of the African continent. North-east Africa is separated from Asia by the Red Sea and the Gulf of Aden. In the north-west it borders a vast landmass separating it from the Atlantic Ocean, while the Indian Ocean borders it to the south-east. Ethiopia consists of a highland plateau divided into two by a rift and surrounded by lowlands (Delliquadri, 1958).

Since information on radiation and evaporation is very scarce, the conventional meteorological variables such as air moisture, wind speed and wind direction, temperature, and rainfall have to be used to identify the climate types in Ethiopia. As the effect of rainfall primarily depends on the evaporation rate and as, according to Bunting (1963), evaporation rates in Ethiopia vary from 1 or 2 to over 10 mm per day (depending on altitude, latitude, season and exposure), evaporation studies are highly important for the interpretation of rainfall data and play an essential role in water balance studies. Such studies should provide the physical background of agricultural development in Ethiopia.

Much information still needs to be collected and analysed. It is to be hoped that detailed studies will be made in the near future (Griffiths, 1972).

2.1 Air pressure and winds

In '*winter*'[2] the pressure systems dominating the climate in Ethiopia are the High pressure cells of the eastern Sahara and Arabia, and an area of Low pressure over central Africa south of 5 °N. Occasionally cyclonic storms of Mediterranean origin

1. The climate in the highlands of Ethiopia is one of the most wonderful known on earth. It unites everything able to enlighten organic life.
2. Though it is incorrect to use terms like winter and summer for tropical regions, for convenience's sake I follow here Delliquadri (1958) who defines 'winter' as the period December—February, 'spring' as the period March—May, 'summer' as the period June—August, and 'autumn' as the period September—November.

enter the Red Sea area and their effects are felt on both shores as far as 15 °N. They arise over the Red Sea when relatively cold air from the highlands flows towards the Red Sea and comes in contact with the warmer air there. North of 12 °N, the Sudan Plains and Ethiopia have north and north-east winds. On the northern Red Sea coastal plain and the Red Sea, north and north-east winds dominate; they are associated with the Sahara High, while the southern section of the Red Sea has south and south-east winds associated with the general air circulation around the Arabian High. During this season, the Horn of Africa and south-eastern Ethiopia are swept by north-east winds. Thus the dry subsident airstreams moving south over Ethiopia from the Sahara, and Arabian anti-cyclones result in dry weather during the period October-March (Delliquadri, 1958; Kebede Tato, 1964).

In '*spring*', from about mid-March on, the pressure system changes. The Sahara High weakens and its centre moves much farther north. The Arabian High also weakens, but above the Red Sea an area of relatively low pressure remains. In the central Sudan, a Low pressure centre develops, whereas the region north of 12 °N is still under the influence of the Sahara High and north and north-east winds persist even during 'spring'. The Horn of Africa is under the influence of onshore winds, during April blowing mainly from the east and south-east, but in May the monsoon establishes. Most likely during this season, a zone of intertropical convergence is present over south Sudan, south Ethiopia and Somali. Warm, moist and unstable air from the Indian Ocean, converging with stable continental air from the Sahara High, produces frontal precipitation. Winds over the Ethiopian and Eastern Highlands generally blow from the east, and south-western Ethiopia has winds from a more south-easterly direction. Conditions over the Red Sea remain essentially unchanged with north–north-west winds in the north and south-east winds in the south (Delliquadri, 1958).

In '*summer*' the weather is dominated by the monsoon Low pressure area of India and Pakistan. Its influence reaches over the Persian Gulf and even extends into the Sahara with a pressure gradient from west to east. During summer in the northern hemisphere, high pressure areas appear all over the southern part of Africa and the south Atlantic and Indian Oceans. They penetrate the western marginal areas of Ethiopia. The main feature during this season is the northward and southward movement of the boundary between the northern and the southern winds, covering an area called the zone of intertropical convergence which lies, in general, along the equatorial low pressure trough.

This intertropical convergence zone is defined as the rather narrow region of bad weather between the hot, dry continental air of anticyclonic origin arriving from the north (the Sahara), and the cooler, wetter maritime air from the south (Indian and Atlantic Oceans). Where the north-eastern and or south-eastern trade winds meet, a trough of low pressure appears.

South of 18 °N, near the centre of the Sahara Low, winds have a western component because they verge on the Indo-Pakistan Low with a lower pressure than the Sahara Low. Air masses associated with these western winds are moist and cool, as their

origin is the South Atlantic; they are the main moisture source for the Sudan and Ethiopia.

North of 18°N, north and north-west winds dominate; their origin is a high pressure centre extending over the eastern Mediterranean. Air masses associated with this anticyclonic cell are warm and dry, and due to subsidence they are even drier by the time they enter the Ethiopian area.

A strong south-western wind flowing over Ethiopia during 'summer' causes a foehn-like subsidence over the Danakil Plains and the Red Sea Coastal Plain; it almost completely dissipates the frontal disturbances. South-west winds dominating the Horn of Africa cause a maximum of upwelling cold water during this season. The air masses, once having passed the Ethiopian and Eastern Highlands, have lost most of their moisture and reach Somalia in a dry, stable condition (Delliquadri, 1958).

'*Autumn*', as 'spring', is a transition period, though the low pressure area of the Sudan is now located much farther south and is not as well developed as in 'spring': the Somali coast shows higher pressures in 'autumn' and is situated more around the col between the Arabian High and the Indian Ocean High. The North African High has intensified as compared with 'spring'. The low pressure over India-Pakistan has almost disappeared and higher pressures start to establish over the continental areas of Asia. This is the season when the intertropical convergence zone retreats, when neither north nor south winds prevail. This means that the northern parts of the area are dominated by the dry, stable air mass of continental origin, whereas the southern margins are under the influence of gusts of moist, unstable Indian Ocean air. This retreat of the intertropical convergence zone to the south brings to Somalia, south-east Ethiopia and Kenya the second rainfall maximum, and to south-west Ethiopia and the south Sudan heavy rains. Winds both from the north and the south quadrants occur (Delliquadri, 1958).

2.2 Precipitation

2.2.1 Average annual rainfall

The Map of average annual rainfall shows a general decrease in annual rainfall from the south-western margin of the highlands to the Horn of Africa and to Eritrea, and in the Sudan Plain from south to north (1500 mm at Katire, below 75 mm at Atbara). The highest quantities fall in south-west Ethiopia (2000 mm or more). The Ethiopian and Eastern Highlands receive 950 mm or more due to a double passage of the intertropical convergence zone and aided by the orography, with the high mountains east of Lake Tana, east of Lake Abaya and the region around Bekeksa standing out as islands of higher rainfall. The high rainfall on the eastern slopes in Eritrea is caused by two rainfall maxima, one of cyclonic-orographic nature (in 'winter'), the other due to frontal-orographic causes (in 'summer').

The 450 mm isohyet encloses a zone transitional to the dry lowlands and the highland regions, including most of the Sudan Plains south of 14°N, the eastern and

southern slopes of the Ethiopian and Eastern Highlands, and the Riftvalley north of Lake Shala. The single ('summer') rainfall maximum in the northern part of the Sudan Plains results in less annual rainfall than in the southern part (with 'summer' and 'spring' maxima) where usually it lasts longer.

The 150 mm isohyet encloses south-east Ethiopia, the Danakil Plains and parts of Eritrea, mainly lowland areas. Even drier conditions prevail over the Horn of Africa and parts of the Red Sea coast, but rainfall there, and in the northern Sudan Plains, is so variable both in amounts and in time that averages are of little significance (Delliquadri, 1958).

Kebede Tato (1964) also emphasized that rainfall, except for the western provinces, is so variable in the 'dry' months, that annual averages should be considered with great care.

2.2.2 Wet and dry seasons

Though terms like 'wet season', 'dry season', 'small rains' and 'big rains' reflect quite well the general trends in the weather, they are not very exact, in particular for the period mid-January to June. According to Huffnagel et al. (1961) in some areas precipitation may vary over a succession of years from very small to amounts approaching those of the 'wet season'. In addition, in most years a wet season is interrupted by spells of 2—3 (sometimes even up to ten) rainless days, whereas in a dry season heavy rainfall may incidentally occur, as happened in November 1967 (Michael Beyenne, 1967). Such deviations are due to the unsteadiness of the pressure systems and the corresponding frontal activity governing the weather (Delliquadri, 1958).

Rainy days in the rainy season usually start with moderate quantities of precipitation in the early morning, from thick clouds. In mid-morning these clouds tend to disperse and are followed by cumuli from which the major quantity of rainfall comes (Huffnagel et al., 1961). Both in the lowlands and in the highlands rainfall has a pulsatory character. Rainfall associated with the intertropical convergence zone occurs in heavy showers of some minutes to several hours; they are often accompanied by thunderstorms and lightning (Delliquadri, 1958).

During the rainy season 100% humidity exists throughout several hours of the night. Although a drop to 60% is normal towards the afternoon, there are days that the relative humidity does not fall below 80%. During the long periods of dry weather between November and early March the humidity of the air in any part of the country, except in the west, may be extremely low (20% or even less). Hail occurs frequently in heavy storms above 2000 m, but sometimes as low as 1000 m (Huffnagel et al., 1961). Simoons (1960b) has reported snow in the Simen mountains, but it is rare and nowhere permanent.

The big rains in the period July—end of September are connected with the north-south movement of the intertropical convergence zone and get their moisture from the westerlies. At the beginning and the end of this period rain falls continuously for several days, but after passage of the intertropical convergence zone afternoon

showers follow, characteristic for equatorial air masses (Suzuki, 1967).

In the south of Ethiopia, the two rainy periods coincide with the movement of the intertropical convergence zone: in April—May northward, in October—November southward (Kebede Tato, 1964). After this passage the wind shifts to the south again and a dry period begins.

In most parts of the highlands the small rains fall in the period March—May. Their frequency depends on pressure conditions west of Ethiopia (the low pressure centre over the Sudan, according to Last, 1962). Maritime air masses from the Indian Ocean are involved; they cause a rainy period of about two months. Showers are common in the afternoon, less frequent during morning and night. The amount of precipitation is not abundant. Sometimes the small rains merge into the big rains ('Kremt'), causing a continuous rainy season from March to September, but as a rule they are separated from each other by a short dry period. Surface winds then blow from the south and do not bring moisture from the ocean (Suzuki, 1967).

According to Suzuki (1967), a third rainy period occurs in November—December, when maritime air from the Indian Ocean penetrates; its length is only half of that of the first rainy season. Others (Delliquadri, 1958; Huffnagel et al., 1961; Kebede Tato, 1964; Last, 1962) do not mention it. However, there are important variations from year to year and from place to place. Variations from year to year in 'summer' rainfall are due to slight variations in the position of the intertropical convergence zone in July near Ethiopia, and the time when the high pressure over the Gulf of Guinea develops. Variations from place to place are mainly due to the influence of relief and the decrease of the 'Kremt' rainfall from south-west to north-east Ethiopia (Last, 1962).

2.2.3 Rainfall regimes

The seasonal character of the rainfall is equally important as the annual amount of precipitation. Areas which have their periods of rainfall as well as their periods of little or no rain in the same months, irrespective of the total amount of rainfall, are subject to the same rainfall regime. Huffnagel et al. (1961), as well as Kebede Tato (1964) and Delliquadri (1958) give a summing up of the different rainfall regimes, of which that of Delliquadri is followed here (see also the Map of rainfall regimes).

(1) *Rainfall regime with maximum in December—February* It includes the Red Sea – Gulf of Aden coastal plains and slopes of the nearby escarpment and it has a single rainfall maximum in 'winter'. Rainfall of the Red Sea is partly cyclonic and partly orographic, but the influence of the cyclonic storms does not extend much beyond 15°N. 'Summer' is the dry season, but western winds occasionally penetrate the Red Sea hills and give rain to the coastal area of the Sudan.

(2) *Rainfall regime with maxima in December—February and June—August* It is found from 15°N along the eastern slopes of the Eritrean part of the Ethiopian Highlands and from there it penetrates into the Sudan. This regime records the

'winter' rainfall maximum of the Red Sea, and its secondary maximum in 'summer'. Both together supply 55—70% of the total annual rainfall; the rest is equally divided between 'spring' and 'autumn'.

(3) *Rainfall regime with maximum in June—August* The region with this type of rainfall (maximum usually in August), known as the Sudan type covers most of the eastern Sudan north of 8 °N and parts of the western Ethiopian Highlands. It may be considered a kind of retarded 'summer' maximum. The northern part of this area has a very brief period of heavy rains at the time the intertropical convergence zone is most north; in its southern part the rainy season is much longer and it is associated with the advance and retreat of the intertropical convergence zone so that it joins up with the 'summer' rains without a notable break. In the north, 75—80% of the rain falls in 'summer', very little in 'spring'; in the south and the western Ethiopian Highlands this percentage is 50—60, 'spring' contributing 15—20%. 'Winter' is the dry season.

(4) *Rainfall regime with maxima in March—May and June—August* This rainfall regime is typical for the Ethiopian and Eastern Highlands and the southern parts of the Sudan. Rainfall is quite similar to that of the Sudan rainfall regime, except for a decrease during the short interval between northwards and southwards movement of the intertropical convergence zone resulting in a double rainfall maximum. Another possible explanation of this drop in rainfall is that the source of the 'spring' rains is the Indian Ocean, whereas the major source of the 'summer' rains is the Gulf of Guinea. A short transitional period marked by a decrease in rainfall occurs when the moisture bearing winds shift from east to west. The 'winter' is the dry season, with only little rain.

(5) *Rainfall regime with maxima in March—May and September—November* The region covered by this type of rainfall includes the African Horn and the adjacent parts of Somalia, Ethiopia and northern Kenya. The period March—May contributes 50—60% of the annual precipitation, the period September—November 25—35%. These rainy seasons coincide with the equinoxes when low pressures over the southern Sudan allow moist winds from the Indian Ocean to penetrate inland. 'Winter' and 'summer' are the dry seasons. Especially during 'summer' fog occurs due to the cooling of lower air layers in passing the cold off-shore waters along Somalia.

(6) *Rainfall regime with maxima in March—May, June—August, and December—February* This regime occurs in the Lake Rudolf basin, the extreme northern part of which extends into Ethiopia. The main maximum, for both the escarpment and the graben, is in 'spring'; it accounts for 55—65% of the annual rainfall. Instead of the 'autumn' maximum of the previous type, the escarpment shows a secondary maximum in 'summer', while in the graben it falls in 'winter'. Annual rainfall, however, is low and strongly varies from year to year.

2.3 Temperature

The main factor influencing temperature in Ethiopia is the altitude. This finds expression in the traditional climate zones (see Chapter 4) of the k'olla (up to 1800 m), the woyna daga (1800—2400 m), and the daga (over 2400 m).

Although, according to Last (1962), the seasonal variations in temperature are small, the three zones do not show the same pattern. In the lowlands they reflect the general variation for the northern hemisphere (coldest month usually January, hottest May). In the higher regions, with more precipitation and greater variation in cloudiness, the temperature regime is more complicated: periods with high rainfall result in small diurnal variations, dry periods with clear skies show large daily variations. According to Huffnagel et al. (1961), in the areas above 1300 to 2100 m, during rainy periods, the maximum temperature rarely rises above 25-28 °C; in dry periods the temperature range is frequently as much as 22 °C (or even more), whereas in the rainy season only some variations exceed 6 °C. Night frost occurs above 2100 m (on sheltered places already at 1800 m) between November and end January, due to gusts of extremely dry air from Arabia.

Delliquadri (1958) concluded that, with a few exceptions, 'spring' is the warmest season, due to rapid heating of the land surface. 'Summers' are relatively cool in large parts of Ethiopia (large parts experience minimum average temperatures in this period). The 'autumn' transitional period shows lower temperatures than 'spring'. The highest temperatures have been recorded in the area along the Red Sea and the Gulf of Aden. The higher parts of the Ethiopian and Eastern Highlands show remarkably uniform moderate temperatures. The largest differences in average monthly temperatures occur along the coastal sections; the lowlands and plains, and the slopes are intermediate; differences are smallest in the Ethiopian and Eastern Highlands.

The seasonal temperatures may be summarized as follows (Delliquadri, 1958).

(1) *Average January temperatures, representing 'winter'* The 25°-isotherm extends southward paralleling the Red Sea, dips into the Danakil Plains, and then curves north-east paralleling the Gulf of Aden. In south Ethiopia it includes large parts of the Ogaden, central Bale, Borana, and borders the Ethiopian Highlands along the west including most of the upper Nile basin. The 20°-isotherm encloses the Ethiopian and Eastern Highlands with extensions into Eritrea and north Somalia. The lower slopes of the highlands and the northern Ogaden have temperatures between 20°—25 °C; in the highlands the range is between 15°—20 °C. Possibly the 15°-isotherm coincides with the 2400 m contourline and the 10°-isotherm with the 3900 m contour. Temperatures below 5 °C are to be met in the Simen, Choke and Chilalo Mountains.
(2) *Average April temperatures, representing 'spring'* 'Spring' is the warmest season throughout Ethiopia, except for the Red Sea-Gulf of Aden area. The Sudan Plains are dominated by the 30°-isotherm as is west Eritrea. The Danakil Plains and the Ogaden are now included within the 25°-isotherm. The Red Sea-Gulf of Aden area

shows an increase of 3°—5 °C with respect to January conditions. The Ethiopian and Eastern Highlands are surrounded by the 25 °-isotherm, and the 20 °-isotherm has disappeared from most of the Eastern Highlands and north Somalia. Large parts of Kefa, Illubabor and Wellega record temperatures over 20 °C. Although temperatures in the Ethiopian and Eastern Highlands are slightly higher compared with January, the isothermal pattern is similar except for the changes mentioned. Islands of lower temperature persist but smaller areas are enclosed by the 15 °-isotherm.

(3) *Average July temperatures, representing 'summer'* The 35 °-isotherm dominates the Red Sea-Gulf of Aden area and curves south into the Danakil Plains; here the 30 °-isotherm penetrates deeply land inwards and parallels the 25 °-isotherm. High temperatures in this region are due to the latitude and foehn-like winds descending from the nearby escarpments. In the Sudan the 30 °-isotherm is now limited to the plains north of 15 °N. In south Somalia the 30 °-isotherm has been replaced by the 25 °-isotherm which slightly penetrates into the Ogaden. Here, low temperatures are due to maximum upwelling of cold off-shore waters along Somalia. Along the Sudanese border lower temperatures are indicated by the downhill movement of the 25 °- and 20 °-isotherms. In July the area enclosed by the 20 °-isotherm almost reaches that of January, except for the highland area of north Somalia. The 10 °-isotherm is above 3900 m. The Ethiopian and Eastern Highlands and the Sudan Plains south of 12 °N record minimum average temperatures in the 'summer' season.

(4) *Average October temperatures, representing 'autumn'* There is a slight shift of the 30 °-isotherm southward on the Sudan Plains while a secondary temperature maximum in Somalia and the Ogaden resulted in an upslope movement of the 25 °-isotherm on the Somali Plateau in Hararge. The 30 °-isotherm is restricted to the Red Sea Coast and west Eritrea, while the Danakil Plains show a noticeable tendency to cooler conditions. The Ethiopian and Eastern Highlands display the continuity of the isothermal pattern noted for previous seasons. Night frost is not uncommon on the higher slopes and in the valleys (including the Riftvalley).

2.4 Climatic regions

With only slight modifications of Köppen's classification, Delliquadri (1958) defined the following climatic regions (see Map of climatic regions).

(1) *BW or desert climate* The regions in Ethiopia with this climate all have average monthly temperatures above 18 °C, a low rainfall, and a high potential evaporation.

The desert region of the Sudan and west Eritrea has to be classified as BWwg, which means 'summer' rains and temperature maxima in 'spring' or early 'summer'. Over much of the area average annual temperatures are about 28 °C.

The coastal plain of the Sudan and the parts of Ethiopia bordering the Red Sea have a BWs climate (dry season in 'summer') and 'winter' rains associated with cyclonic storms. The Red Sea and Gulf of Aden coast almost have the world's highest average monthly and yearly temperatures, the first up to over 35 °C at various stations.

The Danakil Plains have a BWw climate, which means two rainfall maxima (in 'spring' and in 'summer'), the 'winter' being dry. Mean annual temperatures are between 25 and 30 °C. In spite of the high day temperatures, the monthly averages tend to be lower than those in the coastal region due to the strong cooling during the night caused by radiation. The BWw climate has its greatest extension in the region between Cape Guardafui and Lake Rudolf and the adjacent south-east Ethiopia. There the temperatures are fairly high (average annual values 25—30 °C) but not as high as in the Red Sea coastal region and the Danakil Plains. The temperature maxima are in 'spring'. A double rainfall maximum occurs in 'spring' and 'autumn'.
(2) *BS or steppe climate* The steppe climate is often transitional between that of the arid desert and the more humid climate. It can be divided into the BSA climate with average monthly temperatures above 18 °C, and the BSC climate with those below 18 °C.

The BSA climate in the western section of Eritrea is classified as BSAwg, having annual temperatures averages of 28 °C and highest values in 'spring' (symbol g). Only one rainfall maximum is present (usually in August). The eastern slopes of the Eritrean Highlands between 15 and 17 °N have a BSAs climate. A BSAw climate is found along the eastern slopes of the Ethiopian Highlands, in the Riftvalley as far south as Lake Shala, and along the western and northern escarpment of the Eastern Highlands where the hot steppe climate grades into the cool steppe climate. Also included in the hot steppe climate is the Omo River Valley. These areas show the same rainfall pattern: a primary maximum in 'summer', a secondary maximum in 'spring'. Temperatures are highest in June, preceding the heavy 'summer' rains.

The BSC climate occurs only as BSCw climate. It is a cool steppe climate surrounded by BSA climates, but at somewhat higher elevations. Its two main areas are in the highland of Eritrea where it extends into north Ethiopia, and the part of the Eastern Highlands east of Jijiga. In Eritrea it is found at altitudes over 2000 m. The western section has a Sudan rainfall regime (a single 'summer' maximum), while the eastern and southern sections show the 'summer' and 'spring' maxima of the Ethiopian Highlands. Though annual average temperatures exceed 18 °C, during 'winter' the monthly temperatures fall below 16 °C, and night frost is not uncommon during December and January. The temperatures are highest during the period preceding the monsoon rains.

The BSCw area in the eastern region of the Eastern Highlands extends from Jijiga to Sheikh in north Somalia. The slopes facing north have a double rainfall maximum (in 'summer' and in 'spring'), those sloping south show 'spring' and 'autumn' rainfall. The highest temperatures occur in 'spring' and early 'summer'; the minima in 'winter'. Night frost has been recorded for the Jijiga area.
(3) *Aw or savanna climate* The savanna climate, with an average monthly temperature above 18 °C, is intermediate between the dry BS climate and the humid Cw climate. The first borderline is characterized by a rainfall deficiency (expressed in the rainfall-evaporation ratio), the second is based on temperature.

A special form of the Aw climate is the Aw″ climate, with two rainfall maxima (in

'spring' and in 'summer'). It occurs in the southern Sudan south of 8 °N, the central parts of Illubabor, the Jima region of Kefa, in the Chercher Highlands of Hararge, and between Harar and the headwaters of the Ganale Doria. The annual rainfall decreases from north Uganda to the north, and increases eastwards in the foothills of Ethiopia. Throughout its area the temperature range usually is below 5 °C; temperature maxima are in 'spring'.

The typical Aw climate is similar to Aw″, except that it has only one rainfall maximum (in 'summer'). In the Sudan it gradually merges into the Aw″ type. It extends from Akobo north-east through the Abbay basin, the western slopes of the Ethiopian Highlands, and penetrates the lowlands of west Eritrea and the Tekkezze valley. The plains belonging to this climate type receive about 940 mm rain a year. The temperatures equal those of the Aw″ climate; they show a 'spring' maximum, a 'summer' minimum, and yearly averages of about 28 °C, though lower temperatures occur in the Ethiopian foothills.

(4) *Am climate* This climate has a temperature regime similar to that of Aw, but because of the higher altitudes at which it occurs, the temperatures are lower. This also results in a higher annual rainfall (over 1700 mm) and a shorter dry season. It occurs in south-west Ethiopia (Kefa and Illubabor) at elevations up to 1500 m. There are two rainfall maxima, but most of the precipitation falls in 'summer'.

(5) *Asw climate* It is characterized by copious rainfall in 'winter' and a secondary maximum in 'summer'. It is found on the eastern slopes of the Eritrean Highlands. The high precipitation is of cyclonic-orographic origin. The 'summer' rains sometimes penetrate the eastern slopes through gaps in the Red Sea hills.

(6) *Cw climate* This climate is found on the Ethiopian and Eastern Highlands as well as in the Riftvalley between Lake Shala and Lake Abaya. The temperatures are lower than those of the surrounding lowlands (monthly averages below 18 °C), lowest in 'winter', and highest in 'spring' because 'summers' are very cloudy. Usually rainfall ranges between 900 and over 1500 mm, with high maximum in 'summer', and lower maximum in 'spring'.

(7) *Cm climate* It is intermediate between Cf (humid every month) and Cw ('winter' dry season). Contrary to the Am climate, the average monthly temperatures are below 18 °C. Its largest area is found in south-west Ethiopia (in Kefa, Illubabor and Wellega) at elevations between 1650 and 2250 m. Scattered areas occur in the Choke Mountains in Gojam and the Debre Tabor area of Begemdir. The average annual rainfall ranges from 1340 mm in Dembi Dolo to over 2000 mm in Gore. Most of the rain falls in 'summer', with a very low secondary maximum in 'spring'. 'Winters' are not totally dry.

(8) *Cf climate* This climate occurs on the eastern slopes of the Eritrean Highlands (north of Asmara) above 1500 m. It has rainfall maxima in 'winter' and 'summer', resulting in over 1000 mm annual precipitation.

3 Soils

As a detailed description and an evaluation of Ethiopian soils are still lacking, only the following information can be supplied.

Last (1962) distinguished three types of parent rock important for soil formation:

the granites of the crystalline basement tending to form shallow, sandy soils;

the volcanic rocks, such as basalts, tending to produce fertile loams, generally red but sometimes black;

the limestones and sandstones which, as a rule, form shallow, poor, sandy soils.

Logan (1946) pointed out that most soils in central Ethiopia are of volcanic origin, that in the west and south-west of the highlands some originate from ancient crystalline rocks, and that on the Somali Plateau those of sedimentary rocks are common.

3.1 d'Hoore's classification in terms of the 7th Approximation

The work of Murphy (1959, 1963, 1968) has supplied much new information, but he gives no classification and soil types are mainly distinguished by their colour and chemical properties. Huffnagel et al. (1961) depicted a map of soil regions, adopted from Dainelli (1943), on which areas are outlined based on relief and origin of parent material (see Map of soil regions), but no classification has been attempted. Useful information on Ethiopian soils has been supplied by d'Hoore (1964). As far as possible his elements and associations are translated into the names of the soil orders of the new U.S.D.A. Soil Classification (7th approximation, 1960) in delimiting the following, broadly outlined soil regions.

1. *Soils of the Coastal Plains* Here Aridisols are found ('Brown Soils', 'Desert Soils' and 'Sierozems').

2. *Soils of the Ethiopian and Eastern Highlands* In the Begemdir-Wollo-Gojam-Shoa region Alfisols (mainly belonging to the suborder Ustalfs), Vertisols and Inceptisols dominate. The shallow soils among them are red to light red-brown on the mountains and hillsides, red-brown on the slopes, brown to dark in the rolling country, to nearly black in the lower parts. The red-brown to dark brown soils are excellent for agriculture, particularly for grain crops, which are found all over the highlands. Stony mountain slopes and lower parts are used for grazing. The major soil problems are erosion on slopes, lack of drainage in lower parts, a too high acidity and therefore a lack of available phosphorus (Huffnagel et al., 1961). In the Lake Tana Plain Entisols are found in association with Vertisols (in topographic depressions). The southwestern part is dominated by Oxisols, Ultisols and Vertisols. In the Eastern

Highlands shallow Inceptisols are found; in the Chercher region of these highlands soils range from grey to brown and are often stony. Their fertility makes extensive farming possible, particularly on the slopes and in those valleys where drainage is sufficient. Erosion is serious here and cuts deep gullies in the steep slopes (Huffnagel et al., 1961).

3. *Soils of the Abbay Trough* In alluvial and colluvial material Vertisols and Inceptisols are found with, more to the west, Entisols in association with Vertisols (in topographic depressions).

4. *Soils of the Danakil Plains and the Riftvalley* The Danakil Plains have Aridisols, with salinity occurring in the Kobar Sink. In the Riftvalley itself, west of Awash, Aridisols are found in association with Vertisols (in topographic depressions), whereas to the south also Inceptisols ('Brown forest soils') and Mollisols ('Chernozem') are present. The Awash river valley is an exceptional area in the Riftvalley with a large plain of alluvial soils (with Entisols) near Nazret where sugarcane is grown.

5. *Soils of the Somali Plateau* This region has mainly Aridisols with soils rich in gypsum in the extreme south-east of the Ogaden.

6. *Soils of the 'Crystalline Highlands'* In the area of north Eritrea, west Tigre and north Begemdir soils are stony, shallow and low in productivity. They belong to the Orders Ultisols and Alfisols, which are in the extreme north even more rocky and shallow, whereas to the west dry Vertisols (in topographic depressions) and Inceptisols are found. In western Wellega soils are deep and belong to the Orders Oxisols and Ultisols; in south Sidamo mainly Aridisols occur.

7. *Soils of the Sudanese Lowlands* Here are flat Vertisols; in Illubabor also Entisols are present.

3.2 Simplified version of the FAO-UNESCO soil map

On the FAO-UNESCO Soil Map of the World (1974), the following legend units, translated into USDA Soil Taxonomy terms, are found in Ethiopia (see Soil Map).

(a) Entisols: mineral soils without distinct pedogenetic horizons

The suborders are:

(1) Fluvents: soils with a medium to fine structure giving them a good waterholding capacity. Especially when the parent material still contains weatherable minerals, they may be well suited for agriculture. They are formed on recent fresh water deposits in river valleys and occur in several parts of the country.

(2) Psamments: sandy soils with a low waterholding capacity and susceptible to wind erosion. They are mainly found in Tigre, Eritrea and in the Abbay Trough.

(3) Orthents: soils on recent erosion surfaces, very shallow, with solid rock close to the surface. A large area occurs in east and south-east Ethiopia.

(b) Inceptisols: soils with a further degree of soil development than the Entisols

Their texture is finer than loamy sand, they contain some weatherable minerals, and they have a relatively high cation exchange capacity. They have water available to

plants during more than half the year or more than three consecutive months in a warm season.

(4) Andepts: soils with allophane, generally formed in volcanic ash deposits. A sizable area occurs west of Lake Chamo and Lake Abaya in Gamu Gofa.

(5) Tropepts: brownish to reddish, more or less freely draining soils, mainly occurring in intertropic regions. They are found in the Ethiopian and Eastern Highlands.

(c) Aridisols: soils of arid regions, with one or more pedogenic horizons, but lacking a surface horizon significantly darkened by humus

Many of them are well-suited for agriculture if irrigation water is available.

(6) Argids: soils with a textural B ('argillic') horizon. They occur only in west Eritrea along the borderline with the Sudan.

(7) Orthids: soils lacking a textural B horizon. They occur over extensive areas in north, east and south Ethiopia. Very saline soils occur, for instance, in Tigre (where around Lake Asale also salt flats are found); soils very high in lime in Hararge; soils with a horizon rich in gypsum in the Ogaden.

(d) Vertisols: heavily textured soils, rich in montmorillonitic clay

They have a high bulk density, a slow permeability, show wide cracks when dry, have a very high cation exchange capacity, and are fairly homogeneous with depth. Frequently they have a pronounced gilgai micro-relief formed as a result of self-mulching.

(8) Uderts: in Ethiopia two groups can be distinguished: the gray to black Pelluderts in the valleys around Addis Abeba, and the more strongly coloured Chromuderts in south-west Ethiopia.

Few Usterts are encountered outside south-west Ethiopia.

(e) Alfisols: soils with marks of translocation of silicate clays (a textural B horizon) without excessive depletion of bases

(9) Udalfs: include brownish or reddish Alfisols of the warm humid regions, mainly found over large areas in south-west Ethiopia.

Also some Ustalfs are found.

(f) Ultisols: soils resembling Alfisols in having a textural B horizon, but more leached and generally poorer in plant nutrients

(10) Udults: the more or less freely drained, humus-poor Ultisols in humid climates in mid or low latitudes with a well-distributed rainfall. They have a light-coloured upper horizon on a yellowish-brown to reddish argillic horizon. In Ethiopia, small scattered areas of Udults are found in the south-western part, whereas outside that region few Ustults are present.

(g) Oxisols: extremely weathered soils

Their mineralogy is dominated by kaolinite, free oxides, and sometimes quartz; the texture is sandy loam or finer.

(11) Ortox: a suborder occurring in Ethiopia. A few areas with Oxisols in southern Ethiopia are included on the soil map.

3.3 Description of soils

The following account is mainly based on the studies of Murphy (1959, 1963, 1968) and should be used together with the simplified version of the Ethiopian part of the FAO-UNESCO Soil Map of 1974 (see Soil Map).

3.3.1 Soils of the Coastal Plains

This desert area consists of calcareous and sandy sediments and has little or no agricultural value because of the extremely low rainfall. Soils are dark brown, sometimes dark grey-brown or dark yellow-brown; the pH is between 7.6 and 8.1.

3.3.2 Soils of the Lava Plateau

These soils are those of the Ethiopian Highlands and those of the Eastern Highlands.

3.3.2.1 Soils of the Ethiopian Highlands

(1) In Central Tigre, north of Korem, soils range from loamy sands to heavy clays. An important part of them, near Quiha to Adigrat, is sandy. In the Quiha-Maichew region they are brown-yellow to very dark grey, in the Quiha-Adigrat area they are less dark. Over 80% of them are neutral to very mildly alkaline. Soils on sandstone parent-rock contain less organic matter and total nitrogen, and are more heavily eroded. North of Quiha, t'ef, barley, sorghum and maize are grown; around Quiha, barley, wheat and linseed, south of it sorghum, maize and, on higher elevations, t'ef, wheat and horse bean. The region has a Cw climate.

(2) Central Wollo. The lowland region south of Kombolca has dark grey to black clay to clay-loam soils. Especially sorghum, maize and t'ef are grown, the latter more commonly at higher elevations. Beyond Dese clay-loams and clays dominate, many of them gravelly or stony and showing considerable erosion. In the Kobbo plain, soils are light to very dark brown (almost black), with a loamy to clayey texture, and neutral; in the Alamata plain they are usually clay-loams.

Crops grown at lower elevations are cotton, sorghum, maize and t'ef; higher up t'ef is important, together with barley and wheat; at 2200 m horse bean appears.

The highland soils are in general neutral; the majority contains 2—5% organic matter; the availability of phosphorus is medium to high; available potassium is usually high; they are well supplied with calcium and magnesium.

The region has a Cw climate.

(3) Central Begemdir has, between Bahar Dar, Addis Zemen and Azoza red-brown (upland hillside soils), or dark grey to very dark grey-brown (alluvial plain lacustrine or lowland) soils. Both are clays. The red-brown soils contain more organic matter (4.6%) than the grey to grey-brown ones (3.0%); both are acid and generally contain low quantities of available phosphorus. North of Lake Tana, the Achara Plain has dark grey-brown to black clay with a deep profile in which during the dry season wide cracks to over one meter deep occur. The Delgi Plain, west of Gorgora, consists of dark brown to black clay. T'ef, maize, sorghum and niger seed are cultivated.

The upland soils south of Gondar are brown loams to clays. They vary in organic matter content (2—4%), are usually low in available phosphorus and high in available potassium; mostly they are slightly to strongly acid (pH 5.2—6.5). The major crop is t'ef.

Between Gondar and the Tekkezze three types of soils are found.

(a) Dark brown to brown, moderately to strongly acid soils high in available potassium, calcium and magnesium, and with an average of 4.7% organic matter. Erosion is considerable. The major crops are barley, wheat, t'ef, pea, horse bean, chickpea and linseed.

(b) (Dark) grey to black medium acid soils, varying in available phosphorus and high in available

potassium, and with an average organic matter content of 4.3%. These clays are montmorillonitic. Barley is the major crop.

(c) Red-brown to dark red-brown soils north of the Wolkefit Pass, mostly slightly to medium acid, with low availability of phosphorus, medium to high quantities of available potassium, and an average of 4.2% organic matter. Sorghum, maize and t'ef are quite often grown on steep slopes.

(4) Gojam has red-brown to dark red-brown clays to clay-loams in the highlands, with some darker soils in the lower valleys. As a rule they are slightly to very strongly acid (ca 54% with a pH between 5.1 and 5.5), low in available phosphorus, high in organic matter (ca 46% of the soils between 3.0 and 5.0%), and medium—high in available potassium.

Major crops are t'ef, barley and niger seed.

(5) In east Wellega soils are clay-loams to clays, red-brown to dark brown (near Nekemte brick-red), strongly to medium acid (pH 4.9—6.3), and have a high organic matter content (6.4—13.6%). The availability of phosphorus is very low, that of potassium medium to high.

Crops are maize, sorghum and t'ef.

West of Nekemte, to the Didessa valley, soils are clay-loams to clays, red-brown to brown, strongly acid (pH 4.9—5.9), and their organic matter content is reasonable (2.4—8.0%); the availability of phosphorus is low.

The region has a Cw or a Cm climate.

(6) North Shoa has in the highland north of Addis Abeba, between 2400 and 3000 m, a varying topography. Main crops are barley, wheat, t'ef, linseed and a few pulses. Soils vary considerably; clays and clay-loams dominate; some are quite stony. The lowland soils are dark, whereas on the slopes they usually show some shade of brown or red-brown. The latter have a deep, permeable profile and are easy to till. Black clay soils occur on gentle slopes. A considerable acreage is devoted to pasture. Most soils are strongly to slightly acid (pH: 5.0—6.5), reasonably high in organic matter (half of them 3.0—5.0%) and total nitrogen, but low or medium in available phosphorus.

North-east of Addis Abeba soils are dark grey-brown or dark brown, generally shallow, often with a very slowly permeable, dense clay subsurface, 15—20 cm beneath the surface. Drainage is a problem next to erosion. Most soils are somewhat stony, and are suitable for the cultivation of small grains. A sod rotation including native grass and barley, wheat, t'ef, and pulses is practised.

Between Debre Birhan and Debre Sina the effects of erosion are very pronounced and steep cultivated slopes show the exposed subsoil. Some slopes are practically depleted of surface soil. Soils are usually stony and range from sandy to clay, and are often low in organic matter. Barley is a major crop along with some wheat, t'ef, and a few pulses.

The soils of the Robi valley are grey-brown, deep, rich, montmorillonitic clays, usually neutral or very slightly alkaline. The subsurface of these alluvials is high in organic matter (averaging 4.1%). The availability of phosphorus, potassium, calcium and magnesium is good. Sorghum, tobacco and cotton are grown.

North Shoa has a Cw climate.

Soil burning is practised in north and north-east Shoa. First the grassland is ploughed several times at a very shallow depth. The loosened soil and the sods are gathered into heaps of ca one meter in diameter, and set afire to kill grasses and weeds. Finally, the burnt soil is spread over the field again and the land is ready for ploughing to depths ranging from 10—15 cm. It takes several ploughings in different directions before the land is seeded. Soil burning raises the pH sometimes as much as 0.2—0.3 units. Organic matter is sacrificed to get more minerals available.

Along the road from Addis Abeba to Debre Birhan organic matter of the 5 cm surface layer was, according to Murphy (1968), between 4.2 and 6.4% (average 5.2%), and total nitrogen between 0.12 and 0.33% (average 0.26%). For the 5—20 cm layer these values were 3.3—4.1% (average 3.6%) and 0.14 and 0.23% (average 0.20%), respectively. The 5 cm surface layer is the approximate depth of surface soil removed in the burning program. After burning of the 0—5 cm layer material was lost, that of the 5—20 cm layer had remained.

Donahue (1972) reported that soil burning increases crop yield by destroying sod pieces, fracturing

Photograph 9. Soil burning in north Shoa.

clods, and killing insects and diseases. By apparently coarsening the texture (clay-loam to loamy sand) it facilitates desirable tilth in seedbed preparation and improves drainage of the surface soil.

(7) Central Shoa east of Addis Abeba is a vast rolling to hilly plain with numerous breaks and valleys called the Yerer-Kereyu Highlands. Its altitude is between 1500 and 2200 m. Soils are dark (medium brown to very dark grey or black) and their texture is almost always clay or clay-loam. Some of them are stony. Considerable sheet and gully erosion occur. On drying, these soils heavily shrink; subsequent wetting causes extremely strong swelling throughout the profile. They are selfmulching (Vertisol-Xererts). Their average organic matter content is 2.2%; most are neutral or slightly alkaline.

A large part is cultivated, especially with wheat; at higher elevations barley is the main crop. T'ef is grown to some extent in the interior; limited plantings of linseed, pea, chickpea, grasspea and other crops occur.

The area between Addis Abeba and Mojo consists mainly of dark clay soils ranging from slightly acid to neutral. Where they are lighter (grey) they usually contain more organic matter. Most are rich in available phosphorus, potassium, calcium and magnesium.

The main crops are t'ef and wheat, other crops of considerable importance are chickpea, pea, horse bean and niger seed. In addition some grasspea, fenugreek, sorghum, barley and maize are grown.

The region has a Cw climate.

(8) South-west Shoa has soils that are, in general, coloured in shades of grey and brown, though some are black and especially on the knolls and steeper slopes red or red-brown soils occur. The texture of both surface soil and subsoil is usually clay or clay-loam.

In the Awash valley plain clays are grey to dark grey with a deep clayey profile; they show heavy swelling and shrinkage. Most are slightly acid to neutral, high in available potassium and calcium, but variable in available phosphorus. Drainage is a major problem. The main crops are wheat, barley, t'ef and chickpea.

At some 100 km from the capital soils are heavily manured with organic residues and ash so that they contain 5.2 to 8.5% organic matter and 0.19—0.30% total nitrogen; in addition the quantities of available phosphorus, potassium, calcium and magnesium are high. The pH is between 5.5 and 6.7. On these soils ensat is grown on a large scale. At a greater distance from Addis Abeba the soils are grey to dark grey or black clays. This area extends from about Ghion to the breaks of the Gibbe. Many different crops are grown there, among them t'ef, sorghum, wheat, niger seed and ensat.

West of Addis Abeba, in the direction of Ambo, the soils are generally dark, usually dark grey to very dark grey-brown or black. Wheat dominates, especially on the brown to red-brown soils. T'ef and barley are also important. Some chickpea and a few other pulses, and other crops, occupy limited surfaces.

Beyond Ambo, to Bako, the same soil types are present. Here barley dominates, but more westwards sorghum and maize are the major cereals. Furthermore some t'ef is cultivated and locally some niger seed is important.

The region has a Cw climate.

(9) Kefa soils are red, red-brown or brown (darker in the lowlands), but very dark grey-black colours also occur. Clay to clay-loams dominate.

West of the Gibbe, towards Jima, are red-brown-grey to black soils. In most of the area lowlands lacking good drainage are grey and the subsoil is usually a tough, dark clay, often quite plastic when wet. The red soils are deep, with red clay subsoils. In well-drained valleys soils may be brown. On the reddish-brown, friable clays coffee grows in the forest; the dark, more poorly drained soils are not suitable for this crop.

Most soils between Jima and Bonga are brown to red-brown clay-loams to clays. Most are medium to strongly acid (pH < 6.0). In general they are well-supplied with available potassium, magnesium and calcium. Except where badly eroded, the total nitrogen and organic matter contents are good: about 95% contain over 0.15% total nitrogen, 68% show over 5% organic matter. The major crops are t'ef, sorghum, maize, barley and coffee (Dawit Deguefu, 1969; Murphy, 1959, 1968).

The region has a Cw, Aw or Cm climate.

(10) Wollamo (Sidamo) has in the Soddo area soils that are generally red clays to clay-loams. Erosion is quite severe. The pH ranges between 6.1 and 6.7, the organic matter content is 2.5—5.5%, the available phosphorus content is low, that of potassium high.

This region has a Cw climate.

3.3.2.2 Soils of the Eastern Highlands

(1) High Arussi is a large, rolling plain with prairie soils between 1800 and 2100 m starting about 45 km south of Nazreth. Its soils consist of clays to clay-loams with a deep profile, medium acid to neutral, low in available phosphorus, but rich in organic matter, nitrogen and available potassium. Next to wheat barley, t'ef, maize and sorghum are grown.

Towards Asella, between 2100 and 2600 m, the soils gradually become red-brown, whereas the other properties remain the same, except that the pH is between 5.0 and 6.0. The limited arable land is used almost entirely for small-grain crops.

The region has a Cw climate.

(2) The Chercher Highlands (Hararge) are a mountainous and hilly area between 1500 and 2400 m with considerable farming on the soils where drainage is sufficient, notwithstanding erosion is rather severe. Most soils are loamy, ranging from sandy loam to sandy clay-loam, but quite a few have a clayey texture and many are stony. They are dark grey to dark brown, some reddish or almost black. To the south-west acidity increases, but all are medium to strongly acid. Generally speaking the organic matter content is higher in the wetter than in the drier areas. Available phosphorus is as a rule medium to high, some soils are poor in available potassium, practically all are rich in calcium and contain medium to high quantities of magnesium.

Many crops are grown: sorghum, maize, barley, wheat, t'ef, coffee, ch'at, sweet potato, common bean, *Citrus*, and in some valleys banana.

Photograph 10. Gully erosion near the College of Agriculture at Alemaya, Hararge.

The region has an Aw and a Cw climate.

(3) High Sidamo has red-brown clay to clay-loam soils in the Hula-Bore area. There grassland dominates, with very little land in cultivation (barley, ensat).

Closely north of Irba Moda, to Kebre Mengist, a rainforest area extends with dark red-brown soils that are slightly to strongly acid and have a high organic matter content (6.3—10.4%).

The region has a Cw climate.

3.3.3 Soils of the Abbay Trough

For the Gojam escarpment of the Through, Murphy (1968) mentioned three soils: a dark stony basaltic clay, a light brown stony sandy clay-loam under t'ef, and a very sticky stony blackland soil. Further particulars are not known.

Photograph 11. Sheet erosion in a barley field near Harawacha, Hararge.

3.3.4 Soils of the Riftvalley

(1) The Lake District includes the Mojo-Shashamane-Kolito area of which a large portion is not cultivated but used for grazing. The soils range from sandy loam to clay, their surfaces from light grey or light grey-brown to dark grey-brown. The darker soils occur in the Shashamane area and near Kolito.

About 30 km north of Shashamane an area with tall trees is present; it continues to the south of the town. The soils often contain a characteristic pumice layer at some 15 to 30 cm depth a few cm or more thick. The surface soil is usually a dark brown to dark grey-brown, loose, friable loam, sandy loam or clay-loam, as far as known neutral to strongly acid. Below the pumice layer a permeable grey-brown loam to clay-loam occurs with a good structure, usually slightly lighter in colour than the surface horizon. A large area of such pumice underlain soils is present just west of Shashamane.

Most of the dark surface soils in the 'pumice zone area' are rich in organic matter and nitrogen, but since the organic matter is almost confined to the rather thin surface layer many of these soils do

not supply the crop (maize) with enough nitrogen throughout the growing season. Nevertheless, agriculture is important in this area.

South of Awasa a hilly to mountainous area starts with red-brown soils. In the Yirga Alem–Wondo region they contain much organic matter (3.0—5.0% and more) but little available phosphorus. Some of them, bordering Lake Abaya on the east, are saline. Those near the north-east end of the lake are dark grey-brown clay-loams and are used for growing cotton and maize; the others are mainly cultivated with t'ef, maize, sorghum, coffee and ensat. (Murphy, 1959, 1968).

The region has a Cw or a BS climate.

(2) The Middle Awash basin is the area of the Riftvalley extending to the east till the Melka Sadi region north-east of Awash village. Much of the land between Mojo and the Awash river is underlain by a rather compact clay hampering internal drainage. The area is mainly used for grazing; where cultivated, t'ef is the main crop. Near Nazret is the Wonji Sugar Plantation, on deep black clay.

South of the Awash, towards Dera, the soils are stony, light to medium brown sandy loams, mildly alkaline, reasonably fertile, and easy to work. Agriculture includes maize, t'ef and sorghum. Higher up, between 1550 and 1800 m, they consist of grey to grey-brown clay-loam, with t'ef as the major crop and furthermore wheat, barley and sorghum.

Near Metahara the soils mostly have a clayish texture, they are deep and moderately alkaline, high in available phosphorus, potassium and calcium, and they contain 1.4—3.5% organic matter. In the Melka Sadi area they range from sandy loam to loam to clay-loam.

On the whole, the soils of the Middle Awash basin, as far east as the Wergi area, are more acid to neutral than those of the area extending towards Melka Sadi where all are alkaline, 90% mildly to moderately so.

The region has a BS climate.

(3) The Awash Plains is the region where the Awash meanders across the southern Danakil Plain before entering Lake Abbe. The area between Afdem and Dire Dawa is, except for some irrigated fruit farms, very rough with stony and gravelly soils on which thornbushes, *Acacia* and grasses grow. In general the soils are calcareous (pH at least 7.8). Those in the direction of Gewani range between loamy sand and clay, with a pH between 7.6 and 10.0 (mostly 7.6—8.4).

From the confluence of the Mille and the Awash, and beyond, the soils resemble in texture those of Melka Sadi. Most of them are mildly to moderately alkaline, low in organic matter and total nitrogen. In the Asaita region these are light and grey to grey-brown, deep alluvial soils ranging from light loams to heavy clays. North of Asaita, to Sardo, is a flat, treeless plain of light sandy to heavy clay soils. In the Tendaho area cotton is cultivated.

3.3.5 Soils of the Somali Plateau

(1) The Alemaya-West Harar area on the southern slope of the Eastern Highlands has intensive farming on the plateau sloping to the south. Sheet and gully erosion are very severe; deep, V-shaped gullies occur. Many steeper slopes are wholly depleted of surface soil. On the steep hillsides most soils are brown, or reddish-brown; in limestone areas dark soils prevail; valley soils are commonly brown to dark greyish brown. About 80% of the soil samples that have been collected in the past are loamy, most range in pH between 6.1 and 7.8 and contain 2—5% organic matter. On the upland especially sorghum, maize and ch'at are grown; the low flat valleys are used for grazing.

The region has an Aw climate.

(2) The Harar-Jijiga region is an area in which erosion and streams have removed so much of the sedimentary material that in many cases the Precambrian granites, gneisses and schists are visible. The soils on the hill slopes are usually gravelly and stony. Because of the poor soils and the low rainfall agriculture is poor. On the hilly slopes sorghum dominates; sorghum and groundnut are grown on the sandy upland loam in the vicinity of Harar.

Beyond the Fafan valley the soils are reddish brown, rocky, pebbly and gravelly. In the vast grassy plain of Jijiga they are brown to dark red-brown (sometimes grey to black) ranging from loam to clay-loam. In general, the soils up to about 50 km south-east of Jijiga are well-supplied with organic matter and have a pH between 7.6 and 8.0. Limestone occurs as an outcrop in the breaks and in the

areas with a shallow soil. Fragments of this rock are on the surface elsewhere, and many of the plain soils are underlain with it at variable depths.

The region has an Aw or a BS climate.

(3) Ogaden is an area of limited rainfall and usually poorly developed soil profiles. The soils are calcareous, in some places gypsiferous, and they may contain excessive amounts of soluble salts. Around Degeh Bur they consist of some 10 to 20 cm sand to loam and a dark red subsoil several feet deep on a porous calcareous rock. Between Degeh Bur and Shilalo they are red and contain somewhat more clay. Near Shilalo and southward to Ferfer they are shallow and contain considerable quantities of gypsum in the surface layer. Wind erosion is always apparent.

From Kelafo to Imi, in the Webi Shebele valley, the soils are shallower than down the river past Kelafo. Here are several areas of deep, medium to fine textured soils.

This region has a BW climate.

3.3.6 Soils of the Crystalline Highlands

(1) The northern Crystalline Highlands include the Eritrean Highlands, northern Begemdir, north-west Tigre, and a narrow area in west Begemdir and Gojam along the Sudanese border. Its base consists of schists, gneisses and granite intrusions; many areas have a lava cover besides sedimentary outcrops. The soils are shallow, often stony or sandy loams, or loamy sands. Clay and clay-loams are common between Adua and Asmara and around Asmara. Erosion is the major soil problem. Their naturally low productivity is enhanced by erosion and the dry climate. Most soils range in pH between 6.6 and 7.8. On some sandy soils between Agordat and Barentu groundnut and sorghum are commonly grown.

The climate varies: it belongs to the Aw, Asw, Cw, Cf and BS types.

(2) The western Crystalline Highlands include central and west Wellega and north Illubabor. As a rule the soils are pale brown to dark red-brown or red, although in certain areas grey to black soils occur. Clays and clay-loams dominate. Most soils are acid, usually contain much organic matter and nitrogen but often little available phosphorus. Murphy distinguishes between red-brown to dark red-brown soils and dark brown to very dark brown soils. The former mostly show a fine structure (heavy loam to clay) with a pH between 4.7 and 6.3; they are found between Nekemte and Dembi Dolo and particularly in the north-western part of Wellega. The latter consist of clay-loam to clay, with a pH between 5.2 and 6.8; as a rule they are somewhat less acid than the dark red-brown soils and show a considerably higher calcium saturation in the exchange complex. Coffee is the major cash crop; maize, sorghum, t'ef and wheat are important food crops.

The region has an Aw or Cm climate.

The differences between the soils of the Lava Plateau and the western Crystalline Highlands in Wellega and Illubabor are less marked than the soil region map suggests.

3.3.7 Soils of the Sudanese Lowlands

These soils are found in the extreme eastern part of the Sudan Plain and extend slightly into west Eritrea and north-west Begemdir to the western foot of the Crystalline Highlands. The surface of this plain consists of alluvial sediments and aeolian sands. The soils are clayey, dark brown to dark grey-brown, and they tend to be mildly alkaline. Cotton and sorghum are cultivated on irrigated fields.

The soils of the flood plain of the Baro river are as a rule heavy loams, clay-loams or clays, very dark grey to dark grey-brown, mostly moderately to strongly acid. They usually contain much to very much organic matter and total nitrogen, but they considerably vary in available phosphorus, potassium and calcium. Maize is the main crop, but tobacco, sorghum, sesame, rape, pea and beans are also cultivated.

In the Gilo river valley soils are similar to those of the Baro river valley in pH, organic matter content and total nitrogen.

The region has an Aw, BS or BW climate.

4 Natural vegetation

4.1 Traditional zones

For centuries, Ethiopians have recognized three climatic and vegetational zones in their country, mainly based on the relation between elevation and temperature. Dove (1890) described them as follows:
- the k'olla or hot zone with average monthly temperatures above 20 °C, below ca 1800 m;
- the woyna daga or temperate zone with the average monthly temperature in the warmest month at most 20 °C, between 1800 and 2400 m;
- the daga or cool zone above 2400 m, with the upper part as the alpine region.

Huffnagel et al. (1961) distinguished a fourth zone called urec or mountain zone above 3800 m so that the daga is between 2400 and 3800 m.

Schweinfurth was the first, in 1868, to publish a geobotanical study of north-east Africa of which Ethiopia is a part. He came to the conclusion that the woyna daga vegetation includes a considerable number of species also belonging to the South-European flora, whereas in the daga many Central-European herbaceous species are present. In the alpine flora the genera are identical with those in the European mountains, but the species are different.

In 1941, Gillett published a study on the plant formations of west British Somaliland and the Hararge province of Ethiopia.

In 1955, Pichi-Sermolli described the vegetation types of the arid and semi-arid zones of tropical East Africa (Ethiopia, Somaliland, Kenya and Tanganyika); he was the first to supply (in 1957) a satisfactory geobotanical survey of Ethiopia. The Vegetation Map of Africa by Keay et al. (1958) and the Grass Cover of Africa by Rattray (1960) are, as far as Ethiopia is concerned, based on this survey.

A difficulty in describing the vegetation of Ethiopia is, according to Mooney (1961), where to stop classifying and to define types; he came to 12 types. Huffnagel et al. (1961) proposed 11, Pichi-Sermolli (1957) came to 21 for Ethiopia.

The following classification covers 16 vegetation types; it is mainly based on the work of Pichi-Sermolli (see natural vegetation map). Scientific plant names are from Cufodontis (1953-1972), even when they are not up to date nomenclaturally or taxonomically.

4.2 Pichi-Sermolli's classification of vegetation types

4.2.1 Desert

True deserts without any plant growth do not occur in Ethiopia. Some areas in the Danakil plains, however, show such a scanty vegetation that, according to Pichi-Sermolli (1957) they may be regarded as such. Mooney (1961) mentioned some small areas towards Lake Rudolf as being close to desert conditions.

4.2.2 Semi-desert and steppe types

According to Mooney (1961) these are found in Eritrea below the escarpment and towards the Sudanese border, in the Danakil and the Ogaden, in parts where the annual rainfall is less than 300 mm, and also in parts of Borana towards the Somalian and Kenyan border. They vary from steppe with perennial shrubs, herbs and grasses through semi-desert and scrub where the vegetation consists mainly of an open formation of grasses, ephemeral herbs and low thorny shrubs, and to semi-desert with *Acacia*. Pichi-Sermolli distinguished the following four types of plant communities within this category.

(1) *Grass, perennial herb and subshrub steppe*

These types are present close along the Red Sea coast, in the Danakil, in the area between the lower Awash River and the border of French Somaliland, in the eastern part of the Haud, and in the Ogaden between Kelafo and Kebre Dehar. They consist of herbs, grasses, shrublets and low shrubs, scattered singly or in small colonies covering less than half of the soil surface. Sometimes stunted or dwarfed trees are present.

In the Danakil, *Gramineae* such as *Eremopogon foveolatus*, *Tricholaena teneriffae*, *Eragrostis*, *Panicum* and *Aristida* grow together with e.g. *Cassia italica*, *Blepharis persica* and *Heliotropium pterocarpum*. Around Assab, *Panicum turgidum*, *Cynodon* and *Dactylis* occur, with stunted and dwarf specimens of *Acacia spirocarpa*. Very scattered, solitary specimens of *Ficus sycomorus* and *Dobera glabra* have been recorded. Ephemerals develop abundantly after rains. In the depression of the Haud, *Chrysopogon aucheri* dominates.

(2) *Shrub steppe*

Shrub steppes occur in the Danakil, on the gentle slopes or plains of the eastern flank of the Ethiopian Highlands including the Eritrean part, a small area between Adi Galla and the border of French Somaliland, a small part of the Haud (Ogaden), and in west Eritrea along the Sudanese border. The steppe is an open community of woody plants with a ground vegetation of scattered tufts of perennial grasses and shrublets. Dominant woody plants are deciduous bushes up to 4 m high; they are solitary or form thickets composed of a small number of bushes surrounded by an assemblage of small shrubs, shrublets and herbs. Wide apart, larger trees may occur.

On the large, bare spaces ephemerals appear after rainfall.

On the eluvial soils of the Haud large bushes are formed by e.g. *Commiphora erythraea, C. samharensis, C. obovata, Lannea triphylla;* shrublets are tall *Jatropha parvifolia, Ipomoea donaldsonii;* herbs and grasses are *Sporobolus ruspolianus, Andropogon cyrtocladus, Ceropegia subaphylla, Momordica stefaninii,* and others.

(3) *Subdesert scrub*

The general distribution of this vegetation type has not yet been established, but it is found in the Danakil, continues to the north in Eritrea (but never above 400 m), is prominent in the arid zone of central Somalia, and may also occur in the border region of the Bale province. It consists of an open assemblage of dwarf trees and shrubs, stunted by drought, intermixed with low shrubs, shrublets, succulent bushes, bulbous and tuberous plants, and ephemeral grasses and herbs. Characteristic are the absence of perennial grasses and the scarcity of taller trees. There are large spaces where only after rainfall a sparse cover of annual grasses and other herbs appears for a short period.

Dwarf trees and shrubs are chiefly species of *Acacia.* For Eritrea may be added *Commiphora, Zizyphus, Maerua, Cadaba* and *Boscia.* In the border area of Bale, species of *Commiphora (C.parvifolia, C.gurreh, C.rostrata)* dominate, accompanied by species of *Acacia (A.sultani, A.spirocarpa), Dobera, Aloë, Cadaba, Euphorbia, Jatropha* and *Maerua.*

The origin of the substratum is similar to that of subdesert shrub and grass areas, but edaphic conditions probably differ as suggested by the absence of grasses.

(4) *Subdesert trees and succulent scrub*

This vegetation type is characteristic for the slopes of the Danakil Alps and the Ethiopian Highlands (except Eritrea). Its exact distribution is as yet unknown, but it is also present on the escarpment of the Eastern Highlands near Dire Dawa. It consists of a very open assemblage of isolated or grouped shrublets and 1-2 m high shrubs with scattered deciduous or succulent trees that are typical for the physiognomy of the landscape. Succulents are common; perennial grasses and other herbs occur here and there. This vegetation is characteristic of slopes and escarpments in the hills and mountains and of inclining plateaus, where the substratum is usually stony.

On the slopes of the Danakil Alps and the eastern escarpment of the Ethiopian Highlands species of *Euphorbia, Aloë, Caralluma* and *Dracaena* are found.

4.2.3 Xerophilous open woodland

This vegetation type occurs both in the arid and semi-arid zone, so that the boundary between them does not correspond with a sharp difference in vegetation. It borders the open woodland and consists of an open assemblage of woody plants, grasses and herbs, among which large bushes and perennial grasses dominate. The 3—5 m high bushes are mostly deciduous and thorny. The scattered trees are characteristic.

Climbers are common. Tufts of perennial grasses and herbs form a discontinuous ground vegetation between the bushes and trees.

Pichi-Sermolli distinguished between the broken xerophilous open woodland of the arid zone and the xerophilous open woodland of the semi-arid zone, differing both in density and floristic composition.

(1) *Broken xerophilous open woodland (arid zone)*

This woodland is found in the Danakil, and (according to Gillett, 1941) in the Aussa and Awash valley where it has been described as the '*Acacia bussei* open woodland'. Gillett also found this vegetation in the Haud.

Characteristic are *Acacia bussei* and other *Acacia* spp., together with species of *Boscia, Maerua, Albizzia* and *Balanites* as important trees and large shrubs. The herbaceous layer consists of *Gramineae* such as *Chrysopogon aucheri, Tetrapogon villosus, T. tenellus, Cenchrus ciliaris* and *Sporobolus variegatus*, and herbs and small shrubs like *Polygala senensis, Hibiscus somalensis, Barleria argentea* var. *argentea, Solanum carense, Ipomoea cicatricosa* and *Hydnora ruspolii.*

It is well represented in the Ogaden with trees and big bushes of *Acacia, Boscia, Cadaba, Maerua, Zizyphus* and *Grewia.* In central Somalia it forms a characteristic association with *Cordeauxia edulis.* Bally (1966) found this association with the Yeheb-nut in the Ogaden between Shilalo and Werder, and between Geladi and Bokh.

(2) *Xerophilous open woodland (semi-arid zone)*

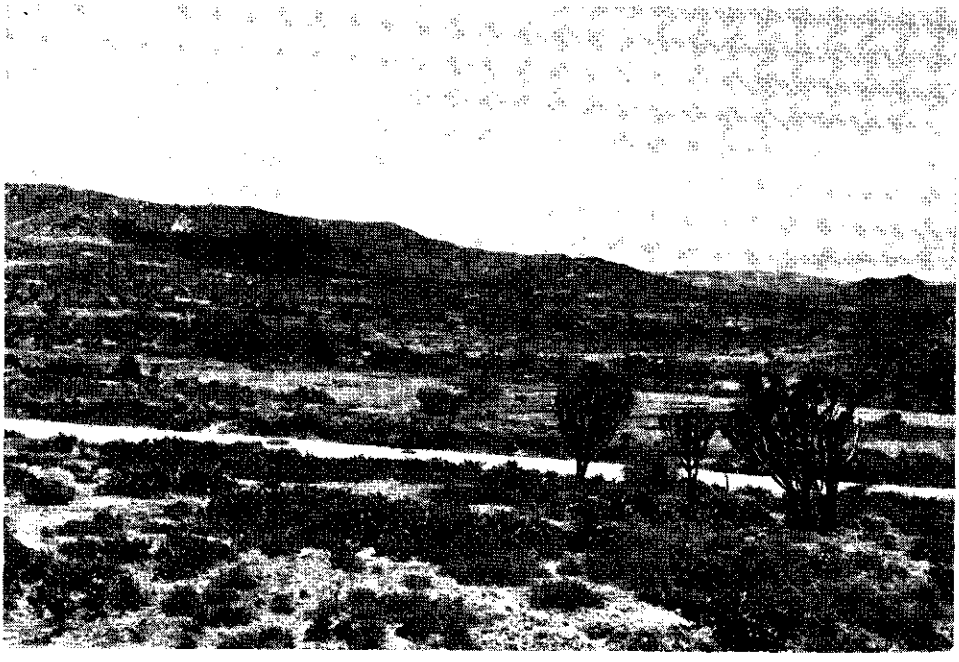
This open woodland spreads along the eastern slopes of the Ethiopian Highlands. In the Awash valley it mainly consists of *Acacia etbaica*, accompanied by, e.g., species of *Acacia, Combretum, Terminalia, Euphorbia, Cadaba, Capparis, Rumex, Vernonia, Aloë* and *Caralluma*, and *Balanites aegyptiaca, Cassia italica, Dichrostachys glomerata* and *Cissus quadrangula.* In the Awash valley this vegetation is the same as that described by Gillett (1941) under the name '*Acacia etbaica* open woodland'.

South and south-east of Harar, the vegetation consists of an assemblage of small deciduous trees, 3—4 m high, and of shrubs growing fairly close together. The ground cover contains many Acanthaceous and Amaranthaceous herbs.

Some of the main trees and shrubs are *Dichrostachys glomerata, Acacia pennata, A. seyal, Capparis tomentosa, C. rothii, Combretum collinum, Terminalia brownii, Commiphora schimperi, Cissus quadrangula, Sterculia africana* var. *rivae.* This vegetation continues on the Somali Plateau with e.g. *Acacia seyal, A. socotrana, Terminalia bispinosa, Delonix elata, Sericocomopsis pallida, Cadaba, Boscia somalensis* and *Chionotrix latifolia.*

In Borana it occurs as a narrow strip along the Ganale Doria river. It continues south of the Kenyan border to Lake Rudolf and crosses the Ethiopian territory in west Borana and Gamu Gofa. A small area is found at the foot of the western slope of the Ethiopian Highlands in Illubabor and Wellega. Finally, it is present in west Eritrea, where it contains

Acacia seyal, other *Acacia* spp., *Adansonia digitata, Dobera glabra, Combretum, Terminalia, Sterculia setigera, Capparis decidua, Boscia octandra* and *Boswellia papyrifera.*



Photograph 12. Vegetation with e.g. *Euphorbia* and *Opuntia* near wadi along the road to Dire Dawa, Hararge.

Photograph 13. Savanna with *Acacia* in the Riftvalley near Metahara, Shoa.

4.2.4 Deciduous woodland

Deciduous woodland is found between 700—800 and 1400—1800 m in the k'olla region of the western part of the Ethiopian Highlands below the montane evergreen thicket and scrub vegetation, on slopes as well as in valleys like the Tekkezze valley. It has a closed but light canopy of 5—12 m high deciduous trees with a lower stratum of small deciduous trees and shrubs and abundant scrub. Herbs are almost absent.

Characteristic are *Boswellia papyrifera, B. pirottae, Anogeissus leiocarpus, Terminalia brownii, Combretum collinum, C. hartmannianum, Lannea schimperi, Lonchocarpus laxiflorus, Stereospermum kunthianum, Commiphora africana, C. schimperi, Erythrina abyssinica, Dalbergia melanoxylon, Gardenia lutea, Dombeya multiflora, Balanites aegyptiaca, Piliostigma thonningii.* In the Tekkezze valley (1000 m) *Boswellia papyrifera* is abundant. Characteristic for the deciduous woodland are the formations of lowland bamboo.

4.2.5 Lowland bamboo thickets

The lowland bamboo, *Oxytenanthera abyssinica*, covers large tracts in west Gojam, Wellega and Begemdir, in the Tekkezze valley between 1200 and 1600 m, and in west Kefa. West of the Didessa river, especially in the valley of the Dabus towards Bombashi and Asosa, it forms almost pure stands. In the valleys of the Anseba, Barka and Mareb rivers limited areas of *Oxytenanthera borzii* occur (Mooney, 1961; Pichi-Sermolli, 1957).

4.2.6 Savanna (various types)

A savanna consists of at least 80 cm high grasses forming a continuous layer under which other plants grow. As a rule woody plants are present. Some trees and shrubs may be present, either isolated or in groups. The following types can be distinguished:
- savanna without trees and large shrubs, the prairie type ('savana rasa');
- savanna with scattered large shrubs, the shrub savanna ('savana arbustata');
- savanna with scattered trees and treelets, the tree savanna ('savana alberata');
- savanna with scattered dense thickets of trees, shrubs and lianas, the savanna woodland ('savana a forteti').

Such savannas are found in the western parts of lowland Eritrea, Begemdir and Gojam, the Abbay and Didessa valleys, the Lake Tana plain, the area between the Didessa and the Baro rivers of Wellega, the area south of the Baro river in Illubabor, south-west Kefa, south Gamu Gofa, the lake region of the Riftvalley, Borana, some parts of west Bale and high Sidamo (Jamjam area), and the region east of Jijiga.

The tree savanna of west Eritrea consists of small shrubs (e.g. *Cadaba rotundifolia*), trees (e.g. *Balanites aegyptiaca* and *Acacia seyal*), and a herbaceous layer of *Andropogoneae*. It continues towards the south to the Abbay with *Hyparrhenia* in the herbaceous layer; the trees belong to *Piliostigma thonningii, Gardenia lutea, Acacia* and *Combretum*.

In the region between the Didessa and Baro rivers, the tree and shrub savanna consist of *Acacia*, *Gardenia*, *Protea* and *Stereospermum* species.

In the Riftvalley near Lake Ziwai the tree savanna consists of *Acacia etbaica*, *A. seyal*, *Balanites aegyptiaca*, *Erythrina abyssinica*, *Combretum*, *Gardenia lutea* as woody plants, with species of *Hyparrhenia*, *Heteropogon*, *Setaria*, *Sporobolus*, *Chloris*, *Pennisetum*, *Tragus*, *Panicum*, *Eragrostis*, *Microchloa*, *Dactyloctenium*, *Harpachne*, *Cyperus*, *Fimbristylis* and *Kyllingia* in the herbaceous layer. In the southern part of the Riftvalley the tree and shrub savanna contains e.g. *Faidherbia albida*, *Acacia seyal*, *Combretum molle*, *Terminalia brownii*, *Stereospermum kunthianun*, *Piliostigma thonningii*, *Faurea rochetiana* and *Gramineae* like *Aristida adoensis*, *A. adscensionis*, *Eragrostis pseudosclerantha*, *Harpachne schimperi*, *Heteropogon contortus*, *Melinis tenuissima*, *Rhynchelytrum repens*, *Setaria pallide-fusca* and *Pennisetum ramosum*.

In the Borana region a tree savanna is present near Negelli, with *Balanites aegyptiaca*, *Acacia seyal*, *Dichrostachys glomerata*, *Combretum molle*. More to the south a prairie savanna as well as a tree and shrub savanna are found.

Prairie savanna is also found east of Jijiga in the Marar plain.

4.2.7 Montane evergreen thicket and scrub

This vegetation consists of evergreen or semi-evergreen, 2—3 m high shrubs, big bushes, small trees, climbers, and occasionally larger trees. The shrubs are either thornless with leathery, glossy leaves, or thorny and succulent. Deciduous plants are not infrequent. Large trees are scattered; sometimes they are replaced by candelabra *Euphorbia*, in others by *Dracaena*. Evergreen scrub grows mainly on slopes and plateaus and on the slopes of the Ethiopian and Eastern Highlands between 900—1000 and 1800—2400 m. In Eritrea and northern Ethiopia the montane evergreen thicket is found in the k'olla and woyna daga regions.

Common shrubs are *Carissa longiflora*, *C. edulis*, *Euclea schimperi*, *Rhamnus staddo*, *R. staddo* var. *deflersii*, *Maytenus ovatus* var. *ovatus* f. *ovatus*, *Heeria insignis*, *Myrsine africana*, *Dodonaea viscosa*, *Rhus retinorrhoea*, *R. natalensis*, *Calpurnia subdecandra*, *Pistacia chinensis* var. *falcata*, *Jasminum abyssinicum*, *Sideroxylon oxyacantha*, *Halleria lucida*, *Canthium bogosense*, *Osyris abyssinica*, *Lantana viburnoides*, *Buddleja polystachya*, *Clutia kilimandscharica*, *Sparmannia ricinocarpa* ssp. *abyssinica*. Small trees, 4-6 m high, are *Pittosporum abyssinicum*, *Nuxia congesta*, *Teclea nobilis*, *Croton macrostachys*, *Dombeya bruceana*, *Maytenus undatus*, *Tarchonanthus camphoratus*, *Bersama abyssinica*, *Ximenia americana*, *Protea gaguedi*. Together with shrubs and small trees woody plants and climbers grow such as *Pterolobium stellatum*, *Chasmanthera dependens*, *Stephania abyssinica*, *Clematis hirsuta*, *C. simensis*, *Sarcostemma viminale*, *Tragia mitis*, *Asparagus racemosus*, *Rhoicissus erythrodes*, *Cissus quadrangula*, *C. cyphopetala*, *Glycine javanica*, *Rhynchosia sennaarensis*, *Cucumis dipsaceus*, *Zehneria scabra* and *Gloriosa simplex*. Larger trees are *Olea africana*, *Barbeya oleoides*, *Trichilia roka*, *Celtis kraussiana* and *Juniperus procera*. Finally perennial herbs and grasses form the lower stratum.

In the Harar region the climax is the evergreen scrub formation, but it has been destroyed by agriculture and the collection of firewood, as in most Ethiopian evergreen scrub formations. Gillett (1941) described this evergreen scrub for the Harar region:

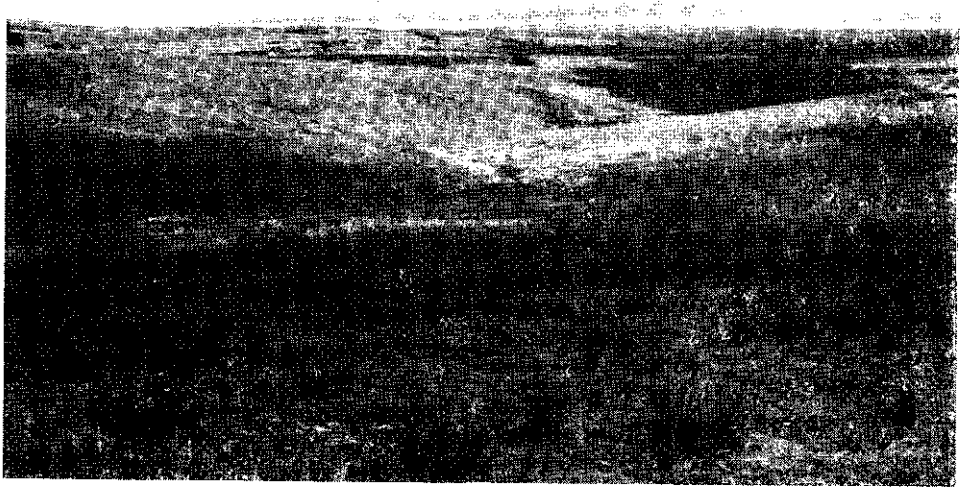
Carissa longiflora and *Cadia purpurea* dominate. Among the larger trees are *Ficus thonningii, Pappea radlkoferi, Croton macrostachys, Erythrina,* and *Terminalia brownii.* Other small trees and bushes are *Carissa edulis, Calpurnia subdecandra, Premna schimperi, Osyris abyssinica, Rosa abyssinica, Vangueria apiculata, Euclea schimperi, Rhus glutinosa, Dovyalis abyssinica, Grewia ferruginea, Cussonia holstii, Fagara usambarensis, Rumex nervosus.* Some chief climbers are *Rubia cordifolia* var. *discolor, Commicarpus africanus, Cissus adenocaulis, C. oxyphylla, Jasminum floribundum, Rhoicissus erythrodes.* Among the herbs are *Sida cuneifolia, Eulophia rueppelii, Dyschoriste radicans.*

This vegetation type continues westwards along the slopes of the Eastern Highlands, and includes the southern part of the Ethiopian Highlands. Not much is known about its (assumedly rich) floristic composition.

Known are *Olea africana, Carissa edulis, Sideroxylon oxyacantha, Rosa abyssinica, Bersama abyssinica, Calpurnia subdecandra, Teclea nobilis, Carissa longiflora* and *Nuxia congesta.*

4.2.8 Montane savanna

The montane savanna differs from the other savanna types in its ecology and floristic composition. Owing to the broken topography, the landscape varies from an open, undulating, treeless country or a savanna with scattered trees, to woodland. It shows a 30—80 cm high, more or less dense herbaceous layer of *Gramineae* and *Cyperaceae* with scrub and perennial herbs.



Photograph 14. Grass vegetation south of Agere Selam, Sidamo.

This vegetation type is found in the woyna daga and lower part of the daga in the northern and central parts of the Ethiopian Highlands, with an extension into the Eastern Highlands; its altitude varies: 1800—2000 m to 2600—2800 m, sometimes up to 3000 m. It is a vegetation type in which the influence of man dominates; it probably developed from dense forest formations.

In north and central Ethiopia the montane savanna of the woyna daga consists of *Andropogon* and *Pennisetum* species, together with such plants as *Falkia oblonga, Dianthoseris schimperi, Digitaria scalarum, Crinum abyssinicum, Albuca, Hypoxis schimperi, Poa schimperiana, Helictotrichon elongatum* and *Agrostis*. On the glossy glades of the slopes *Andropogon, Eragrostis papposa, E. schweinfurthii, Aristida, Panicum, Pennisetum, Rhynchelytrum repens*, many species of *Indigofera* and *Crotalaria* and *Trifolium simense* dominate. In the valleys *Andropogon, Pennisetum, Eragrostis, Panicum, Setaria, Eleusine floccifolia, Trifolium, Crotalaria cylindrica* can be found. In the lower parts of the daga the richness of the vegetation decreases. Around Debarek large tracts with *Pycreus nigricans* occur.

The montane savanna is interspersed with *Hypericum lanceolatum* and isolated specimens of *Erica arborea* and *Rosa abyssinica*. At higher elevations these two grow together with *Echinops*. Near villages and streams *Acacia abyssinica, Hagenia abyssinica, Pygeum africanum, Maytenus* and *Juniperus procera* may be found.

On the Eastern Highlands, at 2000 m, the herbaceous layer of the montane savanna includes *Hyparrhenia schimperi, Rhynchelytrum repens* and *Pennisetum villosum*, together with widely scattered trees like *Rhus abyssinica, Cussonia holstii* and *Cordia africana*.

4.2.9 Montane dry evergreen forest

Although much reduced in extent, this community includes valuable timber forests, at one time covering most of the Ethiopian and Eastern Highlands. Its upper stratum is not very dense but contains high trees; the lower tree stratum is much denser. Small trees and large shrubs, and herbs complete the picture. Epiphytes and lianas are usually present.

This forest type develops on rather humid places, although the precipitation is not very high (1000—1300 mm) and shows a marked dry period.

Five vegetation types may be distinguished.

(1) *Mimusops kummel forest*

This type occurs in the western part of the Ethiopian Highlands and has been studied in the Lake Tana region.

Dominant is *Mimusops kummel*, accompanied by smaller specimens of *Millettia ferruginea, Albizzia schimperiana* and *Celtis kraussiana*. Additional species are e.g. *Trichilia volkensii, Ficus thonningii, Flacourtia indica, Teclea nobilis, Ritchiea steudneri, Oxyanthus speciosus, Dracaena steudneri, Diphasia dainellii, Olea mildbraedii, Diospyros abyssinica*. Under this stratum scrub, shrublets and herbs are present.

(2) *Podocarpus gracilior forest*

The up to 50 m high denominative species ('zigba') is present between 1500 and 2200 m and needs relatively much rain (700—1000 mm). Another typical species is *Juniperus procera* ('tidh'), a tree also found at lower altitudes. *Podocarpus*, often in pure stands,

occurs near Shashamane, Wadara, Kebre Mengist, in the Mogado forest near Agere Mariam, the forest south of Goba, the Chercher range, the Wofasha forest near Debre Sina, the Mangasha forest west of Addis Abeba, and near Jima.

Podocarpus is often associated with *Pygeum africanum, Ekebergia rueppelliana, Olea hochstetteri, Celtis kraussiana, Polyscias ferruginea*, and (on drier places) also with *Juniperus procera* and *Olea africana.*

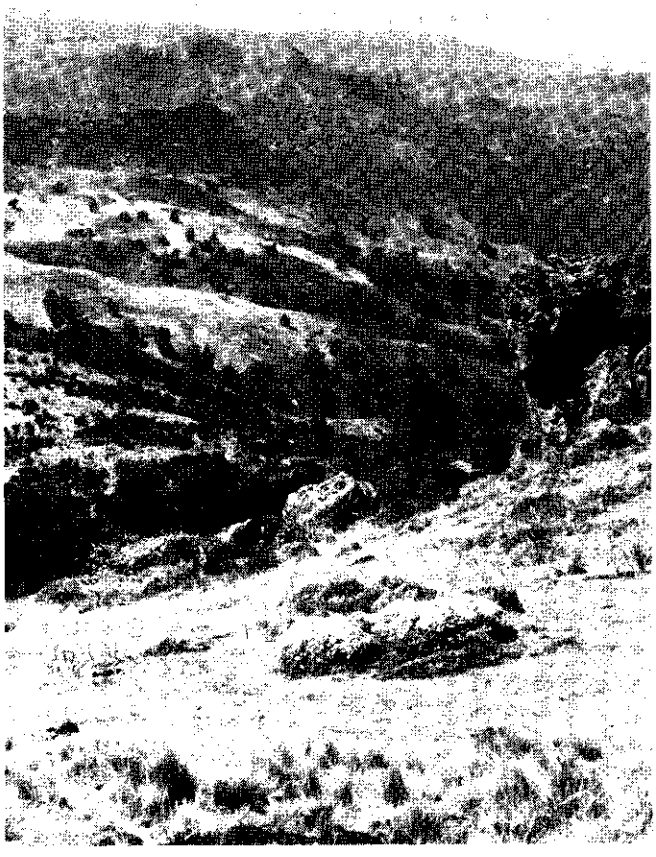
(3) *Juniperus procera forest*

The *Juniperus* forest prefers an altitude between 2200 and 3200 m, though in Borana it starts at 1600 m. It occurs in drier regions than zigba (450—1000 mm). It dominates in the 30—50 m stratum.

The undergrowth consists of 10—20 m high specimens of e.g. *Apodytes dimidiata* ssp. *acutifolia, Cussonia, Ekebergia rueppelliana, Millettia ferruginea, Olea africana, Pittosporum abyssinicum, Pygeum africanum, Hagenia abyssinica, Rapanea simensis.* The shrub stratum contains *Carissa edulis, Dodonaea viscosa*, and species of *Grewia, Gymnosporia, Hypericum, Euclea, Rhus, Pistacia, Sideroxylon* and *Myrsine.*

It is found, often as pure stands, on the upper slopes of the escarpment in Eritrea, Tigre, Begemdir, Gojam and Wollo, in Hararge (Chercher range), Shoa (Wofasha and Mangasha forests), Sidamo (Jamjam forests, Borana), in parts of Arussi and in the Araenna mountains of Bale (Mooney, 1961; Pichi-Sermolli, 1957).

Photograph 15. *Hagenia abyssinica* in the Gara Muletta area, Hararge.



Photograph 16. *Juniperus procera* in the highlands of Bale.

(4) *Juniperus procera – Podocarpus gracilior forest*

This forest type is intermediate between the pure zigba and tidh forests. It occurs at 2000—2200 m in Shoa, Hararge, Arussi and Bale provinces (Gillett, 1941; Mooney, 1961).

(5) *Acacia xiphocarpa forest*

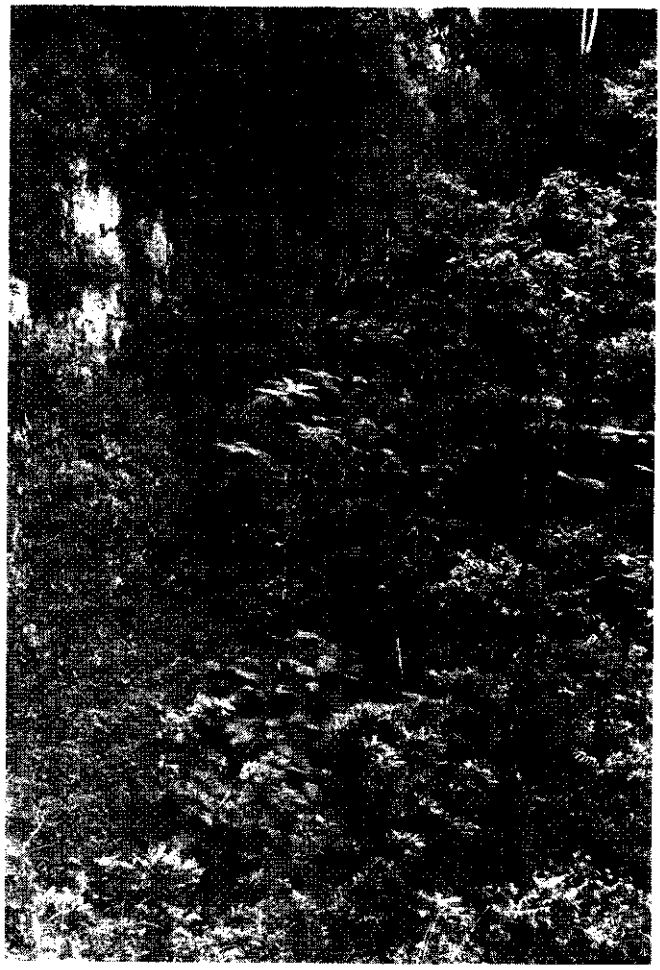
This *Acacia* forest, only 10—12 m high, is a more xerophilous type of the montane dry evergreen forest. It can be found in the regions of Lake Tana and of Tukur Dinghia.

The stratum of small trees, bushes, climbers and lianas consists of plants such as *Ficus thonningii*, *Bersama abyssinica*, *Schrebera alata*, *Ritchiea steudneri*, *Salix subserrata*, *Vernonia amygdalina*,

Maytenus ovatus var. *ovatus* f. *pubescens*, *Maesa lanceolata*, *Capparis persicifolia*, *Hippocratea africana* var. *schimperiana*, *Phytolacca dodecandra*, *Urera hypselodendron*, *Jasminum abyssinicum*, *Asparagus asiaticus*. Common herbs are *Hypoestes verticillaris*, *Sida ternata*, *Digitaria abyssinica* var. *velutina*, *Cardamine africana*, *Laggera pterodonta*, *Commelina pyrroblepharis*, *Guizotia villosa*, *Geranium simense*.

4.2.10 Montane moist evergreen forest

This forest type occurs in southern Wellega, Illubabor, Kefa, and some parts of Sidamo, where annual rainfall exceeds 1200 mm, but especially in the region between Bonga and Gore (with the Sai forest) with a rainfall over 2000 mm. Logan (1946) called this forest type the *Pouteria-Albizzia* association. Where conditions are less



Photograph 17. *Cyathea manniana* in the forest near Bonga, Kefa.

humid, this association gradually merges into the *Podocarpus* association, a transition accompanied by a gradual decrease in frequency of many species common to both associations. Among the first to drop out are *Aningeria adolfi-friderici*, *Allophylus abyssinicus*, *Sapium ellipticum*, *Dracaena* and *Galiniera coffeoides*, while *Podocarpus gracilior* and *Sideroxylon oxyacantha* are among the first indicators of the *Podocarpus* association. At its upper limit the *Pouteria-Albizzia* association merges into bamboo forest.

The upper stratum is formed by 30—50 m high trees, like *Aningeria adolfi-friderici*, other species of *Aningeria*, *Morus mesozygia*, *Bosqueia phoberos*, *Manilkara butugi*, *Fagaropsis angolensis*, *Olea mussolinii*, *Albizzia schimperiana* and *Mimusops kummel*. Then follows a dense stratum of 18—25 m high trees, like *Ekebergia rueppelliana*, *Pygeum africanum*, *Syzygium guineense*, *Celtis kraussiana*, *Apodytes dimiadiata* ssp. *acutifolia*, *Polyscias ferruginea*, *Ficus*, *Bersama abyssinica*, *Schefflera abyssinica*, *Ilex mitis*, *Sapium ellipticum*, *Canthium giordonii*, *Macaranga lophostigma*, *Dracaena*, *Phoenix*, *Pittosporum ripicolum*, *Allophylus abyssinicus*, *Cordia africana*, *Croton macrostachys*, *Deinbollia*, *Millettia ferruginea*, *Trichilia siderotricha* and *Erythrina*. Among the small trees and bushes are *Galiniera coffeoides*, *Coffea arabica*, *Randia malleifera*, *Clausena anisata* ssp. *abyssinica*, *Teclea nobilis*, *Diphasia dainellii*, *Maytenus*, *Garcinia*, *Maesa lanceolata* and the tree fern *Cyathea manniana*. Finally a rather poor stratum follows with *Tectaria gemmifera*, *Pteris abyssinica*, *Dryopteris*, *Asplenium ceii* and *Aframomum korarima*. Epiphytes are abundant. The trees are usually festooned with mosses, orchids, ferns and club-mosses (Mooney, 1961; Pichi-Sermolli, 1957).

Photograph 18. Forest south of Yirba Moda, Sidamo.

Photograph 19. Degraded forest north of Kebre Mengist, Sidamo.

4.2.11 High-level bamboo forest

In Shoa, Wellega, Kefa, Gamu Gofa, Bale, Arussi and Sidamo, between 2300 and 3200 m, the bamboo *Arundinaria alpina* grows mostly in pure stands. South of Dodolla probably the largest forest of this plant occurs between 2300 and 2900 m, where it is said to cover many thousands of acres.

The plant may be found in association with *Hypericum lanceolatum*, *Rapanea simensis*, *Syzygium guineense*, *Buddleja polystachya* and *Erica arborea* (Mooney, 1961; Pichi-Sermolli, 1957).

4.2.12 High mountain vegetation

This vegetation type occupies the upper slopes and summits in the highest areas of the Simen Mountains (Ras Dashan, 4620 m), the Lasta Massif (Mount Abuna Yosef 4194 m), the Guna Massif (Mount Guna, 4281 m), Mount Collo (4300 m), the Choke Massif (Ras Birhan, 4154 m), the Gurage Massif (Mount Gurage, 3719 m), the Gughe Massif (Mount Tola, 4200 m), the Amarro Mountains, Mount Chilalo (4127 m), Mount Bada (4133 m), Mount Kaka (4200 m), Mount Batu (4307 m) and the Gara Muletta (3384 m). In Mooney's description it begins above the *Hagenia-Hypericum-Rapanea* association at ca 3300 m where it consists of montane scrub (up to ca 4000 m), montane steppe (up to ca 4400 m), on the Ras Dashan followed by scree. Pichi-Sermolli distinguished high mountain scrub, high mountain steppe, and afro-alpine

Photograph 20. *Echinops ellenbeckii* on Mount Kondudu, Hararge.

formations. These types cover only rather small areas and they gradually pass into each other.

(1) *High mountain scrub*

This scrub is an assemblage of 2—3.5 (rarely 5—6) m high shrubs, sometimes in clusters, and perennial herbs and grasses. Over a distance of 200—400 m at higher altitudes its height gradually diminishes to 60—80 cm in passing into the high mountain steppe (> 4000 m). In the Simen Mountains, between 3000—3200 and 3300—3700 m, it consists of *Erica arborea*.

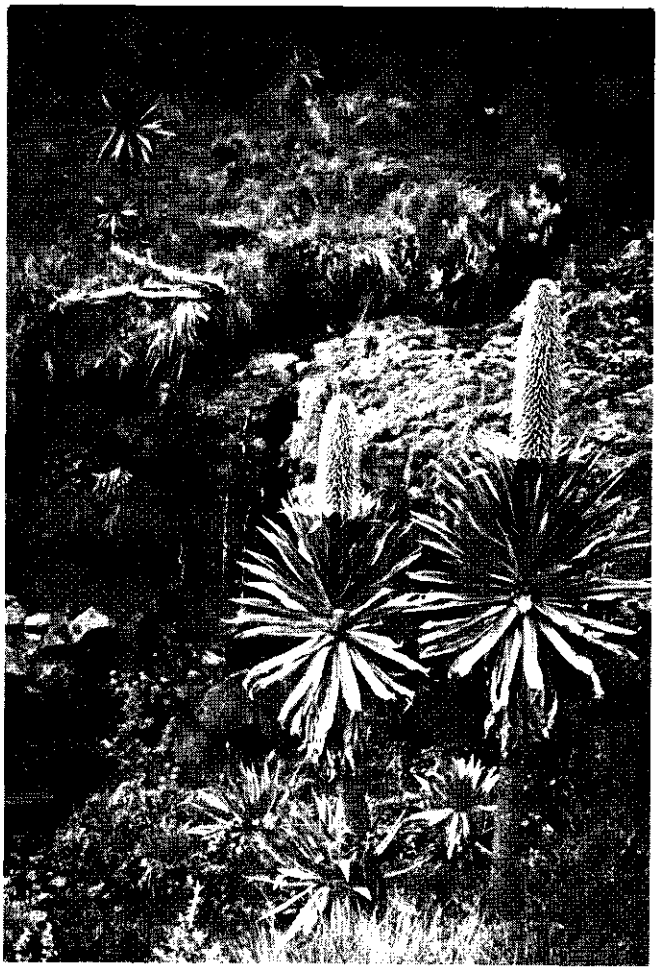
Among the associates are *Hypericum lanceolatum*, *Schefflera abyssinica*, *Rapanea simensis*, *Myrica salicifolia* and *Protea gaguedi*.

Near its upper limit, *Erica arborea* becomes less frequent and *Lobelia rhynchopetalum* appears. In its lower regions, between 3000 and 3500 m, the scrub and herb vegetation is richer.

Here *Rosa abyssinica*, *Hypericum lanceolatum*, *Erica arborea*, *Helichrysum horridum*, *H. schimperi*, *Dipsacus pinnatifidus*, *Pterocephalus frutescens* and *Asparagus* are present.

(2) *High mountain steppe*

This steppe has a very limited extent and perhaps it is only a degraded scrub vegetation. Its lower limit is vague, and Pichi-Sermolli even assumes that it is already



Photograph 21. *Lobelia rhynchopetalum* in Simen Mountains Begemdir.

found down to 2800 m. Its flora is of afro-alpine nature.

Lobelia rhynchopetalum is characteristic.

4.2.13 Afro-alpine formations

Representatives of these formation group are found above 4000 m, though isolated patches occur at lower altitudes.

In the Lasta Massif, *Lobelia rhynchopetalum* and *Senecio farinaceus* have been recorded. On Mount Chilalo occur *Lobelia rhynchopetalum, Alchemilla haumannii, Anemone thomsonii, Moraea thomsonii, Kniphofia thomsonii, Hesperantha petitiana, Blaeria spicata, Dierama pendulum, Helichrysum formosissimum, H. citrispinum.* On Mount Tola *Lobelia rhynchopetalum, Alchemilla haumannii, Helichrysum*

formosissimum, Bartsia petitiana, Sebaea brachyphylla, Swertia lugardae, S. kilimandscharica, Senecio myriocephalus, Uebelinia, Lotus and (according to Scott, 1952) *Lobelia giberroa.*

For the Simen Mountains above 4300—4350 m three types of afro-alpine communities have been described.

(1) *Plant communities on stony places*

They occur on mountain ridges and peaks and consist of shrublets, perennial herbs and isolated clumps of grasses.

Among them the following species have been noted. *Helichrysum citrispinum, Oreophyton falcatum, Arabis cuneifolia, Epilobium schimperianum, Ranunculus oreophytus, Gymnosciadium pusillum, Satureja contardoi, Dipsacus eremocephalus, Cineraria abyssinica* f. *rothii, Carduus schimperi, C. semiensis, Festuca abyssinica, Anthemis, Paronychia bryoides, Herniaria hirsuta, Cotula abyssinica* var. *nana, Poa, Conyza messerii, Sagina afro-alpina, Trifolium cryptopodium, Senecio degiensis, Swertia engleri, Galium hochstetteri, Anthemis semiensis, Senecio nanus.*

(2) *Plant communities on rock slopes*

They consist of *Afrovivella semiensis, Carduus semiensis, Stachys hypoleuca, Urtica simensis, Asplenium, Oreophyton falcatum, Arabis cuneifolia* and others.

(3) *Marshy associations*

They show tussocks of *Carex monostachya*, sometimes forming an almost closed carpet, intermingled with other plants.

To the latter belong: *Saxifraga hederifolia, Limosella africana, Ranunculus dertropodius, Veronica beccabunga, Haplocarpha rueppellii* and *Deschampsia caespitosa.*

4.2.14 Coastal formations

The main types of this group are the plant communities of the coral beaches, the sandy shores, the deltas, estuaries, dunes, and the mangrove swamps.

The vegetation of the coral beaches consists chiefly of saline plants like *Atriplex farinosa, Suaeda schimperi, S. monoica, S. baccata, Arthrocnemum glaucum, Cornulaca ehrenbergii, Salsola, Zygophyllum album, Limonium axillare, L. cylindrifolium.* In the coastal sands near Assab *Panicum turgidum* is found, as in the estuarian vegetation *Suaeda fructicosa* is present. On the moving dunes *Scaevola plumieri, Calotropis procera, Blepharis persica, Eragrostis ciliaris* var. *brachystachya, Sporobolus* grow, and on the consolidated dunes a varied vegetation is found including species of *Acacia, Commiphora, Grewia* and others.

Mangrove swamps occur in several coastal localities but only very local, such as near Massawa and Assab. They consist of e.g.

Avicennia marina, Rhizophora mucronata, Bruguiera gymnorhiza, Ceriops tagal, Sonneratia alba, Lumnitzera racemosa and *Xylocarpus* (Mooney, 1961; Pichi-Sermolli, 1957).

4.2.15 Swamp formations

Inland swamp vegetations are found in Chew Bahir, along the shores of the Riftvalley lakes and Lake Tana, north-west of Lake Abbe, and in the northern part of the Danakil Plain (Lake Asale). Characteristic are, in general, *Phragmites australis*, *Typha*, and many *Gramineae* and *Cyperaceae*.

Along the shores of Lake Tana, vast areas are covered by *Cyperus papyrus* and *Sesbania* species (such as *S. aegyptiaca*, *S. speciosa* and *S. punctata*). Along the shores of the Riftvalley lakes occur *Aeschynomene elaphroxylon*, *Cyperus papyrus*, *Phragmites australis*, *Typha*, *Juncus oxycarpus* and *Scirpus*. In the arid zone swamps salt-tolerant plants are common like *Suaeda*, especially *S. monoica*, and species of *Salsola* and *Salicornia*, and isolated shrubs or trees of *Tamarix* and *Phoenix*. The high mountain swamp with *Carex monostachya* has been mentioned already.

4.2.16 Riparian formations

Riparian vegetations are complicated communities. They can be classified in types largely depending on altitude and edaphic requirements. All Ethiopian rivers, either seasonal or carrying water all the year round, have their own particular riparian vegetation, as apparent from the following descriptions.

In west Eritrea, along the Barka, the Gash, and their tributaries, forests of *Hyphaene nodularia* are abundant; also *Tamarindus indica*, *Tamarix*, *Ficus*, *Balanites aegyptiaca* and *Zizyphus* are found. In east Eritrea, along the wadis, also *Aphania senegalensis*, *Trichilia roka*, *Ficus sycomorus* and *F. vasta* occur.

In the northern part of the Danakil Plain *Hyphaene dankaliensis*, *Phoenix dactylifera*, *Acacia* and *Zizyphus spina-christi* are found.

The Awash valley has along the river borders *Maytenus*, *Rhamnus*, *Acacia nubica*, *Triumfetta*, *Acalypha*, *Ricinus communis*, *Salvadora persica* and *Sarcostemma viminale*.

South of Negelli, along some wadis, have been recorded *Mimusops kummel*, *Rhynchosia sennaarensis*, *Kanahia laniflora*, *Ludwigia pubescens*, *Plectranthus hararensis*, *Conyza persicifolia* and *Solanum cufodontii*.

The borders along the Mareb, the Belesa, the Tekkezze and the Angereb, and their tributaries in west Ethiopia, show an abundance of shrubs and trees, among them *Ficus sycomorus*, *F. vasta*, *F. glumosa*, *F. salicifolia*, *Tamarindus indica*, *Syzygium guineense*, *Aphania senegalensis*, *Acacia sieberiana*, *Salix subserrata*, *Tamarix aphylla*, *Trichilia roka*, *Sesbania punctata*, *Kanahia laniflora*, *Kigelia aethiopicum*, *Cordia africana*, *Diospyros mespiliformis*, *Gossypium anomalum*, *Vernonia amygdalina* and *Chasmanthera dependens* (Mooney, 1961; Pichi-Sermolli, 1957).

5 Ethnic groups and languages

5.1 Grouping

The heterogenous mixture of linguistic, ethnical and cultural types in Ethiopia is dominated by the Amhara and the closely related Tigrai. The Amhara live in Begemdir, Gojam and Shoa, the Tigrai in northern Eritrea and Tigre. Together they make up about one third of the population. Among the other groups the Galla is the largest (ca 40% of the total population); other significant groups are the Somali (ca 6%), the Sidamo (ca 9%), the Danakil or Afar (ca 4.5%), the Gurage (ca 2.5%) and the Shankalla peoples (ca 6%). Except for the Shankalla, all belong to the Mediterranean race. Within this Mediterranean group, subgroups with distinct physical characteristics can be distinguished (Lipsky, 1962).

Murdock (1959) divided the highland Ethiopians into three ethnic groups: the Central Ethiopians speaking Hamitic languages (either Semitic or Central-Cushitic), the Sidama peoples speaking either West-Cushitic or East-Cushitic, and the Galla. Ullendorf (1966) also described three ethnic groups: people of Cushitic stock (Hamitic Ethiopians) speaking Semitic languages; Cushitic groups of the Beja, Sidama and other types; and people of Nilotic origin. He suggested the use of linguistic affinities as a guide to ethnic distribution.

Since linguistic and ethnic limits do not coincide, grouping according to language and culture of Cushitic, Semitic and Nilotic origin (or sometimes mixtures) seems preferable in this 'museo di popoli', as Conti Rossini (1937) called it.

Except some Nilotic and certain unclassified languages, all belong to the Semitic and Cushitic subfamilies of the family called Afroasiatic (or Hamitic, as Murdock suggested in 1959). The more generally accepted term Hamito-Semitic is misleading since the Afroasiatic language family has five co-ordinate branches: Semitic, Berber, Ancient Egyptian, Cushitic and Chad (Greenberg, 1963).

Trimingham (1965) suggested the following linguistic groups for Ethiopia (see also the map of languages):

- a group speaking Semitic languages (Tigre speaking people, Tigrai, Amhara, Gurage, Harari, Argobba, Arabs);
- a group speaking Cushitic languages (Beja, Agau, Gimirra-Maji group, Kaffa-Gonga group, Ometo group, Janjero, Afar, Saho, Somali, Galla, Sidamo group, Burji-Geleba group);
- a group speaking Negro languages, some of them not yet classified (e.g. Kunama, Baria, Gumuz, Berta, Mao, Annuak, Mekan, Bako people).

5.2 Semitic languages

(1) *Tigre* is spoken by the 120,000 to 250,000 inhabitants of the northern Eritrean hills and the eastern and western plains, by some 60,000 in west Eritrea (the Beni Amar) and by some 100,000 inhabitants of the Sudan (some people of the Beni Amar, a Beja tribe, speak Bedawiye, or Beja, others Tigre). They are all islamitic nomads with only a small group engaged in agriculture. In the northern hills three groups dwell that belong to a federation of Bet Asgede: the Habab, the Ad Takles, and the Ad Temaryam. They are also moslems and largely nomadic. So are several other tribes, such as the Ad Sheikh, the Ad Tsaura, the Ad Miallim, the Bet Mala, the Marya and the Mensa. The people on the Dahlak Islands off the Massawa coast also speak Tigre (Lipsky, 1962; Ullendorf, 1966).
(2) *Tigrinya* is spoken by the 1 to 1.5 million christians (Tigrai people) settled in Tigre and in the plateau districts of Eritrea province (Hamasen, Serae, Akkele Guzay and the edges of Keren and Massawa). This language, together with Tigre and Amarinya, has replaced the Ge'ez of the Kingdom of Axum. Today, Ge'ez is the liturgical language of the Ethiopian Orthodox Church (Lipsky, 1962; Ullendorf, 1966).
(3) *Amarinya* is the language of the christian Amhara of Begemdir, Gojam, Wollo and Shoa. Though it is spoken by not more than half the population, it is the national

Photograph 22. Tigrai girl in Alamata, Wollo.

language of Ethiopia. Its vocabulary contains many words and expressions of Cushitic origin, but the Semitic stock has remained appreciable. It has few dialectic variations (Lipsky, 1962; Ullendorf, 1966).

(4) *Gurage* is spoken by 350,000 to 500,000 inhabitants, most of them living in the area south-west of Addis Abeba enclosed by the Awash, the Omo and Lake Ziwai. Many of them live in the capital.

Linguistically, the Gurage is divided into three groups: Eastern Gurage (Selti, Wolane), Western Gurage (Chaha, Ezha, Muher, Ennemor) and Northern Gurage (Aymallal). Contrary to Western Gurage, Eastern Gurage is closely related to Harari, though the vocabulary shows a considerable infiltration of Arabic (Lipsky, 1962; Shack, 1966; Ullendorf, 1966).

(5) *Harari* or *Adare* is spoken by the 35,000 residents of the town of Harar. As it is surrounded by Galla and Somali, their languages have considerably influenced the Harari vocabulary and grammar, but the influence of Arabic has been greater as Harar is the principal moslem city in Ethiopia. Harari is generally written in Arabic characters. (Lipsky, 1962; Ullendorf, 1966).

(6) *Argobba* actually includes two languages spoken by some hundreds of people in an area north-east of Addis Abeba and in a few communities south of Harar about which not much is known (Lipsky, 1962).

(7) *Gafat* was spoken by tribes in the Abbay region of Gojam, but the language is extinct (Ullendorf, 1966).

Photograph 23. Argobba woman in the market of Harar, Hararge.

(8) *Arabic* is mainly spoken in Eritrea, in particular in coastal towns like Massawa and Assab, but probably not more than 15 to 20% of the Eritreans are able to speak it fluently. Concentrations are found in Harar and Jima, but they form only a small fraction of the total population (Lipsky, 1962).

5.3 Cushitic languages

The inhabitants of Ethiopia speaking a Cushitic language belong to four groups.
(1) *Northern Cushitic* is spoken by part of the Beni Amar; Beni Amar use Tigre or Beja (Bedawiye). Some of the Beni Amar groups have incorporated Tigre speaking persons, who have remained bilingual (Lipsky, 1962).
(2) *Central Cushitic* is the language of the Agau, the original inhabitants of the plateau, of which now no more than isolated pockets, totalling perhaps 75,000 now bilingual people, have remained in the northern and central Ethiopian Highlands. Representatives of this group are the Bilen (Bogos) around Keren; the Kemant, Kwara and Falashas in the area west of the Tekkezze river and north of Lake Tana; the Agau in Agaumeder and Damot (Gojam) speaking Awiya; and the Khamir and the Khamta between the southern Tigrai and the Lasta (Lipsky, 1962; Ullendorf, 1966).
(3) *Western Cushitic* is not spoken by a closed group but by persons belonging to various cultures, of which four may be distinguished.
(a) The Gimira-Maji group consists of Negroid people with an archaic, pre-Cushitic culture in which agriculture is primarily based on the cultivation of tuber crops. To this group belong the Benesho, the Mere and the She (sometimes as group referred to as the Disu), and the Nao, Chako, Dorsha and Maji. They live south of the Kaffa region and number about 30,000. Culturally and racially the Ari tribes of the Bako highland are closely related to this group (Murdock, 1959; Straube, 1963).
(b) The Kaffa-Gonga group includes the Motsha, the Kaffa, and the Bosha (Garo). The Bosha live south of the Janjero between the Gibbe and Gojeb, the Kaffa south of the Gojeb and west of the Ometo group, the Motsha east of the Massongo. More than 10,000 people speak various dialects of the Kaffa language, the major being Kaffa and Shinasha (Lipsky, 1962). According to Bieber (1920), of the people living in the old Kaffa kingdom only the Kafficho (or Gonga) and the Mansho speak Kaffinya.
(c) The Ometo (West Sidama) group lives in the middle basin of the Omo River and spreads north-west as far as Kefa, south-east as far as Lake Abaya and beyond the upper reaches of the Galana Sagan (Cerulli, 1956). In this group Ethiopoid rather than Negroid characteristics dominate. The economy is no longer solely based on tuber crops but includes cereals and cattle (Straube, 1963). According to Cerulli (1956), the main members of this group are: the Wollamo, Zala, Gofa, Basketto, Badditu (Koyra or Amarro), Zayssa, Haruru (Gidicho), Chara, Uba, Kullo (Dawaro or Dauro), Konta (Waratta), Malo, Doko (Sidi), Kucha (Koisha), Borodda and Gamu (Zagitsa).

The linguistic classification of the people living in the south-west area of the Ometo group is not clear, in particular for those between the Omo and Woito rivers. There two tribal groups are found that speak a tongue different from West Cushitic: the group of the Ari and Dime, and that of the Banna, Hammar, Bashada and Karo. The Ari are classified by Cerulli as Nilotic, but Cushitic influences can be traced back as well (Jensen et al., 1959).

According to Haberland (in: Jensen et al., 1959), the Nilotic culture predominates among the Male, Banna, Hammar, Bashada, Karo, Chamako, Arbore and Bodi, whereas the groups of the Ari, Basketto and Dime tribes have best preserved their Negritic character.

(d) The Janjero live north of the Bosha and between the Omo and Little Gibbe. Their language does not fit into the Ometo, Kaffa-Gonga or Gimira-Maji groups. At the base of the Janjero culture an ancient non-Cushitic component can be found related to the Gimirra and Ari cultures, as obvious in the language (Straube, 1963).

(4) *Eastern Cuchitic* can be divided into six groups.

(a) The Sidamo group covers, strictly speaking, the people living between Lake Abaya, Lake Shala and the upper valleys of the Webi Shebele and Ganale. Their language belongs to the Eastern Sidama group. In a broader sense, the Sidamo includes six linguistically, racially and culturally related tribes: the Sidamo proper, the Hadya (Gudela) living between the Omo and the Billate and south of the Gurage, the Kambatta, the Tambaro, the Alaba living between the Billate and Lake Awasa, and the Darassa (Cerulli, 1956).

The indication 'Sidama' is used by the Galla for all non-Gallas. European scholars use the word for a group of people with a clearly defined Cushitic linguistic pattern living in south-west Ethiopia, those who speak West-Cushitic and languages belonging to the Sidamo group (Ullendorf, 1966).

(b) The Burji-Konso-Geleba group is difficult to classify so that several contradictory divisions have been proposed. Murdock (1959) considered this group to be a survival of the Megalithic Cushites, which probably spread southward from the Ethiopian Plateau and which are renowed for their stoneware, their terraces and their large stone phalli. A well-developed agriculture on terraced fields, irrigation, and the use of animal manure still characterize the mountain areas where the Megalithic Cushites must once have been concentrated. Their origin may have something to do with a small group of Cushitic tribes living between the Galla and the Sidama: the Konso cluster. To it belong e.g. the Darassa, the Guji, the Sidamo group, the Konso, and the Burji (Murdock, 1959).

Jensen (1959) distinguished several units: the Sidamo-Burji, the Galla-Konso, the Chamako-Gauwada, and the Geleba.

Straube (1963) pointed out that an important characteristic of the so-called Megalithic complex seems to be the highly developed agriculture (terracing, manuring, irrigation, crop rotation) which can be found with the Chamako before they settled in the lowlands, the Burji, Konso and Gauwada. This type of agriculture is not restricted, however, to those who speak Cushitic: it can as well be found among the

Photograph 24. Konso men in the Konso area, Gamu Gofa.

Photograph 25. Priest in the Konso area, Gamu Gofa.

mountain people of the Sudan and East Africa.

Cerulli (1956) divided the Burji-Konso group in two sets of tribes living from the highlands east of the Sagan and Lake Chamo to the left bank of the lower Omo, all possessing pronounced Negroid characteristics. The first includes the Burji, Konso, Gardulla, Gidole, Tsamai (Kule) and Arbore, all 'hamiticized' Negroids (some others may be provisionally added). They all belong to the Konso-Geleba language group, but some place the Burji in the Sidamo group. The second group includes the Amar Kokke, Kerre, Bachada and Banna, linguistically all belonging to the Bako group but culturally probably more related to the Konso-Burji tribes.

(c) The Galla (Oromo) form the largest ethnic group in Ethiopia. They predominate in Kefa and Illubabor; large settlements are in Wellega, central Wollo, Shoa, Arussi,

Photograph 26. Borana people in south Sidamo.

Photograph 27. Galla girl in the market of Harar, Hararge.

Hararge and Sidamo. In recent years their numbers in Arussi, Sidamo, Gamu Gofa and Wellega have considerably increased. Although they speak the same language (Gallinya), their scattered occurrence over the country hampers classification (Lipsky, 1962).

According to Ullendorf (1966), their origin is probably in the corner of the Horn of Africa, but continual pressure by the Somali drove them west and south-west. Haberland (1963), however, pointed to the cool highland of Bale as their ancestral home, where they lived as a single tribe by rearing cattle and growing grain. In the 16th Century they spread in all directions. All authors who look at the Galla as pure pastoralists have overlooked the fact that they cultivated grain (barley) by their own ancient methods. The Mati of the southern Guji have best preserved this archaic type of agriculture.

Trimingham (1965) divided the Galla into three dialect groups: the Borana dialect spoken by the Borana, Jamjam (Guji), Arussi, Ittu, Karayu and Wollo, the Tulama dialect used by the Shoa Galla, and the Macha dialect spoken by the Limu, Guma, Goma, Jima, Gera, Leqa, Laqamti and Nonno. Haberland (1963) mentioned as dialect groups the Borana, the Guji (Jamjam or Jamjamtu) with the northern Guji (Alabdu) and the southern Guji (Uraga, Mati and Hoku), the Arussi, the Eastern Galla or Harar Galla (Ittu, Annya and Afran K'allu), the Tulama or Shoa Galla, the Macha, and some minor groups like the Karayu, the Wollo and the Yaju.

(d) The Somali constitute a compact ethnic block of about 1 million people. Ullen-

Photograph 28. Afar people in the market of Awash Station, Shoa.

dorf (1966) classifies them into three large groups that are linguistic as well: the Edji, the Hawiya, and the Sab. They live in Hararge, the Ogaden, and in parts of Bale, and Sidamo. According to Trimingham (1965), the Dir (Isa), Isaq and Darod belong to the Heggi (Edji) or northern group, the Hawiya live south of the Darod near the Webi Shebele river; west of the Hawiya group live the Sab (with the Digil and Rahanwiin).

Of the six clan families into which the Somali as a whole are divided, four (the Dir, Isaq, Hawiya and Darod) are mainly pastoral nomads, two (the Digil and Rahanwiin), after having settled in south Somalia have largely become agriculturists (Lewis, 1961).

(e) The Afar or Danakil, of which some 60,000 to 75,000 live in Ethiopia, occupy the most inhospitable area of the country: the hot sand and lava lowlands, the volcanoes, the salt depressions and the scrub-bush lowlands of the Danakil depression between the Red Sea coast and the highland mountains. They are nomadic herdsmen owning camels, cattle and goats. The southern area, Ausa on to Awash, is the only part of their homeland able to support a permanently settled population (Lipsky, 1962).

(f) The Saho live in the coastal depression between Massawa in the north, the Gulf of Zula in the east, and the escarpment of Akkele Guzay in the west. They are mainly pastoralists, and their seasonal migrations take them regularly up to the plateau. The language of the two large tribes, the Asaorta and the Mini-Fere, is a Cushitic tongue akin to Dankali. The westward movement of these tribes is still going on (Lipsky, 1962; Ullendorf, 1966).

5.4 Negro languages

The people speaking Negro languages form a very complex group, though they all use languages belonging to the Nilo-Saharan language group. They mainly live in the western lowlands of Ethiopia, near the border of the Sudan. Cerulli (1956) distinguished the following groups of people.

(a) The Bako group of which the Ari tribes of the Bako Highland probably speak a Nilotic language. Perhaps the Banna-Hammar and the Dime also belong to it (Haberland, in: Jensen et al., 1959).

(b) The Didinga-Longarim-Murle group of which only the pastoral Murle live in south Ethiopia (in the south, near the Omo). Little information is available on the physical characteristics of this people.

(c) The Suri-Surma-Mekan group is represented in Ethiopia by the Suri, Tirma, Zilmanu, Mursu (Mersu), Mekan (Surma) and Massongo (Majongo), all living west of the Maji. They have marked Negroid properties. Agriculture provides the basis for life for most of them, except for the Mursu who depend on hunting and fishing.

(d) The Ingassana-Mao group lives in the western parts of Wellega, Gojam and Begemdir. It consists of the Berta, Gumuz (Gumus, Gunza, Guniz), Koma, and Mao, in general all Negroid. The Ethiopians call them Shangalla or Shankalla; they are

Photograph 29. Bani Shangul boys in the small market near the Didessa river west of Nekemte, Wellega.

also known under the name Bani Shangul. They are no pastoralists and do not have many cattle.

Other groups include (Trimingham, 1965):

(e) the Annuak, living between the Akobo and the Baro,

(f) the Kunama in south-west Eritrea between the Gash and the Setit, and

(g) the Baria north of the Gash.

5.5 Ethiopians in classical literature

According to an editorial note of Kush (1958), 'Ethiopia' and 'Ethiopian' in former times refer to the region between the First Cataract of the Nile and the 15° parallel. The word 'Ethiopia' which actually was used in Antiquity to refer to the northern Sudan is ambiguous, since it is used nowadays for 'Abyssinia'.

The Greek and Romans classified as Ethiopians those having a certain pigmentation which they attributed to environment, especially the heat of the sun. Homer's Ethiopians are 'remote peoples sundered in twain, the farther-most men, some dwelling where the sun rises and others where it sets'. Aeschylus is the first Greek who located Ethiopians definitely in Africa. Herodotus is the first Greek writer visiting Africa who gave a substantial account of Ethiopians living south and south-east of Elephantine. He referred to the city of Meroë situated at a two month's journey from Elephantine (Snowden, 1970).

In the sixth Century B.C. the Ethiopians of the independent kingdom of Kush transferred the seat of their government from Napata near the Fourth Cataract further south to Meroë, situated between the Fifth and Sixth Cataracts. It was the Ethiopian people and civilization of the Meroitic period that evoked the attention of classical writers (Snowden, 1970).

In Ethiopia, the name 'Ethiopia' appeared for the first time in the Greek version of an inscription of king Ezana (4th Century A.D.), which is still present at Axum. It is the translation of the name 'Hasbashat', being the most important people of the Empire of Axum at that time. From Habashat 'Abyssinia' was derived (Drewes, 1974, pers. comm.).

6 Agriculture

6.1 Ethiopian agriculture through the eyes of 'forengi' (foreigners)

In the 12th Century rumours spread through Christian Europe about a mysterious Christian king called Prester John, ruling somewhere in the East. His kingdom was said to be India; later on it was identified as Abyssinia. This Abyssinian monarchy was considered a potential ally in the struggle against the Moslem powers (Pankhurst, 1961).

Marco Polo, whose 'Travels' appeared in 1298, was the first of a number of writers to touch upon economic and social conditions in Ethiopia. Although he himself never visited the country, he wrote: 'You must know that Abesh (Abyssinia) is a very large province and constitutes Middle India. You must also know that the chief king of all this province is a Christian. All the other kings are subject to him.' He mentioned that the country abounded in 'all the necessaries of life'.

The Egyptian courtier Ibn Fadl Allah Al-Omari devoted much attention to Ethiopia in his geographical work 'Masalik el Absar' (1342—1349) which was largely based on accounts of Ethiopian and other travellers to Egypt. He referred to the cultivation of wheat, barley, sorghum, t'ef, chickpeas and lentils, and he remarked that two harvests a year could be obtained. In describing the Moslim kingdoms Awfat, Dawaru, Arababni, Hadya, Sarha, Bali and Dara, he writes: 'dans chacune des régions décrites et sur la 'bordure musulmane', on sème avec les pluies deux fois par an et on recueille deux récoltes. À l'époque où se fait la première moisson survient une seconde pluie, qui permet de semer la seconde récolte . . . Les espèces de plantes potagères que l'on trouve dans ce pays sont le blé, l'orge, le pois chiche, la lentille, le psille, le sorgho, et quelques autres légumes et grains . . . Ils ont encore une céréale qu'ils nomment dans leur langue tafi, dont le grain est de la taille de celui de la moutarde et dont la couleur tend vers le rouge, et quand il est brisé, vers le noir. Ils en font du pain, car il ressemble au blé.' For Awfat (Ifat), Ibn Fadl Allah Al-Omari mentioned in his work a tree called cat, of which the young leaves and stem tips are eaten: 'il excite l'intelligence et donne la joie; il permet de se priver en partie du manger, de boire et d'avoir des rapports sexuels.'

Brother Rafael, quoted by Zorzi (1522) was much impressed by the country: 'Axum, a great city, is distant from the Nile 3 or 4 days and there is great heat; there grow corn, vines, beans, cropped twice a year as in all the lands of Presta Jani; there grow all fruits except chestnut, and there grow peas, beans, chickpeas, beans ('fasali'), and in the best and richest grounds there grow many trees and date palms,

but the dates are not as good as those of Cairo because they like sand. There grow lemons, citrons, oranges to full perfection. There grow not melons, but gourds and other things and herbs, flowers of different kinds . . .' (Crawford, 1958).

Alvares, in his 'The Prester John of the Indies' (1540) has supplied much interesting information on the agricultural aspects of the country through which he travelled from 1520 till 1526. 'In all the country is more millet than wheat or barley; in these, and where wheat and barley are somewhat lacking, there is much tafo and daguca (seeds not known to us), pulse, beans, kidney beans, chickpeas, and all vegetables; and in other countries all sorts of grain and vegetables in great abundance and sufficiency.'

In the valleys of a monastry near Bizan he observed orange trees, lemon trees, citron trees, pear trees, and figs, peach trees, cabbages, coriander, cress, wormwood, myrtle, and other sweet smelling and medicinal herbs. He furthermore mentioned that the town of Quiha is situated in very beautiful fields, all irrigated by channels of water descending from the peaks, artificially made with stone, with wheat, barley, beans, pulses, peas (which they have all the year round), garlic, onions, garden rue, and around the houses much mustard.

Alvares continued that near rivers, fields are sown with all kinds of seeds, which grow all the year round. Each time passing along the road, he always found some wheat just sown, and some emerging, and some in grass, some in the ear, some ripe, and some reaped or threshed on the threshing floor; and so with other seeds of this country as well. There is flax too, but it gives no fibre, and no cloth is made of it. 'There would be much fruit and much more cultivation in the country, if the great men did not ill-treat the people, for they take what they have, and the latter are not willing to provide more than they require and what is necessary for them.'

'In all this country they make bread of any grain, as with wheat, barley, maize, chickpeas, peas, lentils, kidney beans, beans, linseed, tafo and daguca. The general drink is made of barley, which they call canha, and they also make it of maize (milho zaburro) and of another grain called guca, for a different wine is made from each of these seeds, tasting like beer; they also make it of darnel. They do not drink this when it is fresh, because it brings a man to the ground.' Alvares found in Tarso threshing floors for coriander like those for wheat, and 'nigo'; from the heads of 'nigo' oil is made.

His impression of the country can be summarized as follows: 'And because I was amazed they said to me: honoured guest, do not be amazed, because in the years that we harvest little we gather enough for three year's plenty in the country; and if it were not for the multitude of locusts and the hail, which sometimes do great damage, we should not sow the half of what we sow, because the yield is incredibly great; so it is sowing wheat, or barley, lentils, pulse, or any other seed. And we sow so much with the hope that even if each of those said plagues should come, some would be spoiled, and some would remain, and if all is spoiled the year before has been so plentiful that we have no scarcity.'

After the invasion by Grañ and his defeat in 1543, Manuel de Almeida described

Ethiopia (between 1628—1646) during the Galla invasions to be a very fertile country. In some parts it yielded two or three crops a year, though the energy and effort the farmers put into cultivating was not great. In the higher and colder parts there was plenty of wheat and barley, as in the lower and warmer parts Almeida found millet (some 15—20 types), as well as daguca, t'ef, chickpeas, beans, nug, linseed, mustard, garden cabbage, and vegetables like turnips and dwarf turnips which they call uxines and daniches, fragrant and medicinal herbs, rue, houseleek, dill, fennel, wild sweet basil, coriander, onions, garlic and many purgative herbs. Interesting are his observations on the false banana: 'Ensete is a tree peculiar to this country . . . The tree itself is eaten, either sliced and boiled, or crumbled and ground into meal which they put in pits in the ground where it keeps for many years, and is taken out and made into apas or pap' (Beckingham & Huntingford, 1954).

Ludolphus, writing about Ethiopia in 1684, said: 'The fertility of the Soyl of Habessinia is to be admired; for the land where it admits of Tillage, abounds in all sorts of Fruits. The long summers affording that extraordinary plenty that in the same place you shall find seed-time and Harvest; which is in some places double, in others threefold. For Grain and Pulse, the Habessines have not only those known to us, Wheat, Barley, Millet, and the like; but also another sort unknown to us, which they call Tef, which makes a very good Bread.' Although 'herbs of all sorts' grew in the country black pepper was non-existent, but this was due to the 'carelessness to plant' rather than to the 'fault of the Soyl' (Pankhurst, 1961).

Crossing the frontier from the Sudan at Serke, Poncet, at the end of the 17th century, exclaimed that he entered 'a world of pleasant fountains. There is no country better peopled or more fertile than Aethiopia. All the fields, and even the mountains, of which there are a great number, are well cultivated.' He mentioned the cultivation of cotton in the country from Giesim and Abiad. Poncet subsequently wrote of forests 'fill'd with orange trees, citron trees and pomegranate trees', and a great amount of cardamom and ginger, the latter with a most agreeable scent. According to him the Etiopians did not esteem coffee very much, and cultivated it more as a curiosity. The bush 'resembles very much the myrtle. Its leaves are always green, but larger and more tufted. It bears a fruit like the pistacho-nut, and on the top a husk, in which are contained two beans, and this is what they call coffee. This husk is green at the beginning, but as it grows more ripe becomes a darker colour . . . They shell it from the husks in which it grows, and send it away without much ado' (Pankhurst, 1961).

Father Lobo (1735) wrote of the economic value of the false banana (ensat). It was 'wonderfully useful'; its leaves were so large to cover a man; the branches and thicker parts of the leaves were ground and mixed with milk to form 'a delicious Food'; the trunk and the roots were even more nourishing and were used by 'the meaner People', when they went on a journey. 'The Abyssins report that the tree when it is cut down, Groans like a Man, and on this account, call cutting down an Ensete Killing it. On the top grows a bunch of five or six Figs, of a Taste not very agreeable which they set in the Ground to produce more Trees' (Pankhurst, 1961).

Bruce (1790) supposed that the ensat was a native to Narea (= Enarea), but was also in cultivation in the north. The Galla, when transplanted into Abyssinia, brought for that particular use the coffee tree, and the ensat, the use of neither of which were before known. 'It grows and comes to great perfection at Gondar but it must abound in that part of Maitsha and Goutto west of the Nile, where there are large plantations of it and it is there almost exclusive of any thing else, the food of the Galla inhabiting that province.'

Bruce was the first traveller who took a less positive view on Ethiopian agriculture. He suggested that the yield of the Ethiopian crops were by then considerably inferior to those of Europe, at that time (Pankhurst, 1961).

In the 19th Century the stream of travellers in Ethiopia steadily increased. Harris (1844) is lyrical in his flamboyant description of the country: 'Although the majestic fabrics, the pillars of porphyry, and the Corinthian domes of early writers, now exist only in the tradition, Ethiopia yet retains the fresh vegetation of a northern soil, the vivifying ardour of a tropical sun, and the cloudless azure of a southern sky . . . Throughout the kingdom the eye is greeted by extensive cultivation; and the art of husbandry in Shoa has far eclipsed the advances made by any nation hitherto visited on the western coast. The Abyssinian husband man takes great trouble in improving the cultivated soils of grain by changing the seed-corn at every season, and sometimes by sowing promiscuously different sorts to produce new varieties. Hence the astonishing number of distinguishable kinds is cultivated in a small compass of ground under certain established appellations and brought into use for very different purposes.'

In his 'First Footsteps in East Africa' (1856) Burton described the vicinity of the walled city of Harar as follows: 'the soil on both sides of the path is rich and red: masses of plantains, limes and pomegranates denote the gardens, which are defended by a bleached cow's skull, stuck upon a short stick and between them are plantations of coffee, bastard saffron, and the graceful kat.'

Bent (1896) made the observation that all the surrounding hills (in a valley near Yeha) had been terraced for cultivation and present much the same appearance as the hills in Greece and Asia Minor which have been neglected for centuries; 'but nowhere in Greece or Asia Minor have I ever seen such an enormous extent of terraced mountains as in this Abyssinian valley. Hundreds and thousands of acres must have been under the most careful cultivation, right up almost to the tops of the mountains.'

Pankhurst (1964) mentioned that the Ethiopian peasant appears to work fairly hard. Political disturbances and wars however often militated against successful cultivation and reduced the incentive to produce. Another difficulty was the system of land tenure and taxation; the peasant was reluctant to increase produce since he was afraid that any surplus would go to the landlord or the government.

Wylde (1901) was equally impressed by Ethiopian farming. Of a village in Yeju in Wag he exclaimed, that it 'produced everything that man wants in this world, tobacco of excellent quality, bananas, oranges, cotton, sugarcane, potatoes, vegetables of all sorts, red peppers, onions, garlic, wheat, barley, Indian corn, dhurra, tef and other grains, beans, peas, shipti, plant for soap, plenty of milk and butter, oxen,

sheep, chickens and everything in abundance, and at absurdly cheap prices, also the most delicious white honey for which the district is famed.'

According to him 'the date of the harvest depends on what part of the country one is in, and its altitude above the sea. Considering some of the cultivated plateaux are not more than 3000 feet above the sea, naturally the crops ripen a great deal sooner than they do on those plateaux that have an altitude of 10,000 feet, and in some parts of the country a little more than a day's journey will take one from autumn back to summer, spring and winter, and from tropical to sub-tropical and European climate, according to height. The crops of wheat, barley, dhurra, maize, tef, dagusa, beans of all sorts, peas of many different kinds, grain, lentils, linseed, and other oil seeds, which form the chief crops grown, begin to get ripe at the end of September, and the first harvest is over by the end of November or early December. The barley amongst the grains is the first to ripen, followed by the dhurra and wheat; the moment these fields have been cleared, and the undergrowth has been fed down by the cattle, they are broken up and a pea, grain, or bean crop grown, which is very often ready to harvest before some of the other crops are ripe. So fertile is the ground that another crop will be sown after these, and if there are good winter rains, will be ripe by the end of March or the commencement of April, making three crops off some fields in the twelve months. It is only in part of April, May, and the commencement of June, that the country looks at its worst, and as if it were burnt up, barren land.'

Irrigation was fairly widely practised in many areas of the country. Travellers of the 19th and 20th Century left descriptions of the use of irrigation in the north (Tigre and Semen), the country of the Yeju Gallas and Shoa, the Aussa region of the east, around Lake Aramaya, and among the Konso of the south (Pankhurst, 1964). 'The amount of labour expended on the system is often very great', said Wylde (1901), 'and one cannot help admiring the natives for their ingenuity and the hard work that has to be done every year to keep the small water courses in order.'

The burning of roots and weeds on cultivated land prior to renewed cultivation has also been described by Wylde. 'If the cultivators think that the richness of the soil is exhausted, blocks of earth are dug up and stacked in a heap or used to make a wall round the fields . . . These stocks of soil are full of the roots of former crops, couch grass and weeds; other weeds and dried vegetation are collected and stacked with them and allowed to remain till the harvest is finished, when they are burnt; and with the purifying heat of the sun and the vegetable ash, the soil becomes sweet and good and regains its fertility, and is again spread over the fields before the next crop is planted. Where these crops have been can always be seen by a richer growth of crop.'

In the 20th Century, Ethiopian agriculture is judged more critically. Lipsky (1962) called it primitive, though above African standards and well-adapted to local needs. He considered the production surprisingly high in quantity, but low in quality.

In the eyes of Bunting (1963), in the management of crops and soils, farming in Ethiopia is more advanced than any other indigenous system in tropical Africa; further progress will largely depend on the application of the methods and results

of agricultural science.

Many experts familiar with Ethiopian farming agree that the country could become a major food exporter (e.g. Omero Sabatini & Samuel, 1969), but others are less optimistic; so are many modern, well-trained Ethiopians. 'The Ethiopian farmer of today', say Assefa Bequele & Eshetu Chole (1969), 'pursues farming practices which are very much in the biblical tradition of his forefathers. Moreover, he operates on fragmented pieces of land, which are economically inappropriate for productive farming. More seriously, however, he is subjected to a system of land tenure which has catastrophic results on production and which is the breeding ground for many social and economic ills.'

6.2 Ethiopia as a gene centre of cultivated plants

Independent gene centres of cultivated plants are mostly centres of human civilization as well (Vavilov, 1928). The expedition headed by Vavilov in 1927 to Ethiopia, Eritrea and Somalia, and the subsequent study of the collected material, led to the conclusion, that Ethiopia (including the hill country of Eritrea) is an independent centre of origin of cultivated plants (Vavilov, 1951). The question whether there is or is not identity between centre of origin (primary centre) and centre of diversity (secondary centre) cannot be answered without entering into ethnological problems concerning the beginning of agriculture and its propagation over the old world (Schiemann, 1951). Centres of diversity are characterized by the appearance of an abundance of recessive forms of certain cultivated plants, its specific geographic position as a naturally isolated area, and the absence of wild forms of the cultivated species (Schiemann, 1939). It will be the richer in endemics the more it is isolated from human traffic. In this way Ethiopia became a centre of diversity for two- and six-rowed barleys as well as for the tetraploid naked wheats (Schiemann, 1951).

The mountain parts of Ethiopia have become a breeding ground for landraces of cereals, pulses and other plants. In addition they are characterized by endemic cultivated plants such as t'ef *(Eragrostis tef)* and ensat *(Ensete ventricosum)*, both derived from wild ancestors for which Ethiopia is a centre of origin (Vavilov, 1957). The same is true for niger seed *(Guizotia abyssinica)*, ch'at *(Catha edulis)* and, as mentioned by Sylvain (1958), for coffee *(Coffea arabica)*. Harlan (1969) also includes buckthorn *(Rhamnus prinoides)* and kosso *(Hagenia abyssinica)*, but the latter, used as a vermifuge, grows only in the wild. Nicholson (1960) suggested, on the basis of the available botanical and historical evidence, that *Gossypium herbaceum* var. *acerifolium* is indigenous to Ethiopia.

Actually the number of cultivated plants indigenous to Ethiopia is not large: the country is primarily a land of field crops, but these show a great diversity of cultivars. The diversity expresses itself under ecological conditions which are rather uniform, since the area of cultivation is concentrated in the woyna daga zone between 1600—2400 m (Vavilov, 1951).

The history of Ethiopian agriculture is closely linked with its past civilizations, but

Photograph 30. Field with t'ef (*Eragrostis tef*), Tigre.

as little archaeologic records are available, the economic prehistory of Ethiopia is highly speculative (Simoons, 1965). According to Murdock (1959), at some time before 3000 B.C., Negroid people penetrated the plateau from the west bringing with them agriculture of the 'Sudanic type' (sorghum, cowpea, yam, Galla potato, okra, sesame). They absorbed the indigenous Bushmanoid inhabitants of the western part of the plateau and made inroads among the Caucasoid Cushites farther to the east. These Cushites stood their ground by absorbing agriculture from the more advanced Negroes. Later on, the highland Cushites differentiated into various groups, of which the most interesting are the Sidamo peoples of south-west Ethiopia and the Agau, who once occupied most of the central and northern part of the Ethiopian Plateau. The Agau were absorbed or driven out by Sabaean Semitic immigrants who came from southern Arabia in waves starting around 1000 B.C., and who brought with them certain

Photograph 31. Hut with ensat *(Ensete ventricosum)*, Sidamo.

Photograph 32. Arabica coffee in flower, Kefa.

types of wheat and other south-west Asian crops.

About the Agau as yet little is known, which is most regrettable since 'all indications point to the Agau as one of the culturally most creative peoples on the entire continent' (Murdock, 1959). They produced the durra type of sorghum, and Damon (1962) even supposed that Ethiopia was the place of origin of all sorghums as cultivated crops. Bunting (1963) thought that sorghum came from the plains of the Sudan and Uganda, but Doggett (1970) supported the view that it was developed from the wild sorghum of Africa by disruptive selection in the Ethiopian area.

According to Murdock (1959), the Agau experimented so much with wild plants that the Central Highlands of Ethiopia ranks, with China and India, among the world's most important minor centres of origin. Murdock listed: finger millet

Photograph 33. Goose neck sorghum, Hararge.

(Eleusine coracana), t'ef *(Eragrostis tef)*, ensat *(Ensete ventricosum)*, garden cress *(Lepidium sativum)*, coffee *(Coffea arabica)*, fenugreek *(Trigonella foenum-graecum)*, ch'at *(Catha edulis)*, vegetable mustard *(Brassica carinata)*, castor *(Ricinus communis)*, niger seed *(Guizotia abyssinica)*, safflower *(Carthamus tinctorius)*, but some of them are rather doubtful. The Agau were in contact with pharaonic Egypt, and this certainly led to the introduction of some crops in the highlands, such as some barleys, some wheats, horse bean, chickpea, lentil, lupin, pea, onion, pomegranate, black cumin, anise, coriander, dill, fennel and linseed.

Interesting is the assumption of certain writers (e.g. Stiehler, 1948) that the cereal-plough culture with barley and wheat was introduced by the Semitic invaders. For several reasons Simoons (1965) suggested a cereal-plough culture involving the

Photograph 34. Sorghum with a loose panicle, Hararge.

cultivation of barley, hard wheat and t'ef in pre-Semitic times, and he accentuated early contacts by trade with Egypt.

According to Clark (1962), the archaeological record as yet provides no confirmation that an independent centre for cereal crop domestication has existed in Ethiopia, but this might be because prehistorically still much of this region is unknown. In addition, the present distribution of various food plants used in sub-Saharan Africa points to local experimentation and subsequent adaptation following the transfer of cereal cultivation from across the desert.

On the Ethiopian high plateau, wheat and barley are the most important crops, but they have not widely spread, perhaps because for the tropical savanna region they are unsuitable without irrigation. Clark (1962) suggested the transfer of barley and wheat by C-group immigrants from Nubia. For these people, Arkell (1961) found evidence of southward movements from Lower Nubia, perhaps near the beginning of the third millenium B.C., either as a result of the military occupation of Nubia by the Egyptian pharaohs of the 11th Dynasty, or because of the gradual desiccation of their country.

According to De Wet & Huckabay (1967), plant domestication may have been introduced from the Near East into Ethiopia, and from there it may have spread to west and south Africa. Equally intriguing is the origin of ensat, which, as suggested

Table 1. Species connected with Ethiopia as a primary or secondary gene centre according to Vavilov (1951).

Primary gene centre:	
t'ef *(Eragrostis tef)*	ch'at *(Catha edulis)*
niger seed *(Guizotia abyssinica)*	coffee *(Coffea arabica)*
garden cress *(Lepidium sativum)*	ensat *(Ensete ventricosum)*
buckthorn *(Rhamnus prinoides)*	
Secondary gene centre:	
Abyssinian hard wheat *(Triticum durum)*	cowpea (*Vigna unguiculata* cv.-group Unguiculata)
poulard wheat *(Triticum turgidum)*	catjang (*Vigna unguiculata* cv.-group Biflora)
emmer *(Triticum dicoccum)*	hyacinth bean *(Dolichos lablab)*
Polish wheat *(Triticum polonicum* var. *abyssinicum)*	lupin (*Lupinus albus* cv.-group Albus)
barley *(Hordeum vulgare)*	linseed *(Linum usitatissimum)*
grain sorghum (*Sorghum bicolor* and others)	safflower *(Carthamus tinctorius)*
finger millet *(Eleusine coracana)*	sesame *(Sesamum indicum)*
pearl millet *(Pennisetum typhoides)*	castor bean *(Ricinus communis)*
chickpea *(Cicer arietinum)*	coriander *(Coriandrum sativum)*
lentil *(Lens culinaris)*	black cumin *(Nigella sativa)*
pea *(Pisum sativum)*	Ethiopian caraway *(Trachyspermum copticum)*
horse bean *(Vicia faba)*	onion *(Allium* spp.)
fenugreek *(Trigonella foenum-graecum)*	okra *(Hibiscus esculentus)*
grasspea *(Lathyrus sativus)*	

Gossypium herbaceum var. *acerifolium* was not listed by Vavilov.

by Stiehler (1948), is probably connected with the aboriginal Negritic or Pygmean population of south Ethiopia; these peoples are older than the Cushites.

According to Vavilov (1951), the following species in Table 1 are connected with Ethiopia as a gene centre (primary or secondary) of cultivated plants.

6.3 Ensat-hoe complex versus grain-plough complex

According to Simmonds (1958), present Ethiopian agriculture is based on three economies: the ensat-planting economy, the nomadic cattle herding economy, and the Amharic-Tigraean plough-and-seed economy. Here only the first and the last will be treated.

The cultivation of ensat *(Ensete ventricosum)*, in the south-western highland zone between 1600 and about 3000 m, has to be classified among the tropical African hoe cultures, unlike the plough farming in the northern Ethiopian Highlands. In the hoe culture, the use of the hoe (or comparable tools) as the main implement is not as typical as vegetative propagation (Smeds, 1955).

Its origin is uncertain. Stiehler (1948) supposed that ensat cultivation is connected with the Negritic or Pygmean populations who, long ago, inhabited the southern Ethiopian plateau. Simoons (1965) rejected this idea because the presence of Pygmies in ancient Ethiopia is questionable: Caucasoids controlled the area from the eastern Sudan to the former British East Africa from late Pleistocene into the Neolithic, suggesting the Negro tribes to be later arrivals. Neither the present Negroes of south Ethiopia, nor those of the northern part cultivate ensat. He concluded that various Cushitic groups are candidates, among which the Sidama-people are the most likely.

Indeed, ensat is widespread among the Cushitic speaking people in the south-western part of the country. Stanley (1966), however, thought it unlikely that these people were the first to cultivate ensat, since they are not the most ancient inhabitants of south Ethiopia, and because their traditions do not satisfactorily explain the use of this plant.

The results of the German Frobenius expeditions to Ethiopia seem to point to a more ancient group of people first cultivating ensat. According to Stanley (1966), they may be traced back to Neolithic times or even earlier. Their survivors may be found in the Bako Highlands (Gamu Gofa) and the Gimirra and Maji areas (Kefa). The situation is very complicated, however, since traits of different cultures are found side by side, and linguistic and cultural subdivisions do not coincide (Jensen et al., 1959). Jensen supposed that the cultivation of tuber crops is connected with a stratum older than the Nilotic and belongs to the Negritic 'Kulturkreis'. The Nilotic stratum spread through the African steppe area and mixed with the Negritic. Over these two strata came at least two waves of Cushitic speaking people.

Straube (1963), too, did not agree with a Cushitic origin of ensat. He distinguished four strata:

(1) The stratum of primitive tuber cultivators, the oldest. Traits of this Negritic culture can be found among the ancient people of the Gimirra type and the Ari

tribes of the Bako Highlands. It looks as if, long ago, this stratum occupied a large part of the south Ethiopian Highlands. Important cultivated plants are ensat, taro and yam.

(2) The Nilotic stratum with intensive cultivation of several cereals (sorghum, millet) and the cattle-raising complex. It led to the 'Sudanic' type of agriculture in the highlands of Ethiopia. This stratum is probably not only important for south Ethiopia, as it also seems to be the cultural basis of the highland in the north.

(3) A stratum connected with representatives of Cushitic tongues which arrived in at least two waves from the north.

(4) The youngest stratum, connected with the Amharic-Christian colonization during the Middle Ages.

Nowhere else in Africa but in south-west Ethiopia is ensat grown (Murdock, 1960). In addition, this region (according to Shack, 1963) shows various culture traits connected with ensat cultivation (the so-called ensat culture complex area).

In the north the Semitic or Cushitic Ethiopians prefer cereals, pulses and oil crops and neglect tuber crops, vegetables and fruits. The plough is associated with this type of agriculture. Its origin is not clear. Some, like Stiehler (1948), supposed that it was introduced by Semitic invaders, starting immigration in several waves from Yemen about 1000 B.C. Stiehler himself suggested that the Cushites transformed their digging stick into a plough under the influence of the Semitic colonization. This seems to be an easy technical solution, since the south Arabian plough is actually a drawn digging stick as it does not turn the soil but solely breaks it to a depth of about 10 cm (Lipsky, 1962).

Simoons (1965), referring to linguistic evidence collected by Cohen, remarked that the word for plough was used among the Cushites before the Semitic invasions, and that it was taken over by the Ge'ez speaking Semites. So he assumed that the cereal-plough culture predates the Semitic colonization and that the Cushites have taken over the plough somewhere near the north end of the Red Sea. It is quite possible that contacts existed between northern highland Ethiopia and Pharaonic Egypt, directly or via other people.

Stiehler (1948) stressed the difference in the type of settlement between the two cultures. The ensat planting culture has patches of agricultural land near dispersed homesteads, each with its own plot of ensat, coffee, cabbage, tuber crops and condiments, whereas in the northern Ethiopian Highlands distinct villages are found. This difference can be traced back to the bipartition of the Ethiopian ancient hoe culture. The village type of settlement developed in the cereal-hoe culture before the development of the Ethiopian plough culture. The settlement of clusters of dispersed homesteads was connected with the ensat-hoe culture. The village and the dispersed homestead in the Ethiopian Highlands are of the same age from the point of view of historical development.

Levine (1966), however, rejected the idea of a nucleated village as an ecological unit in Amhara society; so did Jackson et al. (1969).

The altitudinal zonal distribution of settlement patterns in south-west Ethiopia

runs parallel with that of the cultivated plants. In the sorghum/maize zone of the k'olla (up to about 1600 m), the village type of settlement is found; in the ensat zone of the woyna daga (1600/1800—3000 m) dispersed homesteads appear. The regional distributions of ensat and dispersed homesteads do not coincide, however: the latter penetrate into the cereal-plough agriculture area (Stiehler, 1948).

All village-type settlements of the highlands are in the cereal area, but not the opposite: on the Ethiopian Highlands a zone can be distinguished in which the cereal-plough agriculture is connected with a pattern of dispersed homesteads. Its presence between the dispersed homesteads of the ensat zone in the south-west, and the cereal-plough village-zone in the north may be because of a move in the distribution limits of certain cultivated plants, the expansion of cereal-plough cultivation at the expense of ensat-hoe cultivation (Stiehler, 1948).

6.4 Agro-ecological regions and the altitudinal range of some crops

The main agro-ecological regions of the country, based mainly on Bunting (1963), are the following.

(1) *Central part of the Ethiopian Highlands* It includes Shoa, Gojam, and also south-west Wollo, south Begemdir and eastern Wellega. Soils are mainly Alfisols, Vertisols and Inceptisols, the altitude ranges between 1800—3000 m, and the average annual rainfall varies between 950 mm and 1500 mm. It is a region of highly developed mixed agriculture where a simple plough and rotations including fallows and annual legumes are applied, often with contoured or even terraced fields. Broad valleys are used for dry season cropping and grazing. The main crops are t'ef *(Eragrostis tef)*, barley *(Hordeum vulgare)*, wheat (*Triticum* spp.), sorghum (*Sorghum bicolor* and other spp.), finger millet *(Eleusine coracana)*, niger seed *(Guizotia abyssinica)*, safflower *(Carthamus tinctorius)*, linseed *(Linum usitatissimum)*, chickpea *(Cicer arietinum)*, lentil *(Lens culinaris)*, pea *(Pisum sativum)*, horse bean *(Vicia faba)*, grasspea *(Lathyrus sativus)*. Many herds of cattle, sheep and goats are kept, which graze on fallow or valley land and consume part of the agricultural residues.

(2) *Lake Tana region* It lies partly in Begemdir south of the escarpment and partly in Gojam. Much of the area is at high altitude (above 1500 m) and receives 950—1500 mm rainfall annually. It is in some ways similar to the central part of the Ethiopian Highlands, but it contains also the great plains around the lake with Entisols and Vertisols, which are suitable for both plant and animal production.

(3) *Northern part of the Ethiopian Highlands* This is a highly dissected country in Eritrea and Tigre with less rainfall (450—950 mm annually) than in the central part of the Ethiopian Highlands, and with mostly less productive soils derived from basement complex rocks and sandstones. Wheat, barley, t'ef, sorghum and oilseeds, including groundnut *(Arachis hypogaea)*, are grown, but there is also considerable production of fruit and cotton (*Gossypium* spp.), and of meat and milk, and of cattle, sheep and goats.

(4) *South-western part of the Ethiopian Highlands* This region is situated at 1500—

2400 m altitude in Wellega, Illubabor and Kefa. It is a high rainfall area (1500 mm—over 2000 mm without a real dry season), with Oxisols, Ultisols and Vertisols. Many crops are produced, including some of those grown in the central part of the Ethiopian Highlands, and in addition maize *(Zea mays)*, ensat *(Ensete ventricosum)*, yams (*Dioscorea abyssinica* and other spp.), taro *(Colocasia esculenta)*, and especially coffee *(Coffea arabica)*.

(5) *South-eastern part of the Ethiopian Highlands* Included in this region are south-west Shoa, west Sidamo and Gamu Gofa at altitudes of 1800 m and higher, with mainly Alfisols, and with 950—1500 mm average annual rainfall. Many crops are produced most important of which is ensat. Other tuber crops like yam, taro, Galla potato *(Coleus edulis)*, anchote *(Coccinia abyssinica)*, and potato *(Solanum tuberosum)* are also cultivated, and of the cereals barley is widely grown followed by wheat and t'ef. In the southern part terraces are no uncommon feature.

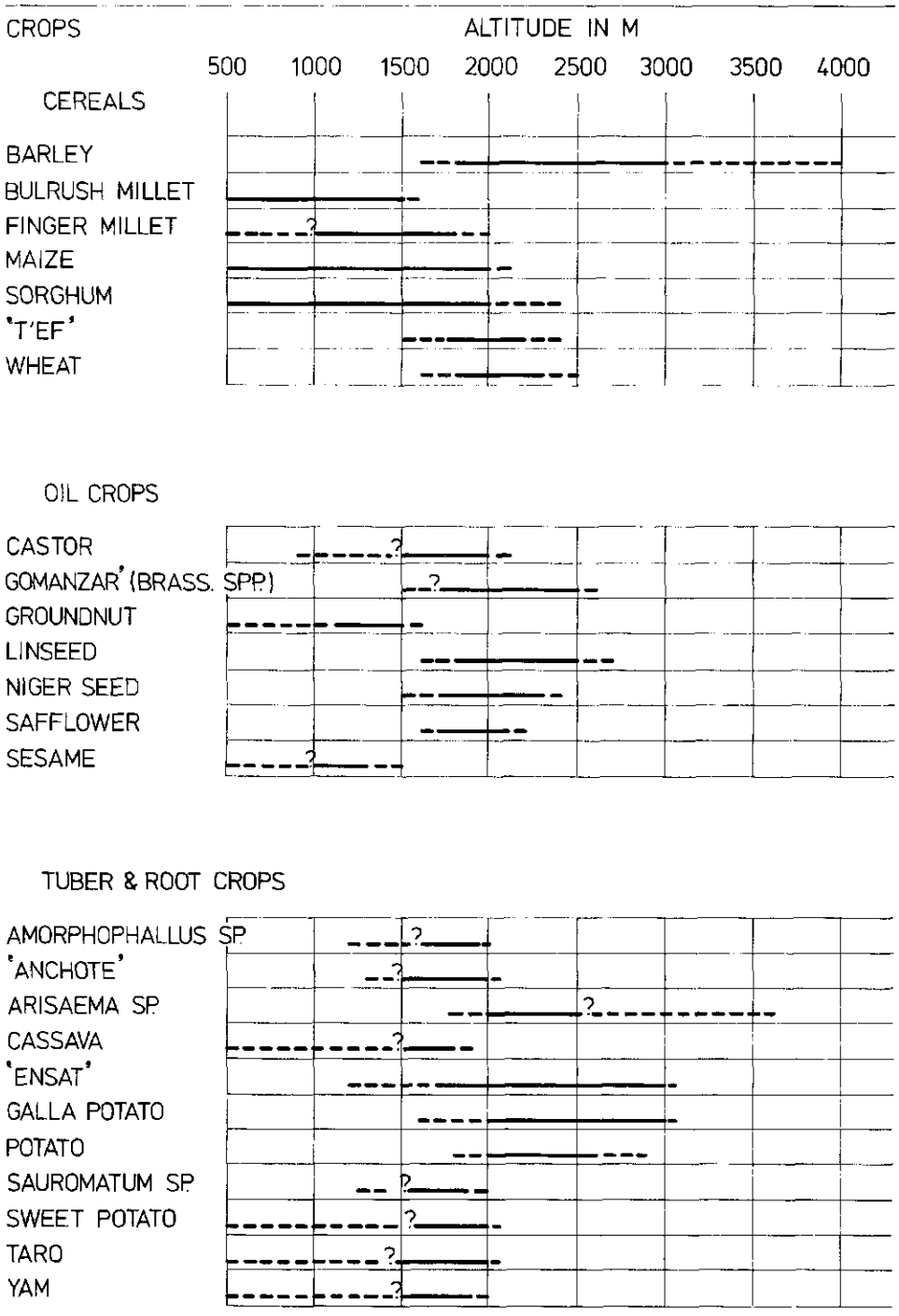
(6) *Eastern Highlands* This area is situated in Sidamo, Bale, Arussi and Hararge at ca 1800 m and higher. Soils are mainly Alfisols and Inceptisols; average rainfall is between 950—1500 mm and in some areas as high as 1800 mm. In high Sidamo pastures are found up to 3000 m, together with barley and ensat. This region is particularly important for animal production. In Arussi and Bale wheat and barley are the prominent cereals (between 2000—3000 m), whereas in east Arussi and Hararge coffee and ch'at *(Catha edulis)* are prominent up to ca 2000 m together with sorghum, maize and beans *(Phaseolus vulgaris)*, and with wheat and barley at higher elevations. Along the western escarpment, in Sidamo, ensat is cultivated together with coffee (the latter up to ca 2000 m).

(7) *Southern Riftvalley and lake region* This region includes parts of Shoa, Arussi, Sidamo and Gamu Gofa and continues as far south as Lake Chamo; it lies above 1200 m. South of Shashamane rainfall is often high (up to ca 1600 mm annually) but the distribution is unreliable since this area is on the boundary between the regions of rainfall maxima during the periods of March—May and September—November, and during March—May and June—August. The Riftvalley north of Lake Shala and south of Lake Abaya receives less rainfall and has higher temperatures. The predominant soils are Inceptisols and Mollisols. Of special interest is the coffee producing area of Yirga Alem—Wondo—Dila—Yirga Chaffe, which party lies in the Riftvalley itself and partly on the escarpment of the Eastern Highlands. Other crops grown are ensat and maize.

(8) *Borana region* The high Sidamo area slopes down to the south into the Borana region with parts situated below ca 900 m. Rainfall varies from 450—900 mm annually. It is the region of the cattle rearing Borana.

(9) *Middle and lower Awash region* This region is situated in the rift country of Shoa, Hararge and Wollo between Nazret and beyond Tendaho, at altitudes from 1500 m to 500 m. Soils are mainly Aridisols, rainfall is uncertain and low, and evaporation rates are high. Cropping depends on irrigation from the Awash river and its tributaries. The chief crops are cotton, sugarcane *(Saccharum officinarum)* and sorghum. There are considerable areas of swamp and upland which are grazed seasonally by the herds

Table 2. Altitudinal range of some crops.



of nomadic graziers.

(10) *Ogaden region* For the greater part this area is below ca 600 m in a country too dry for crop production, although the soils are potentially fertile. Irrigation might be developed by making use of the rivers running into the Ogaden: in fact some irrigation schemes have been carried out like the Godere scheme. At present the Ogaden is a region of nomadic graziers.

(11) *Western Lowlands* Plains are found at the foot of the western escarpment and foothills of the Ethiopian Highlands below ca 1000 m, which gradually slope into the Sudanese plains. Temperatures are high and average annual rainfall varies from ca 1200 mm at Gambela to less than 150 mm in north Eritrea. Agriculture with or without irrigation is performed. Between the Setit and Angereb in north-west Begemdir, for instance, with an annual rainfall between 500—700 mm, rain-fed crops like cotton, sesame *(Sesamum indicum)* and sorghum are grown (Kline et al., 1969). The Baro river plain in Illubabor is potentially a very important area for agricultural production.

For the altitudinal range of some crops see Table 2.

6.5 Systems of agriculture

In Ethiopia, four agricultural systems can be distinguished: the seed-farming complex, the ensat-planting complex, shifting cultivation, and the pastoral complex. Though, due to many transitions and a great diversity within each of those systems, their borderlines are not always clear, they form the base for the following considerations (see also Westphal, 1974).

6.5.1 The seed-farming complex

Characteristic is the reproduction of nearly all crops by seed (mainly cereals, pulses and oil crops), whereas tuber crops are much less important. This complex is found in the Ethiopian Highlands (in particular in its central and northern parts), in the Eastern Highlands, and in the Konso and adjacent regions. As a rule this type of agriculture is practised by people with a Semitic or Eastern-Cushitic language.

Grain cultivation in ensat regions will be treated under the ensat-planting complex (6.5.2), grain cultivated by shifting cultivators and pastoralists in the lowlands will be discussed under shifting cultivation (6.5.3) and the pastoral complex (6.5.4), respectively.

For the occurrence of crops in the seed-farming complex see Table 3.

For yields of some crops see Appendix I.

6.5.1.1 The grain-plough complex of the central and northern Ethiopian Highlands

Striking in the grain-plough complex is the near-absence of fruit trees, green vegetables and tuber crops: emphasis is on seed production and broadcast sowing, whereas

Table 2. *(continued)*

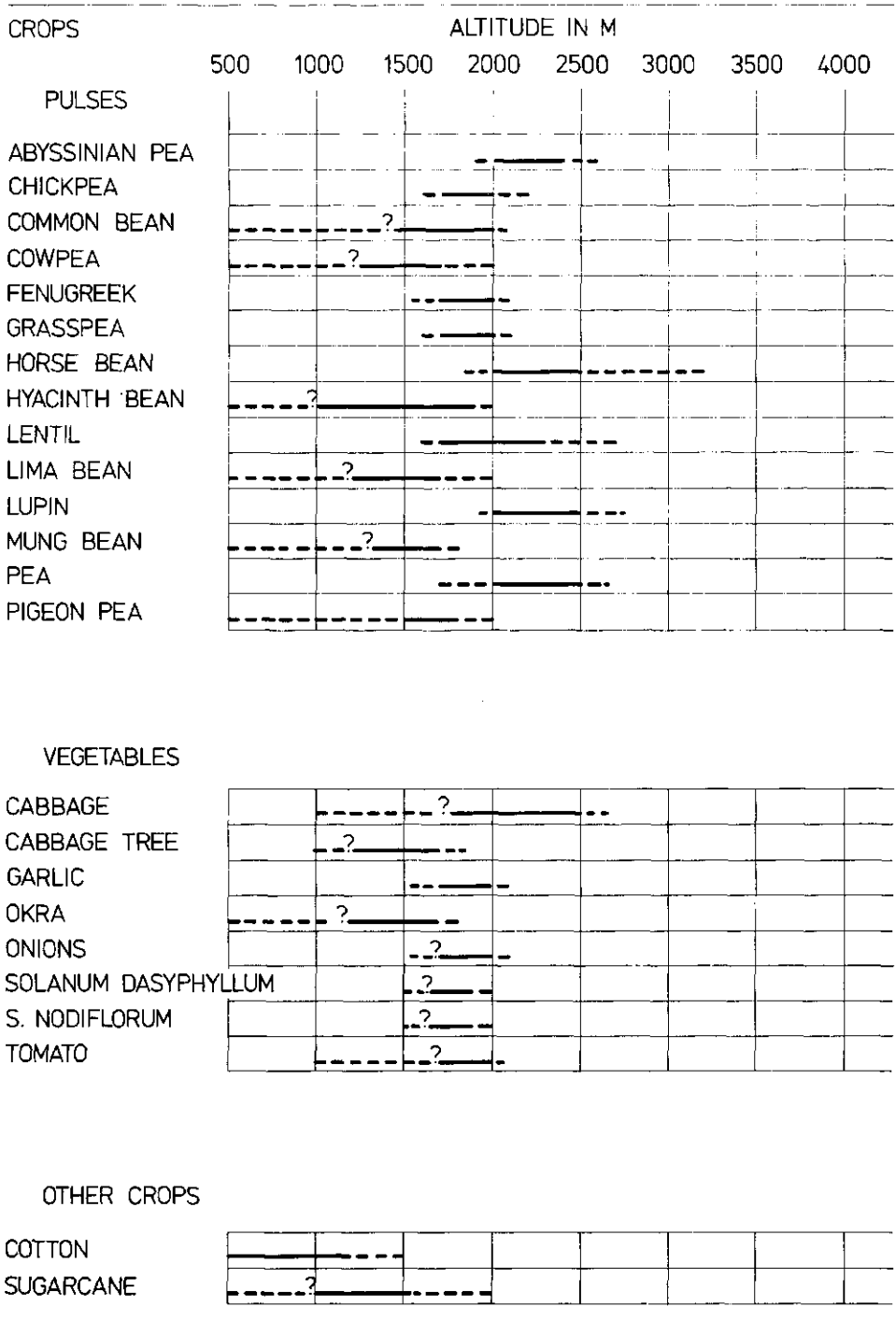


Table 2. *(continued)*

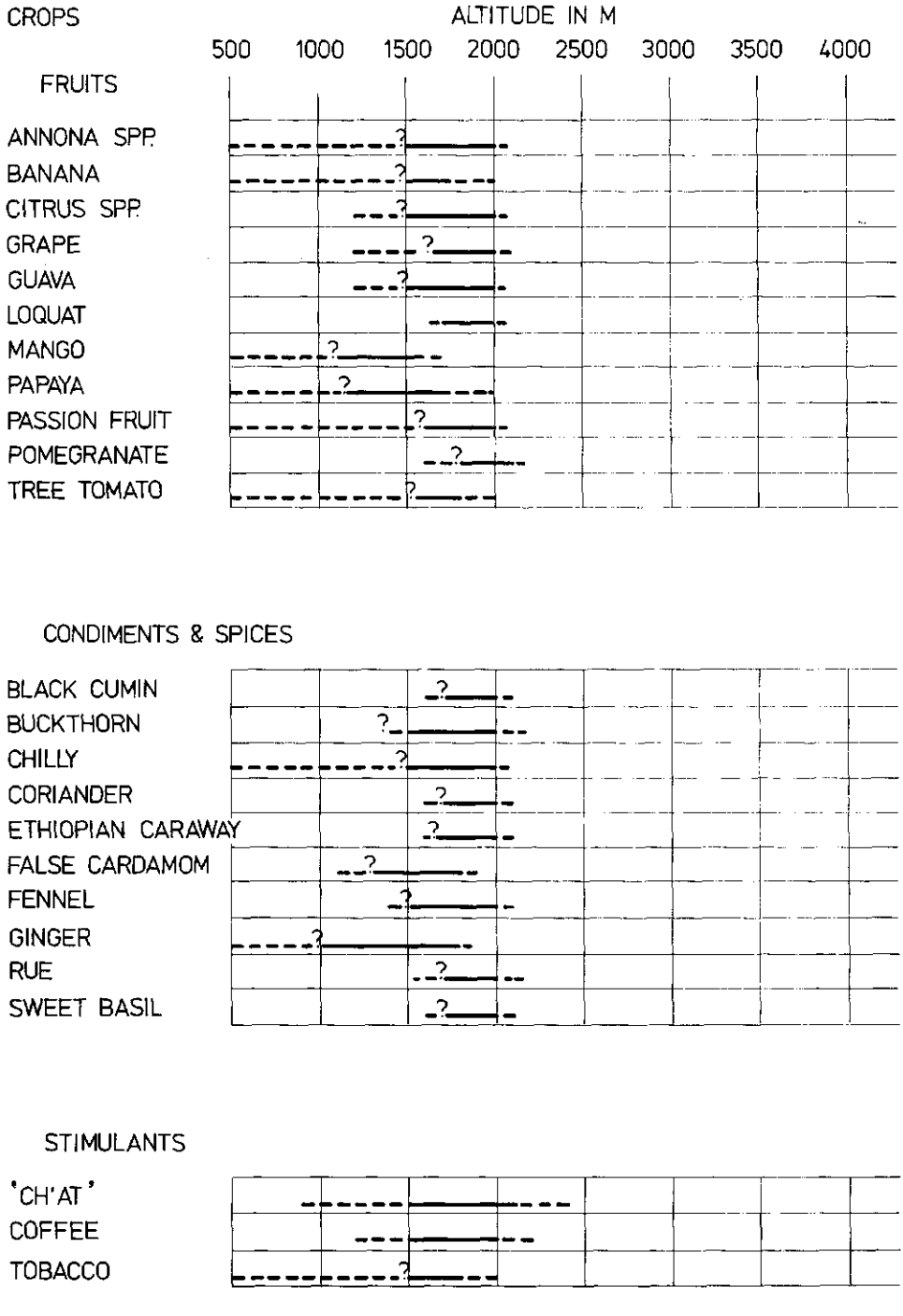


Table 3. Crops in the seed-farming complex (see 6.5.1)[1].

Cereals	Oil crops	Tuber crops	Pulses	Vegetables	Fruits	Condiments and spices	Stimulants	Other crops
Grain-plough complex of the central and northern Ethiopian Highlands excl. Wellega (see 6.5.1.1)								
t'ef+	niger seed+	potato°	horse bean+	cabbage+	lime°	*Capsicum* pepper+	coffee° (Eritrea, Tana area)	cotton°
wheat+	linseed+	Galla potato° (Gojam, W.-Shoa)	pea+	onions°	orange°	sweet basil+	ch'at°	sugarcane°
barley+	*Brassica*+	sweet potato	chickpea+	garlic°	grape° (Guder)	buckthorn°	tobacco	grain amaranth
sorghum+	safflower°	ensat (W.-Shoa)	lentil+	tomato°	peach°	coriander°		
maize°	sesame°	taro	grasspea+	pumpkin°	guava°	rue°		
finger millet°	castor°		fenugreek+		banana	thyme°		
	groundnut° (Eritrea)		lupin° (Gojam)		papaya	garden cress°		
	sunflower		common bean°		lemon	fennel		
			Abyssinian pea°		citron			
			hyacinth bean		loquat			
					passion fruit			
					mango			
Grain-plough complex in Wellega (see 6.5.1.1)								
barley+	niger seed+	anchote+ (*Cucurbitaceae*)	common bean°	cabbage+	papaya°	*Capsicum* pepper+	coffee+	sugarcane
t'ef+	castor°	ensat°	pea°	pumpkin°	banana°	buckthorn°	ch'at°	lemon grass
sorghum+	*Brassica*°	Galla potato°	fenugreek°	tomato°	peach°	sweet basil°	tobacco°	
maize°	sunflower	taro°	hyacinth bean°	onions°	citron°	rue°		
wheat°		yam°	horse bean°	garlic°	lemon°	coriander°		
		potato°	chickpea°		mandarin°			
		sweet potato°	velvet bean		lime°			
					orange°			
					grape°			
					passion fruit°			
					guava			
					pine apple			

Table 3 *(continued)*

Cereals	Oil crops	Tuber crops	Pulses	Vegetables	Fruits	Condiments and spices	Stimulants	Other crops
Barley-hoe complex in connection with pastoralism of the Galla (see 6.5.1.2)								
barley+				cabbage°				
Grain-plough complex of Arussi and Bale (see 6.5.1.3)								
barley+ wheat+ t'ef+ sorghum° maize°	linseed+ *Brassica*° castor° sunflower° safflower°	sweet potato° potato°	horse bean° pea° lentil° grasspea° chickpea° Abyssinian pea° common bean	cabbage° onions° garlic° pumpkin°	passion fruit	*Capsicum* pepper° buckthorn° sweet basil° rue°	coffee° tobacco°	sugarcane°
Sorghum-plough complex of the highland of Hararge (see 6.5.1.4)								
sorghum+ maize+ barley÷ wheat° t'ef° bulrush millet° finger millet	*Brassica*° safflower° castor° groundnut° sesame° sunflower	sweet potato+ potato° cassava	common bean+ horse bean+ pea+ chickpea° grasspea° cowpea° fenugreek° lima bean° pigeon pea lentil Abyssinian pea	pumpkin+ cabbage° onions° garlic° tomato° okra° aubergine° haricot bean	banana° passion fruit° Italian apple° orange° lime° lemon° sour orange *Annona*° guava° mango° peach° pomegranate° loquat° grape°	*Capsicum* pepper+ fennel° coriander° sweet basil° rue° buckthorn° rosemary black cumin Ethiopian caraway	coffee+ ch'at+ tobacco°	sugarcane° lemon grass°

Table 3 *(continued)*

Cereals	Oil crops	Tuber crops	Pulses	Vegetables	Fruits	Condiments and spices	Stimulants	Other crops
					papaya°			
					watermelon			
					avocado			
					mandarin			
Sorghum-hoe-terrace complex of the Konso cluster (see 6.5.1.5)								
sorghum+	linseed°	*Araceae*+	common bean+	cabbage	lime°	*Capsicum*	coffee°	cotton+
maize+	sunflower°	taro°	hyacinth	tree+	citron°	pepper°	tobacco°	
finger	castor°	yam°	bean+	*(Moringa)*	papaya°	sweet basil°	ch'at	–
millet°		sweet potato°	pigeon pea+	cabbage°	banana°			
wheat°		potato°	mung bean°	pumpkin°				
barley°			cowpea°	onions°				
t'ef°			chickpea°	tomato°				
			lentil°					
			horse bean°					
			pea°					

1. The occurrence of the crops is indicated as follows: frequent with +, infrequent with ° and rare without a mark.

putting seeds in holes is as a rule limited to certain garden plants. Many farmers in Begemdir and Simen even have no idea of vegetative reproduction (Simoons, 1960; for Gojam see Kuls, 1963).

For ploughing, the Ethiopians use the 'marasha', an implement that does not turn the soil but only breaks it so that the dry plant parts remain at its surface. With some slight variations, this marasha consists of a bent wooden beam, with a triangular piece of wood serving as a sledge on each side; in front of the beam is a yoke, its other end is slightly widened and has a vertical hole for the steering stick with a metal point that penetrates the soil (Huffnagel et al., 1961).

Contour ploughing is usual and done three to four times (the first time in the dry season) before an adequate seedbed is obtained. After broadcasting the seeds are ploughed in. In most places, crude wooden ploughs are used with a small iron point which crumbles the soil, resulting in a better rainfall absorption and reduction of the speed with which water may start to run off (Huffnagel et al., 1961). Important is that the plough furrow contributes to the prevention of erosion by forming pockets which catch and hold water during heavy rains (Hailu Mengesha & Lee, 1960). In some highland parts numerous stones protect the soil against excessive evaporation. As the top soil is not turned over, grass roots and crop residues remain on top of it and protect the soil against erosion. Pure plough farming, however, does not exist, since additional hoeing implements are used (Huffnagel et al.)

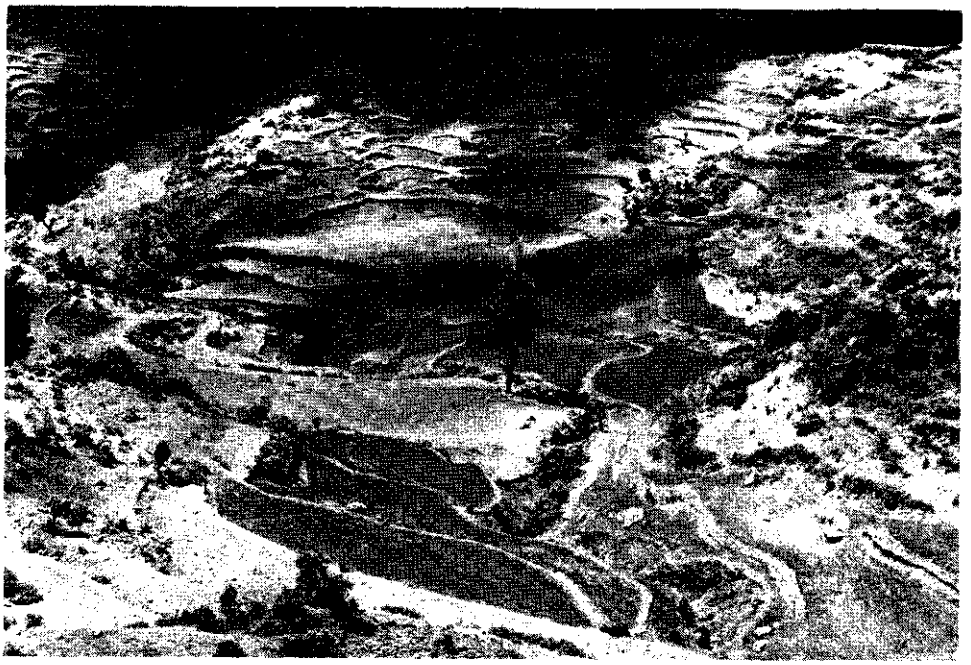
Arable-pasture rotation By far the largest part of the highland is covered with a dense sod or heavy growth of bunch grass. Volunteer grass may enter the rotation of crops as often as every third year. Often the sod survives the cropping period and extends again as soon as the land is left fallow. Many of the sod grasses are rhizomatous as well as stoloniferous. In general, erosion conditions are worse on grazing land than on crop land. There are indications that some farmers watch the natural succession of plants and await for the appearance of certain indicator plants before ploughing the land again. So, through the centuries a rotation of crops and sod grasses maintained the productivity of the land (Semple, 1945).

Livestock is kept throughout the year on natural pastures and stubble. Supplementary feeding of forage or grain is not unknown. An arable-pasture rotation is applied, except where local conditions prevent the growing of crops. The system of keeping land under stock is robbed of its full effectiveness, since the dung collected from fields and corrals is widely used as fuel (Huffnagel et al., 1961), so that the preservation of the soil productivity depends on grass.

Terracing and drainage Terracing is practised in parts of Tigre and in north-east Shoa. In south Tigre narrow terraces, often even less than one meter wide, are found on steep slopes; west of Adigrat they are very wide (Huffnagel et al., 1961). In north-east Shoa many slopes are inconspicuously terraced, both in the gorges and on the plateau (Buxton, 1949). According to Huffnagel et al., terracing is also frequent in parts of Gojam, but Kuls (1963) hardly found any there. There are no drainage-type terraces in this part of Ethiopia which, with an average annual rainfall between 950—1500 mm, creates a problem, especially since the rainfall is concentrated in a

Photograph 35. Ploughing in Tigre.

Photograph 36. The marasha, Tigre.



Photograph 37. Terraced fields with barley in April near Maichew, Tigre.

period of only about three months.

Drainage furrows are ploughed on probably 10—15% of the fields, usually at intervals of 3—7 m. They are 15—20 cm wide and deep (Huffnagel et al.).

Irrigation In several parts of the highlands irrigation is practised. In Tigre fields of barley, which comes as a second crop after the harvest in November—December of rain-fed t'ef, wheat or barley, are irrigated. Pulses, sometimes planted after the second barley harvest in February, are also irrigated and then harvested as late as April (Dove, 1890).

In Begemdir and Simen the irrigated plots are small and occur only along streams. The most intricate system of carefully dug irrigation ditches has been observed in an Agau village, where water is channelled by establishing diversion dams in irrigation ditches. Here, farmers supply irrigation water to their maize, barley, t'ef and chickpea fields by breaching the wall of the ditch, and when the field received enough water, they seal the wall again (Simoons, 1960).

In Wollo, irrigation is applied to some extent in the highland valleys and on the eastern slopes of the escarpment by diverting run-off water towards the fields (Murphy, 1968).

In Gojam, irrigation is not rare, but as a rule limited to plots of onions, chillies, tomato, Galla potato *(Coleus edulis)*, potatoes, etc. near the houses. In the Choke Mountains, irrigated onion plots are frequent in the valleys and on natural terraces; below ca 2000 m the same applies to chillies. Most irrigated fields serve the cultivation

of barley, a salient characteristic of the Injibara region (ca 2500 m) and Gimjabet in south Agaumedir, but also found in some parts of Damot. Around Gimjabet irrigation water is brought from small rivers, sometimes over several kilometers, through channels to the fields near the settlements and distributed through minor channels over barley fields (Kuls, 1963).

In north-east Shoa, irrigation is practised on the level shelves in the gorges. Along some rivers a more elaborate irrigation system has developed which provides water throughout the dry season. Its object is to ensure an early crop of barley, to be harvested before the main rains start in June. The system has to be partly rebuilt every dry season, as the dams, constructed of stones and earth, are swept away during the rains. Close to each dam, water is diverted into a furrow in which it flows in a direction opposite to that of the river. From this furrow, minor channels branch off which can be opened or blocked at will (Buxton, 1949).

Around Bako, in west Shoa, irrigated onion and maize fields occur in the dry season, whereas in every valley west of Nekemte in Wellega irrigated plots with maize and sorghum are found.

Cultivation practices including crop rotations The use of a rotational system of farming with a seasonal fallow of the land, and the inclusion of a legume crop are most probably responsible for the sustained though low yields. Soils are clayey or loamy in texture, being black or red, and rich in phosphorus and potassium. Situated in the woyna daga (1800—2400 m), they are suited for the production of grasses, legumes and small grains. But any deviation from the traditional rotation, fallow included, results in a large decrease in yield or even crop failure. This may indicate that the nutrients of these soils are in a very delicate state of balance, nitrogen being the most critical element (The Agriculture of Ethiopia, 1954). After centuries of cultivation they are generally still in good condition, indicating that the rotation systems and customary practices have been satisfactory (Omero Sabatini & Samuel, 1969).

According to Harrison et al. (1967), the conditions in the central Ethiopian Highlands are characterized by

- the soil type: soils are clayey, often with large cracks when dry, plastic and sticky when wet so that only crops tolerating some amount of waterlogging can be grown;
- the rainfall pattern: the small rains (March—April) are often not sufficient for planting, but if they are, the following dry period before the big rains (July—September) is too severe and too long so that it is necessary to wait until the big rains fall (during a period of about three months), though then the temperatures (at 2000—3000 m) are low;
- the interaction of soil type and rainfall pattern: the small rains release nitrogen originating from organic matter collected in the soil during the dry season, but it is lost by leaching before the crop is planted, so that at the start of the big rains little nitrogen is available, and nitrogen fertilization has little effect due to the reduced efficiency of soil organisms and crop roots in the waterlogged soil (Harrison et al., 1967).

Nevertheless, t'ef is the most important cereal in the central and northern Ethiopian Highlands (Purseglove, 1972). It thrives well during the short and cool rainy season as it tolerates waterlogging. If conditions are not extreme, barley and wheat are also suitable; highland sorghum can be grown if the rainy season is long enough (Harrison et al., 1967).

T'ef is an unique crop in the Ethiopian ley system. Agronomically it is more a ley grass than a grain crop, combining soil-restoring and fodder-producing properties of a ley grass with food production (Ruthenberg, 1971). This is, however, a bold assertion. After the harvest of t'ef the stubbles are grazed by cattle. At the end of the dry season they are ploughed under to prepare the seedbed for the next crop.

In *Begemdir* and *Simen* sowing may start already with the first rains early in April, but more often in May and June. Frequently another crop is sown in September to take advantage of the late rains. Usually one kind of seed is sown but sometimes the farmer mixes several kinds of seeds, or first sows one and then, after a few days, a second, or rarely even a third. The most common mixture is wheat and barley. Other mixtures include pea and horse bean; t'ef and garden cress *(Lepidium sativum)*; Egyptian lupin (*Lupinus albus* cv.-group Albus) and t'ef, linseed or barley; sorghum and finger millet *(Eleusine coracana)*; sorghum and chickpea; safflower and chickpea; safflower and t'ef; sorghum, sesame and common bean; maize and gourds. It is

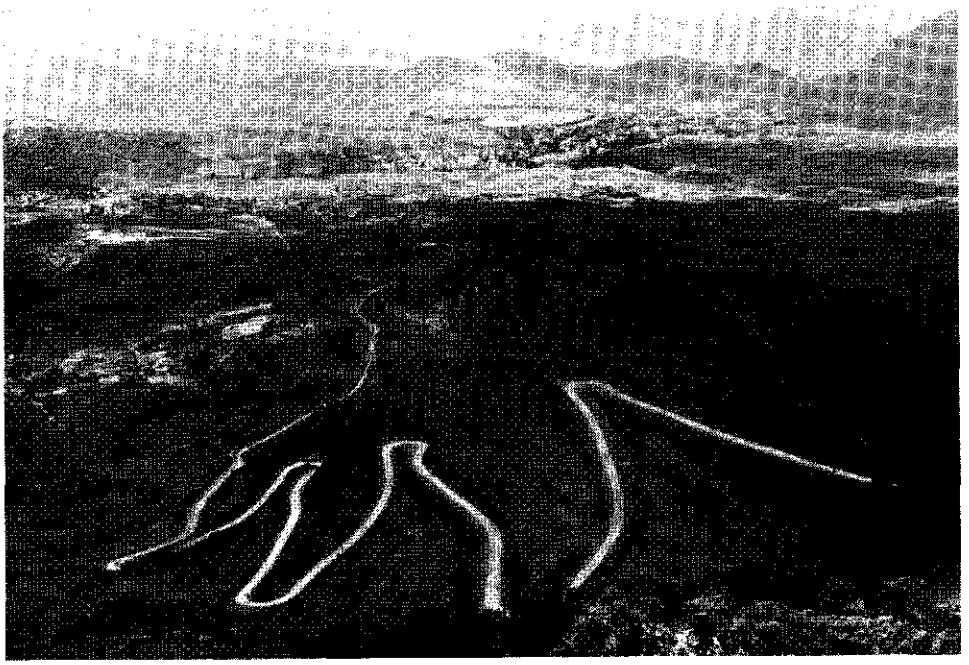
Photograph 38. Aerial view of huts, ploughed fields, and fields with probably young barley east of Gondar, Begemdir.

common practice to grow two successive crops on the same field in a year. Almost any crop may be used for the late crop, but emmer *(Triticum dicoccum)*, other wheat types, barley and lentil are commonly found in Simen (Simoons, 1960).

To control the growth of bushes, fields are burned after harvest, either every year or every few years. On black soils the rotation seldom includes a fallow period (Table 4:1); chickpea and niger seed are included to restore soil fertility. On red soils a field is fallowed every few years: a common rotation here gives Table 4:2. Fallowing comes no sooner than necessary and although farmers recognize the necessity of the fallow third year, they in fact cultivate a field every year until it is exhausted. Domestic animals graze the fallowed land. Harvesting time is the dry season for crops sown in March to May from September to February—March, for crops sown late in the rainy season the end of the dry season (Simoons, 1960).

After harvesting, the piled cereals and pulses are left to dry in the field for a few weeks, threshed there with oxen, and winnowed. In the meantime, the farmer selects large and healthy seeds for the next year, often many from one good-looking plant, or he may set aside a larger quantity from one selected field. This seed is kept indoors in small containers; the seed for consumption is stored outdoors in pits or in containers sheltered from rain by a roof, or also indoors. Losses due to insects are usually high (Simoons, 1960).

In *Tigre* and *Eritrea* yields are lower, due to less productive soils and a shorter



Photograph 39. Maichew surrounded by fields and mountains, Tigre.

Table 4. Crop rotations (second crops excluded).

Region	1st year	2nd year	3rd year	4th year	5th year	6th year
1 Begemdir/Simen	t'ef	t'ef	niger seed	t'ef	chickpea	t'ef
2 Begemdir/Simen	t'ef	finger millet	fallow or barley	pea	barley	pea
3 Gojam	barley	barley	barley	t'ef	fallow	fallow
4 Gojam	barley	t'ef	t'ef	niger seed	t'ef	linseed o niger see
5 Gojam	t'ef	t'ef	niger seed	t'ef or finger millet	fallow	fallow
6 Shoa	chickpea or grasspea	t'ef	t'ef	t'ef	t'ef	t'ef
7 Shoa	legume	white t'ef	brown t'ef	brown t'ef	brown t'ef	brown t'e
8 Shoa	legume	white t'ef	brown t'ef	brown t'ef	sorghum	pea or horse bea
9 Shoa	chickpea	white t'ef	brown t'ef	brown t'ef	fallow	white t'ef
10 Shoa	pea	wheat	t'ef	linseed	lentil	common
11 Shoa	t'ef	maize	niger seed	t'ef	maize	niger see
12 Wellega	early maturing t'ef	late maturing t'ef	late maturing t'ef	finger millet	fallow or niger seed	fallow or white t'ef
13 Arussi	barley	pea or horse bean	linseed	fallow	etc.	
14 Arussi	barley	fallow	etc.			
15 Arussi	barley	wheat	pea or horse bean	linseed or fallow	fallow	etc.
16 Arussi	barley	wheat	linseed	fallow	fallow	etc.
17 Arussi	pea	t'ef	t'ef	wheat	horse bean or 2 × common bean	fallow
18 Gamu Gofa	wheat	wheat	barley	etc.		
19 Gamu Gofa	barley	fallow	pea	etc.		
20 Gamu Gofa	1. Galla potato 2. barley	wheat	fallow	etc.		
21 Gamu Gofa	Galla potato	fallow	barley	etc.		
22 Gamu Gofa	1. barley 2. barley	wheat	etc.			
23 Kefa	t'ef	t'ef	sorghum	taro	fallow	fallow

:ar	8th year	9th year	Remarks	Source
			on black soils; no fallow	Simoons (1960)
'	?		on red soils; as a rule fallow after 6 years	Simoons (1960)
'	etc.		on red soils; fallow during 5th—7th year	Kuls (1963)
'	fallow	etc.	on dark, loose soils; fallow after 6 years	Kuls (1963)
			on black soil	Kuls (1963)
	barley or wheat	sorghum, etc.	on black soil; Debre Zeit area	Huffnagel et al. (1961)
			on grey, sandy soil; no fallow? Debre Zeit area	Huffnagel et al. (1961)
'	etc.?		on grey, sandy soil; no fallow? Debre Zeit area	Huffnagel et al. (1961)
ı t'ef	brown t'ef	sorghum or barley, etc.?	on grey, sandy soil; no fallow? Debre Zeit area	Huffnagel et al. (1961)
um	barley	etc.?	on grey, sandy soil; no fallow? Debre Zeit area	Huffnagel et al. (1961)
' .rs)			Bako region; fallow during 6 years	Ruthenberg (1971)
'	etc.		Region of Nejo in western Wellega	Taddesse Ebba (1968), pers. comm.
			Chilalo subprovince	Kline et al. (1969)
			Chilalo subprovince	Kline et al. (1969)
			Chilalo subprovince	Kline et al. (1969)
			Chilalo subprovince	Ryden (1972)
'	fallow	etc.	Riftvalley area	Kuls (1958)
			Dorse tribe in east Gamu Gofa	Straube (1963)
			Dorse tribe; fallow with green manure	Straube (1963)
			Dorse tribe	Straube (1963)
			Dorse tribe; fallow with green manure	Straube (1963)
			Dorse tribe; no fallow?	Straube (1963)
'	fallow	fallow, etc.	Jima area; in remote area; fallow as long as 20 years	Huffnagel et al. (1961)

Photograph 40. Area around Adua waiting for the big rains, Tigre.

main rainy season, except for the eastern slopes of the highland (over 1000 mm) where coffee is grown (Delliquadri, 1958). Here the important crops are wheat, barley, t'ef, sorghum, oil crops (in Eritrea including groundnut) and various pulses.

In *Gojam*, between 1800 and ca 2600 m, t'ef is the most important crop. Seedbed and cultivation are intensively cared for. Ploughing is repeated several times before the seedbed is ready, furrows are drawn by ploughing perpendicular to the wind direction, some weeks after seeding the fields are weeded, and finally the crop is harvested just before full maturity. Above ca 2400 m wheat and barley, and at ca 3000 m barley dominate. Since most irrigated fields are used for barley, this cereal may be even more important than t'ef. Finger millet is often cultivated between ca 1900 m and ca 2200 m. Of the pulses horse bean is found as high as 3200 m. Land on which this crop does not grow very well is planted with Egyptian lupin. At higher altitudes pea is common, as in the woyna daga lentil and chickpea are important. Chickpea is grown in the dry season on Vertisols and is sown end September to begin October. The prominent oil crops niger seed and linseed are found in the woyna daga up to ca 2500 m. On the Zegie peninsula coffee is grown (Kuls, 1963).

Tuber crops do not play an important role, with two exceptions: in the daga zone of the Choke Mountains and Agaumedir potatoes are cultivated (planted in December—January). In Agaumedir many fields with Galla potato are present. Manuring is not restricted to gardens and small plots, but may include fields with barley, wheat or pulses, but in a rather haphazard way. The manured land is permanently cultivated;

if necessary for the unmanured land a fallow may be inserted after 4—8 years of cultivation. In densely populated regions the fallow is reduced to 1—2 years. Quite often the same cereal is sown for 2—3 subsequent years on a field, after which a several years' rotation of cereals with pulses and oil seeds follows, but obviously there are no fixed rotations. For some rotations see Table 4: 3, 4 and 5. Since t'ef is sensitive to weed growth, it is exceptional to find it as the first crop after burning, which is frequently practised (Kuls, 1963).

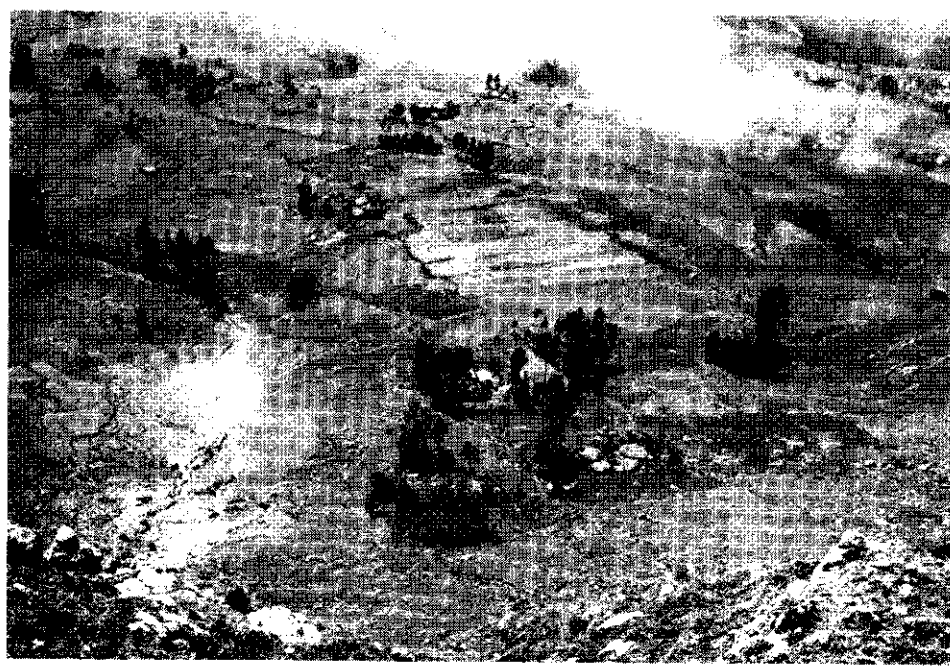
Interesting is a type of rotation in strips practised in the daga region, based on three annually interchanging crops. In the Choke Mountains it mainly is a three strip system with two strips under crops and one fallow. Here the cropped strips usually have barley, wheat is less important, and Egyptian lupin is even less frequent. An important advantage of this system is that the stubble of the fallow strip can be used for grazing till the end of the rainy season and till the time that the crop on the other strips is ready for harvesting. Especially in densely populated areas this increase in pasture land is important (Kuls, 1963).

Irrigated fields are permanently cultivated and manured as well (Kuls, 1963).

Harvest takes several weeks to some months. In the upper parts of the woyna daga it starts early in December and continues till February. The moment does not only depend on the crop, but also on the time of sowing since on large fields sowing is done in stages resulting in cereal fields with green and mature parts. Next to a marked vertical differentiation of agriculture, a horizontal differentiation can be distinguished, as a result of ethnic differences between Agau and Amhara. Characteristic for the first is a more intensive type of agriculture in which irrigation is quite important and the cultivation of Galla potato is typical, whereas for the Amhara the destruction of forest (initiating large-scale erosion), the preference for seed crops, and the emphasis on livestock is typical (Kuls, 1963).

Wollo is an important grain province: its higher parts produce t'ef, barley, wheat, horse bean and pea, at lower elevations t'ef and sorghum are more prominent. At the end of April fields with young barley were observed, especially around Lake Ashangi in north Wollo, which were probably irrigated.

In *north and north-east Shoa*, between ca 2400—3000 m, a sod rotation is applied which includes barley, wheat, some t'ef and pulses like horse bean and pea. In the dry season long-fallowed grassland is broken with the plough, the sods are gathered into heaps and set alight (soil burning) to kill the grass and the weeds, and finally the soil is spread again. After the onset of the main rains, at the end of June, the fields are ploughed again and sown: first barley and late in the main rainy season of June—September the other crops. Furrows are made at regular intervals and enlarged from time to time to carry away the surplus water. Sometimes barley is also sown during the early rains (February—March), but in north-east Shoa the early crop rarely gives a good return and sometimes fails completely. The land on the plateau, after being cultivated for a few years, is kept fallow for a widely varying period that may be as long as 5—7 years. Down in the gorges, where the climate is milder and irrigation is practised on the level shelves, chickpea, lentil, some t'ef, wheat and



Photograph 41. Erosion, ploughed fields, and fields with young barley in April north of Debre Birhan, Shoa.

Photograph 42. View of huts, fields and pastures from the Termaber Pass, Shoa.

barley are cultivated. In the lower parts of the gorges maize, sorghum, tomato, chillies and coffee are grown. Here terracing and irrigation are practised (Buxton, 1949).

The *Yerer-Kereyu Highlands* of Shoa, east of Addis Abeba, with their extremely swelling and shrinking soils, are for a large part under cultivation (especially between 1500 and 2200 m) and they form a very important grain region. The main cereals are t'ef, wheat and barley; maize and sorghum are less important. In addition, many pulses are grown: chickpea, pea, lentil, grasspea, horse bean; also niger seed, safflower and linseed. Field preparations start in March or April with ploughing. Burning of fallow land is often practised. In general, fields are ploughed three times, and after the removal of weeds and the sowing of the crop a last ploughing is performed, except for t'ef. Barley and sorghum are sown, during the small rains (March—April), followed by chickpea and horse bean, and in July quite often by some wheat. In the beginning of August again wheat is sown on black soils; chickpea or lentil follow end September on red soils. T'ef is planted mid-July on black soils. Pulses such as chickpea and lentil sometimes give two crops a year. On fields sown with chickpea and lentil in April, a second crop of grasspea or chickpea will be sown. Grasspea is usually cultivated on land that lies fallow that season. Pulses sown in April or end September are harvested end July or end December. Barley and sorghum, sown in April, are harvested mid-September and December respectively; wheat, sown mid-June or begin August, is reaped mid-November or December. T'ef is harvested early in January (Kuls, 1957).

Fields are often cultivated for at least two years with a cereal, followed by some of the pulses. On black soil wheat can be grown for four successive years, on red soil barley for only two years followed by horse bean, pea or chickpea. Grasspea is mainly used to improve the soil and as cattle feed (Kuls, 1957).

For some rotations practised in the Yerer-Kereyu region see Table 4:6, 7, 8, 9 and 10.

For the agricultural calendar see Fig. 1.

In the *Bako area in west Shoa* sorghum, t'ef and niger seed are important crops (Murphy, 1959). For a typical rotation of this area see Table 4:11. Ensat and Galla potato are also found here.

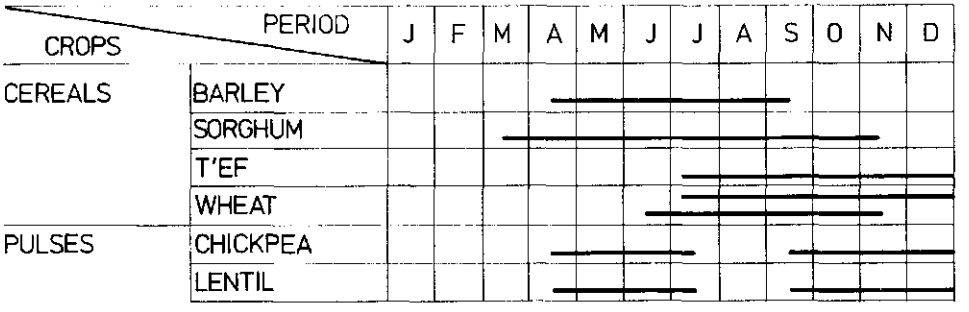


Fig. 1. Agricultural calendar in the Yerer-Kereyu Highlands, Shoa (source: Kuls, 1957).

South-west of Addis Abeba to the Gibbe the main cereals are wheat, t'ef and barley, whereas on limited areas niger seed, horse bean, grasspea, chickpea, cotton, maize and sorghum are grown. Ensat especially occurs in the region beyond Ghion. T'ef is the dominant cereal, except in the immediate Awash valley where wheat is extensively grown. During the big rains this valley is flooded; the land is sown as soon as the water has receded. The nearly flat and poorly drained lands are used for grazing; on the bordering Vertisols t'ef is grown, whereas the undulating valley land is almost wholly used for wheat. Chickpea is rather extensively cultivated along with the cereals, especially where surface drainage is slow; it can be planted later than wheat (Murphy, 1968).

In *east Wellega*, agricultural practices are, in general, similar to those in central and northern Ethiopia. Important crops are t'ef, barley, sorghum, maize, niger seed, most of them sown in June and July and harvested in December. As soon as the crops have been collected, the farmers start preparing the land for the next crop. Soil fertility is maintained by using a 'shifting-stable method': the farmers construct a rectangular enclosure on a plot of land which has to be fertilized. Cattle spend 10—15 nights there before it is shifted to another place. Where the cattle population is too low to produce enough dung to maintain a reasonable level of soil fertility, people resort to fallowing. A field may be left fallow for 5—6 years. In addition to shifting stables and fallowing, crops rotate, but not in a fixed way. Usually one year t'ef is followed by beans or

Photograph 43. Drainage furrows in a recently prepared field west of Nekemte, Wellega.

Photograph 44. Young plants of Galla potato *(Coleus edulis)* in a mixed plot west of Nekemte, Wellega.

peas. Sorghum and maize may succeed barley. Peasants keep small gardens in the fenced area around their houses, sometimes irrigated. Important crops are here: chillies, buckthorn, cabbage, tobacco and anchote *(Coccinia abyssinica)*. Cultivation of coffee and ch'at is not widespread (Hailu Wolde Emmanuel, 1963a).

In the woyna daga of *west Wellega* coffee is grown. Farmers even burn the pasture lands to eliminate diseases and to further the propagation of good grasses. To avoid shortage of cereals during the rainy season, in many parts people cultivate sorghum and maize in the valleys: both are sown in February, irrigated, and harvested in July. In the uplands yams are grown: they are planted end January and ripen in June (Hailu Wolde Emmanuel, 1963b).

A rotation for this region is listed in Table 4:12.

6.5.1.2 The barley-hoe complex in connection with pastoralism of the Galla

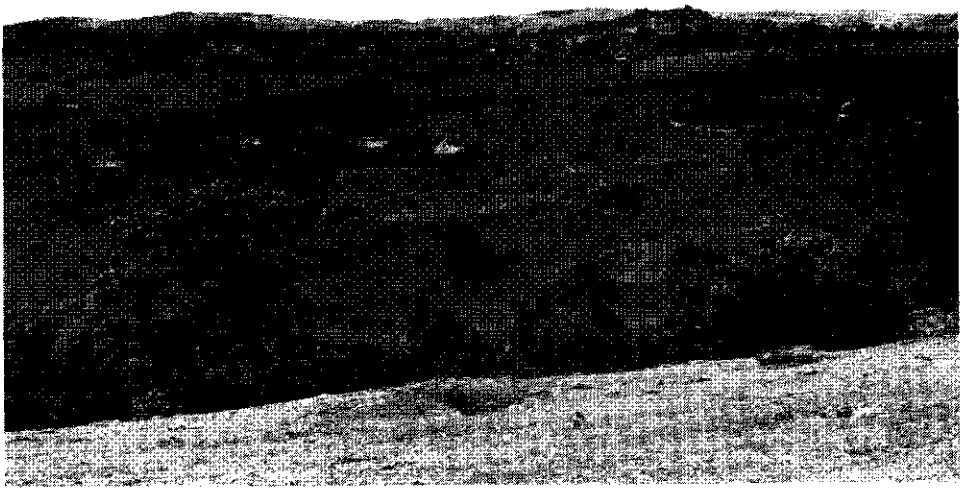
Past authors have assumed that the Galla, who started invading the Ethiopian Highlands at the beginning of the 16th Century, were herdsmen of horned cattle and long-tailed highland sheep, without knowledge of agriculture. Haberland (1963) showed, however, that they cultivated barley and some wheat because they have their own words for these crops: 'garbu' and 'k'amadi', whereas for other crops they now use words borrowed from Semitic and other languages. Barley was regarded as the most sacred crop, even among the tribes who hardly grew it.

Originally these Galla used the hoe, and manuring was unknown. They were not familiar with the grinding of grain with stones, so all cereals were roasted. Neither did they make beer. Their combination of cattle rearing and archaic cereal cultivation possibly represents a special stage in the development of agriculture as compared with the intensive cultivation of many cereals by neighbouring peoples (Haberland, 1963).

The Galla migrating to the north adopted ploughing from the Amhara, those moving to the west turned to an intensive form of hoe cultivation adopted from the previous Western-Cushitic population, those going to the Chercher Highlands took over the agricultural practices of the original inhabitants there. At present the Galla living in the highlands are familiar with most Ethiopian crops (Haberland, 1963).

The lowland Galla tribes, such as the Borana, are itinerant pastoralists and offshoots of a culture with a mixed economy. They originated from outpost-groups who became independent, and their practice of shifting pastures resulted in the division of many Ethiopian tribes into two strongly differentiated groups: the agriculturalists in the highlands and the pastoralists in the lowlands. They have permanent villages, but the young men live in outposts ('fora') in the highlands as well as in the lowlands to look after the herds, with which they move every season to another region. Where grazing conditions were favourable, 'fora' groups have permanently settled in the lowlands, but they still live exclusively on cattle rearing and obtain their agricultural commodities from highland tribes (Haberland, 1963).

Photograph 45. Fenced pastures, corrals and barley fields south of Bore, Sidamo.



Photograph 46. Barley fields with different stages of growth south of Bore, Sidamo.

Only some tribes have kept to the old Galla type of agriculture, in particular in the highland of Sidamo, possibly also in north-west Bale near the border of Sidamo. In Sidamo, only the Mati dwell in the highlands, whereas the Uraga and the Hoku live both in the highlands and the lowlands. The Wanjaltu group of the Mati inhabits the area south of Agere Selam, around Bore (2600 m), the Gagartu group of the Uraga lives in the highland between the Mati and the Darassa. Some of these highland Guji keep their herds in the lowlands during the rainy season, in the highlands during the dry season. Shortage of pastures has forced many to graze their cattle near their settlements on their fenced barley fields (Haberland, 1963).

At the beginning of the small rains, in March, the Mati start preparing the fields. As soon as a part of a field is ready, barley is sown so that, later on, various stages of growth occur side by side. The last sowing month is June. Harvest is from November till January. In preparing the fields, grassy parts are chopped and sown immediately afterwards. Digging sticks are not usual; the plough is probably unknown. In general, a plot is cultivated for three years and then abandoned for an indefinite period, so that the cultivated fields occupy only a small part of the total agricultural area: the rest consists of pasture and bushes.

Nowadays barley is harvested with a sickle, in the past the stalks were pulled out and the ears were cut off with a knife. Threshing is postponed until the last harvest has come in. For their food, the Mati entirely depend on barley. Though they live close to the Darassa, ensat has not yet entered the diet as with the Alabdu who buy

it from the Darassa. The Mati area is too cold for wheat, but sometimes cabbage, tobacco and pumpkins are grown (Haberland, 1963).

The Eastern Arussi probably still perform the old Galla type of agriculture, but to what extent is not known.

6.5.1.3 The grain-plough complex of Arussi and Bale

Under Amharic influence, the Galla in Arussi and Bale turned to ploughing and only some groups kept to the old Galla type of agriculture (see 6.5.1.2). In the Arussi regions suitable for cereals, such as south of the Gugu Massif, in Sirk'a, around Goba and Ginir, along the middle course of the Webi Shebele, and in east Bale, barley has probably been cultivated since ancient times. Nowadays, nearly all people in west Arussi are exclusively engaged in agriculture (Haberland, 1963).

Little is known about the penetration of plough agriculture in Bale, though it has been established that under the influence of the 'ketema' (Amharan military settlements like Goba), after the incorporation of this region into the Ethiopian Empire in 1890, it considerably expanded there. On the highland plateau of Bale, barley and wheat are important crops, with some pulses like horse bean and pea. Probably the crops associated with this type of agriculture were introduced together with the Amharan plough.

Photograph 47. Cereal fields north of Asella, Arussi.

In highland Arussi, in particular at higher elevations in the subprovince Chilalo, ploughing is general practice. Here barley is important, followed by wheat and linseed. Other crops include t'ef, sorghum, maize, pea, horse bean, lentil and black mustard. In the woyna daga, barley takes 5 to 6 month to ripen, in the daga usually 7 to 8 months. Unlike with wheat, two harvests of barley are possible: the first between November and January, the second during June—July. The undulating area between Ethaya (ca 2200 m) and Asella (2360 m), with deep dark brown loams, is an important agricultural area with barley and wheat as the major crops and, in addition, rape seed, horse bean, pea and t'ef. South of Asella the main crop is barley. Between Sagure (2500 m) and Bekoji (2650 m), soil burning is widely practised. In the southern part, including the Gedeb-Asasa plain, only some barley and linseed are cultivated (Yilma Kebede, 1967).

Crops are grown on separate plots. Ploughing starts about a week after the onset of the rains (March—April), but fallow land is broken earlier (beginning in September or October). Three to four ploughing operations take place on fallow land before soil burning is begun in January—February. Land for linseed and pea is ploughed only once, for the other crops the second ploughing takes place in April—May, the third ploughing (in June) serves to prepare the seedbed, and the fourth to cover the seed. In the area south of Asella, manure is added after soil burning, followed by a final ploughing before seeding. Some crop rotation is practised. Most frequently linseed precedes fallow and barley follows it (Kline et al., 1969). Some general rotations are listed in Table 4:13, 14, 15 and 16. The last linseed crop is followed by a two year's (sometimes up to five year's) fallow. Beans and t'ef are rarely included in the rotation (Ryden, 1972).

During the last decades, the pastoral Arussi in the Riftvalley were forced to engage themselves in agriculture. They took over the plough from the Amhara or Amharized Galla and Gurage who had moved into their territory. These immigrants occupied land originally used by the Arussi for grazing. In this region, at ca 1500 m or higher, the same crops are found as in Shoa (especially cereals and pulses, some oil crops) with sometimes sweet potatoes and potatoes; ensat and other tuber crops are absent. Unlike the Galla in Shoa, the Arussi use manure. Between Lake Shala and Lake Awasa their main crop is maize; sorghum, t'ef, wheat, barley, common bean, horse bean, pea, chickpea, lentil and grasspea are also cultivated, but linseed, niger seed and safflower are unimportant. Fields near the houses are well-manured and used for maize, often for several subsequent years, until the yields drop, after which horse bean is planted followed again by maize. For the other crops a rotation is practised with 2—3 year's fallow during which the land is used as pasture. A frequently applied rotation gives Table 4:17 (Kuls, 1958).

Field preparations start in February or March after the beginning of the small rains. One or two weeks before sowing the land is ploughed several times. Sorghum is sown in March, maize in April, t'ef, barley, wheat, pea and horse bean in July. Barley, horse bean and pea are harvested in October, maize in October—November, wheat in November, t'ef in December and sorghum in January. Chickpea is sown in

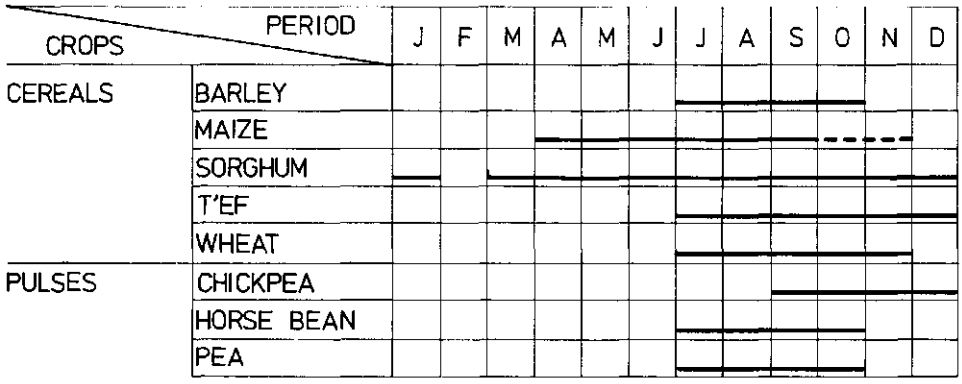


Fig. 2. Agricultural calendar of the Arussi in the Riftvalley, Shoa (source: Kuls, 1958).

September and reaped in December. For the agricultural calender see Fig. 2 (Kuls, 1958).

The cultural landscape of this area completely differs from that of the neighbouring ensat growing Sidamo, though these live under comparable climatic conditions and at the same altitude. This also applies to the highland at ca 3000 m of Bale, Arussi and Sidamo where the Sidamo plant ensat, the Arussi prefer tillage, and the Bale area is inhabited by pastoralists (Kuls, 1958).

Important for the Arussi with their herds living in the lower parts of the region is the gathering of wild fruits and other edible plant parts, such as tubers of *Dioscorea schimperiana* ('ankorumba'; Haberland, 1963).

The islands in Lake Ziwai are inhabited by the Lak'i, culturally distinct from the Galla and speaking a Semitic language. Their intensive agriculture on terraced fields includes finger millet, sorghum and cotton, manured with dung and ashes of burnt crop residues. Under the Pax Amharica many Lak'i settled on the lake shores, changed to ploughing, and now cultivate mainly maize, t'ef, wheat, finger millet, barley and horse bean. Fallow land, and areas unsuitable for agriculture are used as pasture for the large cattle herds. The mode of life of the Lak'i strongly resembles that of the settled lowland Arussi (Haberland, 1963).

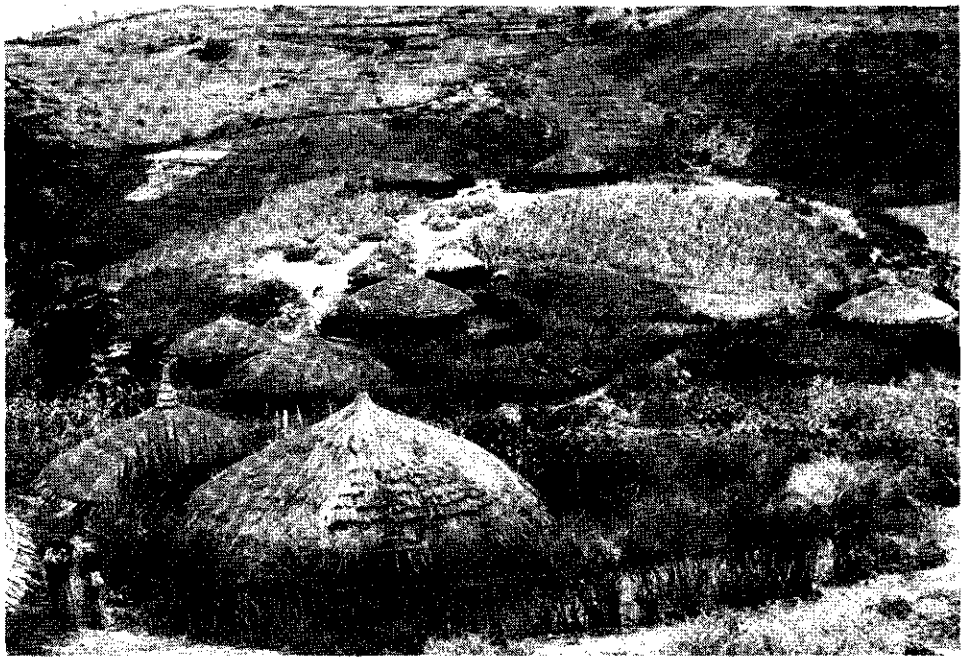
6.5.1.4 The sorghum-plough complex of the highland of Hararge

The highland of Hararge stretches from about Gelemso in the west to the Kundudo mountain group in the east; it includes the Chercher Highlands (or Ahmar Mountains), the Gara Muletta Massif, the Kondudu mountain group, and the highland plateau between the Gara Muletta and Kondudu. The highland itself, its plateaus sloping to the south, and the valleys with sufficient drainage are extensively farmed. Where drainage is insufficient, the land is used as pasture. Characteristic is the dominant position of sorghum, a crop widely distributed in Ethiopia; except for the Hararge region this is a major crop in the lowlands and in north Ethiopia. In addition, a large number of other crops is grown. Everywhere field cropping, home gardening, and the cultivation of trees and shrubs are found. Though varying in proportion, the first

Photograph 48. Characteristic landscape in the Chercher Highlands with sorghum/maize fields, Hararge.

always predominates. Grain sorghum, and the field crops interplanted or associated with it in a rotation system, comprise the 'durra complex' of this highland region (Brooke, 1958).

Irrigation is limited to the relatively few places where topography and drainage conditions permit the construction of channels or trenches which several times a year supply water from the main stream. Here tree or shrub crops are grown. Field crops, except sorghum, are rarely irrigated. On hillsides often rather crude drainage terraces are constructed, varying in width between 6 and 9 m, the vertical distance between the levels being only 30—60 cm. In the central section of the highlands bench terraces occur about 1.8 m wide, with walls built of rocks. Similar terraces are found on steep hillsides in the vicinity of Harar, but most of them are abandoned or planted



Photograph 49. Cluster of huts in the Chercher Highlands with small gardens, a threshing place with heaps, surrounded by fields with sorghum/maize, Hararge.

with tree crops (Brooke, 1958). These highland terraces are everywhere mainly used for coffee and ch'at, and occasionally for vegetables. They are narrow and decrease in width with the steepness of the slope (Huffnagel et al., 1961).

Friable, well-drained reddish and reddish brown loams dominate. In the Harar region erosion is extreme: deep V-shaped gullies have destroyed the only moderately steep hill sides; sheet erosion, although not so evident, is severe. Some of the land has been terraced, but lack of co-operation among the farmers, resulting in insufficient terrace outlets causes water excesses. Unfavourable boundaries and much-trodden steep paths in the wrong places, developing into gullies, contribute to the erosion (Murphy, 1968).

On the remaining favourable places a rather extensive agriculture has developed in which three zones may be distinguished.

(a) The coffee zone (ca 1400—1700 m) in the south has bowl-shaped valleys with irrigated banana groves and extensive gardens with a mixture of crops such as sugarcane, coffee, ch'at, maize, sweet potato and t'ef. The also irrigated slopes of these valleys show terraces with mainly coffee and ch'at. On the upper slope parts mostly sweet potato is cultivated. On higher ground sorghum predominates.

(b) The durra zone (ca 1600—2000 m) has sorghum as the dominant crop, with some coffee and ch'at on the valley borders.

(c) The barley zone (ca 2000—2400 m), except in the Gara Muletta area solely

occupies isolated patches of the former *Podocarpus-Juniperus* forest. It is mainly inhabited by Amhara. Next to barley, wheat, horse bean and pea are grown (Schottenloher, 1939).

The Galla distinguish many different types of sorghum ('bishinga'). The popularity of this crop is mainly based on its tolerance to adverse ecological conditions (it is drought resistant), and the relative simple cropping techniques. Preparation of the fields left fallow for several years involves breaking the turf with digging sticks during the dry season, 4—6 weeks before the small rains are due, and clods are overturned before ploughing. Moreover, for the seedbed preparations the fields are ploughed after the first rains, but nothing more is done until seeding. The sorghum cultivars which require more time for maturing are sown first, at about 1750 m followed in April by the main type, in the lower areas in May. As late as June or July a much smaller area is seeded with fast maturing cultivars. Seeds are broadcasted and covered by additional ploughing. On the most fertile soils the plough is also used for thinning to 30—45 × 60 cm. Plants that fail to flower or are uprooted during thinning are used as fodder (Brooke, 1958).

In December or January the sorghum is cut several inches above the ground with a sickle. After two days' drying in the field the heads are removed and piled. Most farmers strip the leaves before cutting and store them in bundles as forage. After stripping the leaves and before the harvest the sorghum plants are bundled together

Photograph 50. Gully erosion near Alemaya, Hararge.

Photograph 51. Sorghum cultivation on rudimentary terraces in the foothills of the Chercher Highlands near Dire Dawa, Hararge.

in groups of 3—5 plants. The stubble is left in the field, ploughed under during the preparation of the new seedbed, and finally collected for fuel or fodder, though this causes loss of organic matter. If the stubble is left in the field beyond late April the old roots will serve as breeding places for termites which attack the new sorghum crop. As a rule sorghum is cultivated year after year until the soil is exhausted. Thereafter the fields are left fallow for two to three years, used as pasture, then planted once with pea or some other pulse, and ultimately again cultivated with sorghum. The rotation cycle greatly varies; for the densely populated Harar region it averages probably 12—15 years (Brooke, 1958).

Brooke (1958) reported the use of compost, spread over the field after the harvest and sometimes ploughed under. According to Murphy (1959), however, in the Ale-

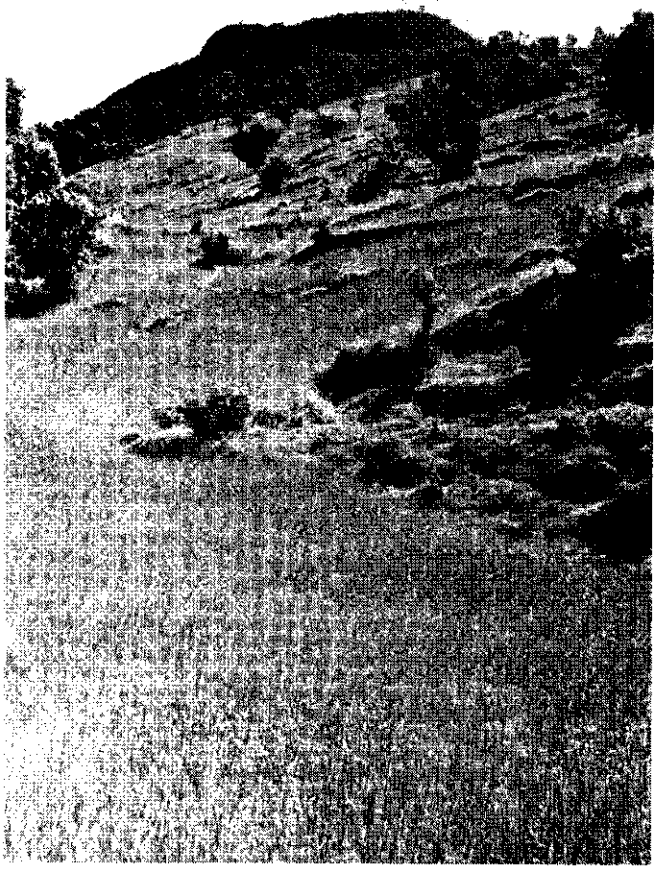
maya-west Harar area it is general custom to remove all crop residues from the fields, including stubble. Also for the Chercher Highlands Murphy never mentioned the use of compost. This is in agreement with the author's observations (in 1967 and 1968). Moreover, cattle most effectively clear the harvested fields except for the coarsest stubbles (in the meanwhile adding some dung).

In general, both sorghum and maize are grown mixed, sometimes also bulrush millet (in the foothills of the Chercher range in the Riftvalley), finger millet and sesame; common bean is very frequent, sometimes cowpea or groundnut occur. The common sorghum type is the 'goose neck' milo.

Maize is the second most important crop. Two types are cultivated: 'flint' maize (maturing in ca 5 months) and a 'sweet' type harvested after ca 4 months. Both are found in fields and in gardens. As a field crop, flint maize is sown mixed with sorghum (April—May). In gardens, sweet maize is sown early June, or late May, together with quickly maturing sorghum cultivars. In gardens, the plants are grown much closer together than in fields. At altitudes up to ca 1700 m the crop is harvested two to three months before sorghum, which means late August to early September, at higher altitudes from late September to November. After three to six harvests of maize and sorghum, one crop of barley or some other small grain may follow (Brooke, 1958).

Over 2000 m, barley is important; at lower elevations, in the 'durra complex', it occupies only a relatively restricted area, chiefly parts where sorghum has failed; thus it is planted late in the season. In the eastern section of the Chercher Highlands, six-rowed barley is common, whereas in the middle and eastern sections two-rowed and four-rowed cultivars are grown. Barley is sown from June to early August, as a rotation crop usually in June, and harvested in October, about two months before the major sorghum harvest. Two harvests a year are not unusual. As a rule, no other crops are planted with barley, but sometimes it is cultivated between young trees, as is the case with ch'at. Brooke reported the use of compost before the first ploughing on a field to be sown with barley, but this has not been confirmed by others. Except near the highest villages, barley is never cultivated on the same field for two successive years; in general sorghum follows, being (with maize) the most favoured food crop. At lower altitudes barley comes in when sorghum and maize fail, because it matures very fast (Brooke, 1958). Such fast maturing barley is also grown (from February to May) before a leguminous crop is sown. Around Harawacha (2700 m), a kind of 'mist' barley is cultivated in the dry season, from September to January (Schottenloher, 1939).

Common bean is the major leguminous crop, whereas south-east of Harar cowpea dominates. The wide distribution of common bean is due to its early maturing and low moisture requirements, which makes it a reliable catch crop when staple cereals fail. In most areas two harvests are possible between April and December. It is customary to plant beans between maize and sorghum, and to prepare the seedbed in the same way as for the cereals. They are sown broadcast, in April; by mid-July the pods are mature and then the plants are pulled out. Immediately afterwards the field is once more seeded and the second crop is usually harvested late November.

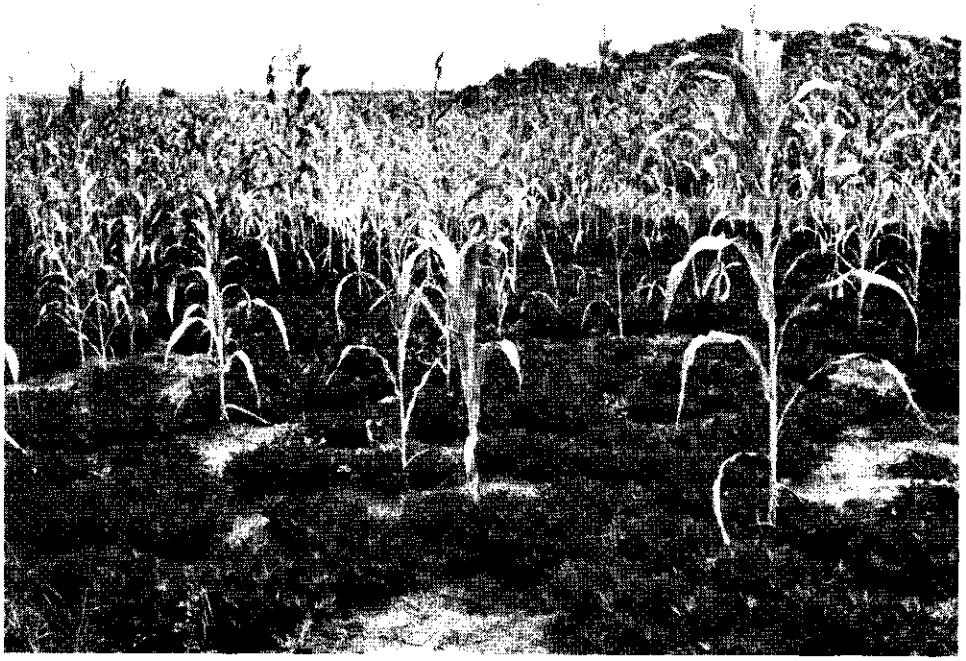


Photograph 52. Barley cultivation on steep slopes in the Gara Muletta area, Hararge.

Pea, like chickpea, is a minor pulse crop. It is not mixed with other crops, and considered the best first crop after a fallow period before sorghum and maize. Sowing time is July, harvesting time late October (Brooke, 1958). Chickpea and grasspea are grown in the dry season as second crop.

East and south of Harar, between 1500 and 1800 m, groundnut (runner type) is important. It grows on red sand or sandy loam. Sowing is in April, sometimes already in March, and it is not harvested before late November. It is customary to grow it with sorghum and maize, but it does not tolerate much shade. Among the Galla, groundnut is usually grown (with sorghum) for two years, followed by another two years of only sorghum and maize (Brooke, 1958).

Sweet potato is the only tuber crop of any importance. It is cultivated on neatly



Photograph 53. The walled city of Harar surrounded by fields and orchards with ch'at *(Catha edulis)*, coffee and *Citrus*, Hararge.

Photograph 54. Field with sorghum and groundnut south-east of Harar, Hararge.

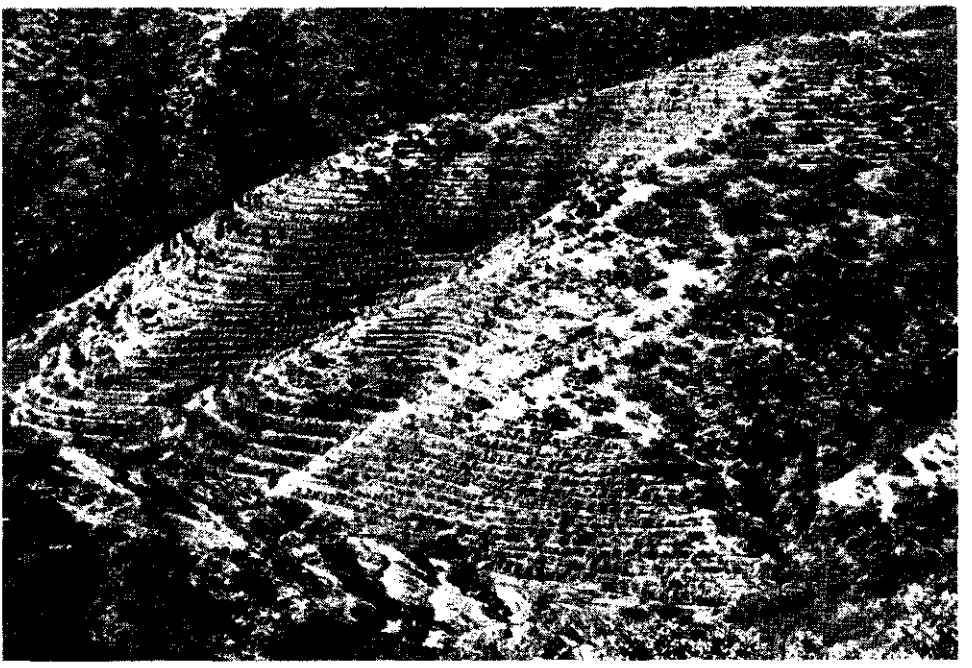
Photograph 55. Sweet potato on ridges near Gelemso, Hararge.

constructed ridges. Cuttings are planted at the end of September and the beginning of October. Large fields occur in the Gelemso region. According to Huffnagel et al. (1961) and Schottenloher (1939), this crop is grown at altitudes between 1600 and 1900 m.

In gardens, potatoes are sometimes grown; cassava is very rare.

Coffee is an important cash crop, particularly in the regions of Deder, Asbe Teferi, Bedessa and Gelemso. It is said to have been introduced from Yemen when Harar was under Arab domination. Shrubs are planted in full light on small, not much over one meter wide terraces which are often irrigated and receive great care. As they are not pruned, after 15—20 years the treelets have attained a considerable height. Then they are cut back and a new growth cycle starts. The coffee is often of good quality since only the red cherries are picked (Huffnagel et al., 1961).

Ch'at is primarily used for its stimulating effect as a masticatory by chewing and usually swallowing the fresh leaves and young twigs. Moderate use causes a feeling of well-being and strength, accompanied by thirst (Hill, 1965). The effects are generally psychic. Euphoria, increased alertness and general excitement and hyperactivity are commonly experienced; in addition, insomnia and anorexia almost always occur (Amare Getahun & Krikorian, 1973). The statements as to the degree of exaltation range from a wild hilarity to inebriation, a state which would seem to depend on the amount of ch'at taken, the type and freshness of the leaves and the way in which they are consumed (Peters, 1952). Young leaves have the highest alkaloid content



Photograph 56. Terraces with ch'at (*Catha edulis*) on the escarpment south of Dire Dawa, Hararge.

and are favoured most (Krikorian & Amare Getahun, 1973).

Besides growing wild it is cultivated in various parts of the country. Hararge is the most important centre of production. It is not intensively cultivated throughout the province, but there are several centres of production of which the Dire Dawa-Harar area is the most important. Here it is the principal cash crop. It is mainly found between 1500 and 2100 m, but with irrigation it extends down to ca 900 m, whereas it is encountered as high as ca 2400 m. Ch'at is exclusively cultivated on well-drained hillsides on dark red-brown sandy loams. Mulching and manuring is not a common practice. Everywhere the plant is grown in rows on ca 30 cm high ridges roughly following the contour lines. On steep places this may result in one row per terrace. Where irrigation is impossible, in periods of drought the shrubs are usually stripped of their leaves (Amare Getahun & Krikorian, 1973; Hill, 1965).

The plant is propagated by 30 cm long cuttings from suckers or low branches, planted at 50—100 cm distance in the rows. It varies in height, even on one field, and comes into production when it is about one meter high, after some five years. The young twigs are broken off near the main branches and trimmed to some 40 cm; this can be repeated for at least several decades. Frequent harvesting makes pruning superfluous. Compared with other crops ch'at is a high-income crop. Kottu Galla recognize various kinds, such as Dallota (white to light green), Dimma (reddish, considered second in quality) and Hamercot (intermediate). At least seven kinds are found in the markets, but they do not represent cultural varieties as sometimes

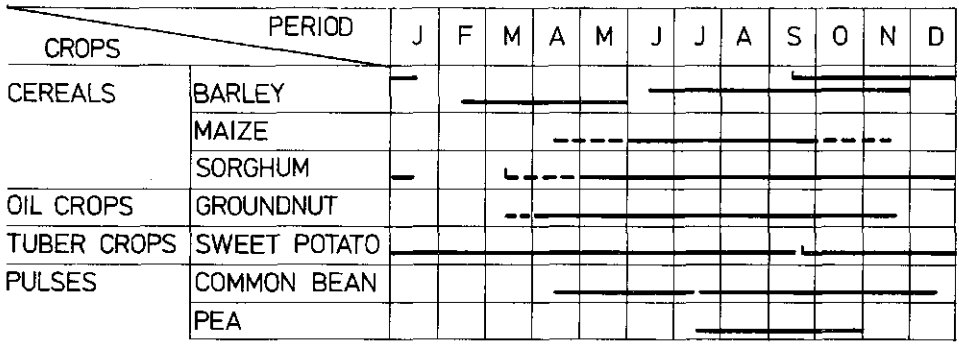


Fig. 3. Agricultural calendar in the highland of Hararge (source: Brooke, 1958).

is supposed. The crop is commonly interplanted with sorghum, maize, beans, sweet potato, *Capsicum* or coffee (Amare Getahun & Krikorian, 1973; Hill, 1965).

In many gardens fruits are grown, sometimes on irrigated places; on plantation-scale only in the Riftvalley. In the vicinity of the College of Agriculture vegetables have successfully been cultivated. As a whole, home gardening is not important.

For the agricultural calendar in highland Hararge see Fig. 3.

6.5.1.5 The sorghum-hoe-terrace complex of the Konso cluster

For many tribes[3] living on the fringes of the highlands in south and south-west Ethiopia, sorghum is a most important crop, though some of them[4] mainly depend on their cattle (Jensen et al., 1959). Most remarkably, some of these tribes practise agriculture on well-constructed terraces with stone walls, sometimes as high as six meters (Kuls, 1958). The Konso are the most interesting among the latter and their methods will be discussed here at some length[5].

The Konso terrace culture is believed to be of ancient origin, more widespread in the past in view of its many remains. Each terrace is bordered by a small earthen ridge and divided into apartments by small ridges perpendicular to the ridge to facilitate the gradual penetration of water into the soil[6]. On level land 10—20 cm high ridges separate parts of some 3 × 3 m; they are also planted. Where there are no stones straw is used to cover the terraces and the small ridges until the crop plants

3. They include the Burji, Konso, Gidole, Gato, Mashile, Gauwada, Chamako, Arbore, the Banna-Hammar group, the Male and the Bodi.

4. As with the Chamako, Arbore, the Banna-Hammar group, the Male and the Bodi.

5. Other tribes belonging to this group are the Burji, Gidole, Gato, Mashile, Gauwada, Chamako and the Male, with the Konso all belonging to the Burji-Geleba language group.

6. The Gidole dug a circular hole of about 75 cm in the centre of the terrace and surround it by stones. It serves to collect rain water. Where the soil is very permeable or stony, they refrain from building an outer ridge (Kuls, 1958).

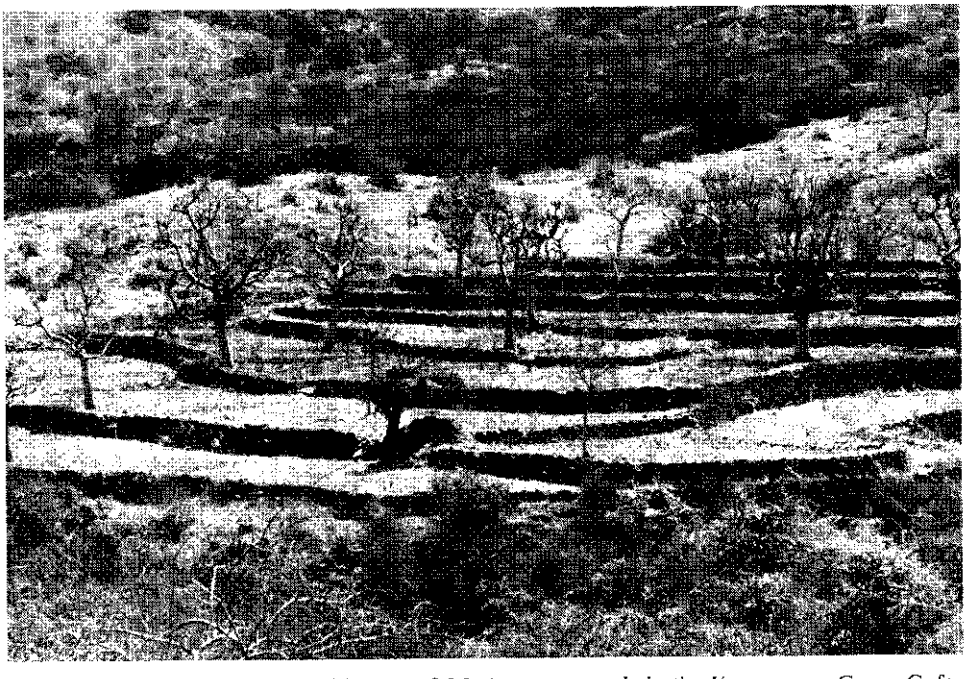
have developed sufficient roots to hold the soil (Kuls, 1958).

Where possible, the terraces are irrigated. The water is distributed through carefully constructed channels over the fields that are usually several hundred square meters large. Sometimes the irrigated fields are situated on terraces with stone-retaining walls as high as six meters (Kuls, 1958). Even the water that runs over the roads is directed towards the fields, through entries in the terrace walls (Nowack, 1954).

According to Nowack, the close connection between animal husbandry and the intensive agriculture is typical for the Konso. He points at the stall-feeding, unknown elsewhere in south Ethiopia, that allows thorough manuring. Kuls (1958) did not fully agree with this view as that part of the livestock that is more or less permanently stabled is too small to produce sufficient manure: it consists merely of some sacrificial animals and milk cows with their calves and most of the cattle lives on pastures near the outer periphery of the settlements.

In the surroundings of the villages nearly all land is permanently cultivated, the terraces are richly manured, and only a few pastures are found. The fields far away from the settlements are also terraced but not manured. They take part in a rotation in which a period of cultivation is followed by a usually longer rest period. Most of the land at some distance from the villages is used as pasture (Kuls, 1958).

Rainfall in the Konso area is below 900 mm, with maxima in April—May and October—November. Sometimes the 'spring' rains due in the beginning of March

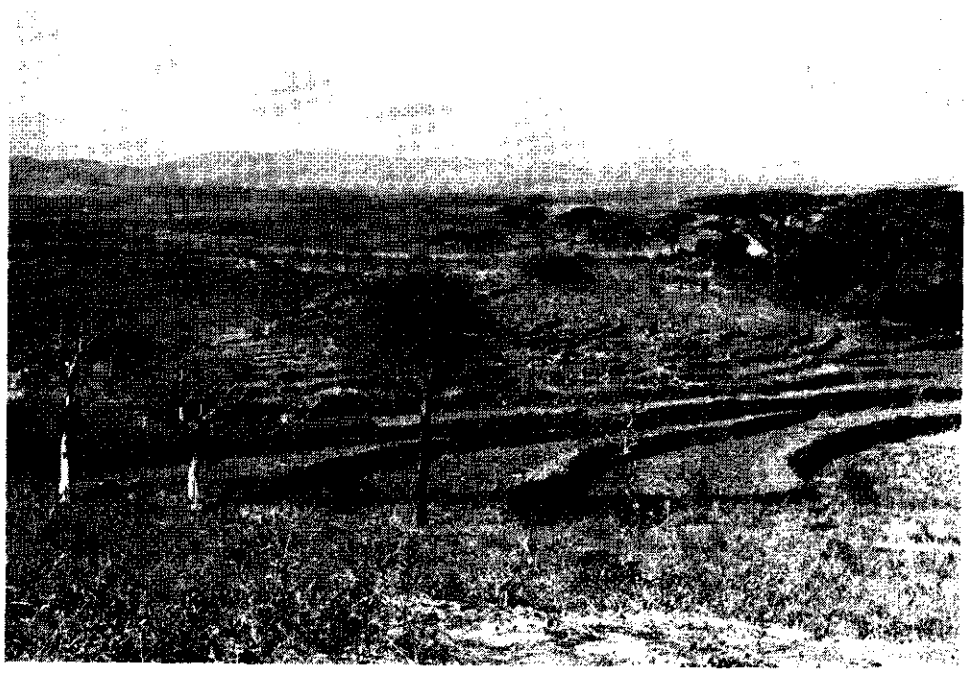


Photograph 57. Terraced fields with trees of *Moringa stenopetala* in the Konso area, Gamu Gofa.

Photograph 58. Terrace wall of fields in Konso, at the end of the dry season, Gamu Gofa.

are insufficient to satisfy the needs of that moment for field preparation and planting. Field preparation, with a two-pronged hoe, starts after the first rains. The Amharan plough is rarely used because it badly suited the terraced fields. In general, the fields are worked only once before sowing. Manure is applied before sowing, but also later on during the development of the crops. The fields are regularly weeded, so that they look like gardens. Nowack (1954) and Hallpike (1970) mentioned the application of animal and human manure.

The number of food plants, both cultivated and wild, is extraordinarily large in Konso. The most important cereal is sorghum, nearly always mixed with finger millet, especially at lower altitudes. Between 1700 and 2000 m wheat and barley dominate, both in Konso and in the Burji and Gidole regions. Hallpike (1970) reported that recently maize has become an important crop. Pulses are very well represented with common bean, mung bean, cowpea, hyacinth bean, pigeon pea, chickpea, lentil, horse bean and pea. Many tuber crops are cultivated, such as taro, yam and sweet potato. Taro is only grown on irrigated fields, for its edible tubers and its leaves that are used for the preparation of beer; Nowack (1954) suggested its use as a leaf vegetable. Yam grows near terrace walls or in gardens, mostly as single plants. Sweet potato sometimes occurs in gardens; according to Nowack, it is not grown for its tubers but for its leaves. The *Araceae Amorphophallus abyssinicus* and *Sauromatum nubicum* are important crops in the Konso region (the first also occurs in the wild), though less so in the western part. Ensat is rare, due to the dry climate (Kuls, 1958).



Photograph 59. Giarso surrounded by terraced fields, Konso, Gamu Gofa.

Photograph 60. Landscape in Konso area dominated by terraced fields, Gamu Gofa.

Hallpike (1970) reported linseed, sunflower and an *Amaranthacea.*

Most striking all over Konso below ca 1800 m is the cabbage tree *(Moringa stenopetala)* with edible young leaves. It grows wild, but it is also sown on terraces and in villages (Pauli, in: Jensen et al., 1959).

Despite the unfavourable ecological conditions, coffee is quite frequent and larger plantations are present, at ca 1850 m, in west Konso. During the dry season it seems to die, but after heavy rainfall in 'spring' it sprouts again. The fruits are roasted in butter, from the leaves a kind of tea is prepared. Cotton is an important cash crop; the yields enable the Konso to buy extra cereals. Its upper cultivation limit coincides with that of sorghum. Two types are grown: *Gossypium herbaceum* var. *acerifolium* and *G. hirsutum* var. *punctatum* (Kuls, 1958).

Except sometimes sorghum and cotton, all these plants are grown in mixed stands: sorghum, sometimes even wheat and barley occur together with beans, *Amorphophallus abyssinicus* and cotton. Consequently, no rotation or any other regular change in land use is practised. Sometimes fields are found with merely sorghum or cotton. Pure cotton fields occur in general on the periphery of the settlements. They are cultivated as long as the crop is profitable, which means for at least three successive years. Afterwards the fields are left fallow for a certain time.

For nearly all species the period of sowing or planting is restricted to the weeks in which the 'spring' rains start, generally in the first part of March. First the *Araceae* tubers are planted, for which the young cormels are used. Broadcasting cotton seeds follows (first wallowed in moist soil to prevent picking by birds), and ultimately the cereals and pulses are sown. Finally, all seeds are covered with soil. From May on, the *Araceae* tubers are ready for harvest, but they are not eaten unless the cereal crops fail. Finger millet is harvested mid-July, at higher altitudes about simultaneously with wheat and barley. In August the beans follow, in mid-September the first sorghum crop, and around December (depending on the rainfall during 'autumn') the second sorghum crop (ratoon). To prevent a too strong competition, in the wheat and barley zone sorghum is sown in mixed fields as soon as the other crops are about 10 cm high.

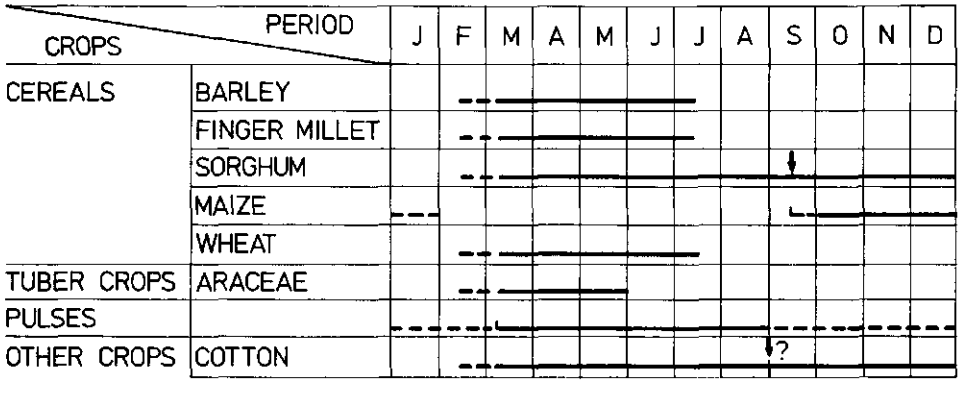


Fig. 4. Agricultural calendar of the Konso, Gamu Gofa (source: Kuls, 1958).

Because of the strict rainfall regime, there are more critical periods in the labour calendar of the Konso than in that of the ensat farmers (Kuls, 1958).

For the agricultural calendar of the Konso see Fig. 4.

6.5.2 The ensat-planting complex

The cultivation of ensat and its use as a staple food are almost restricted to the peoples in south-west Ethiopia who speak either East-Cushitic or West-Cushitic. It is found in the highland zone between ca 1600 and ca 3000 m where the average annual temperature is 16—20 °C (see map of ensat area). Elsewhere it is not known as a cultivated plant (see also Purseglove, 1972).

The wild form of *Ensete ventricosum* is common and widespread in tropical Africa from Kenya and Uganda south to Mozambique and the Transvaal, and west to Zaire and Cameroon (Simmonds, 1958). In Ethiopia it is not common, although in some places subspontaneous. Most remarkably the wild form occurs at lower altitudes than its present cultivation area. This implies ecological adaptation (Taye Bezuneh & Asrat Felleke, 1966).

Kuls (1958) suggested that the natural centre of distribution of ensat is in the higher parts of Kefa, in the humid corner of south-west Ethiopia. There it is found in the forests.

Ensat is a herbaceous plant related to the fruit banana, so that foreigners sometimes call it 'false banana'. Until recently it was included in the genus *Musa (Musa ensete)*, although already Bruce (1790) pointed to the differences between ensat and the banana. In 1862, Horaninow moved it to *Ensete (Ensete edule)*, followed by Cheesman (1947) who included in this genus some Australian and African *Musa* species on taxonomic and genetic grounds, but an accurate generic description may only be prepared after more elaborate study, preferably by comparing living specimens in the entire African area.

Cheesman came to the following provisional botanical description of the genus.

Ensete Horan.

Single-stemmed monocarpic herbs, usually large. True stem remaining short until flowering. Leaves large, the blades oblong, commonly narrowed below into a short or rather long free petiole, the latter again expanded below into a sheathing, but often not completely stem encircling base. Sheaths of the lower leaves sometimes short, so that the plant has a rosette habit, sometimes long and forming a pseudostem like that of *Musa*. Pseudostem, when formed, nearly always dilated at the base. Upper leaves passing gradually or suddenly into bracts. Inflorescence pendulous. Bracts usually persistent. Flowers many to each bract, in two rows, those of the lower bracts hermaphrodite or female, those of upper bracts male. Free tepal often tricuspidate, sometimes entire. Fruit leathery, dry or with very scanty pulp, containing relatively few seeds. Seed usually large (i.e. exceeding 1 cm in diameter), globose or irregular, most commonly smooth, with a conspicuous, irregular and usually deeply sunken hilum. Basic chromosome number n=9.

Photograph 61. The ensat plant according to J. Bruce's Travels to discover the source of the Nile in the years 1768-1773, 5 (1790).

Interplanted crops include cabbage *(Brassica carinata)*, coffee and ch'at. In some areas, coffee becomes the major cash crop after ensat has been grown for 6—8 years. At ca 3000 m barley is a common crop along with ensat (Taye Bezuneh & Asrat Felleke, 1966).

It has been argued by Smeds that the ensat-planting cultivation is superior to the seed-farming of central and north Ethiopia as to maintaining the fertility of the soil, because manure is extensively used in the ensat areas. Foremost, however, is that the ensat-planting culture can support a denser population than seed-farming: the ensat regions are among the densest populated in the whole of Ethiopia, with a density of 175 habitants per square kilometer in some parts of Sidamo (Smeds, 1955). Simmonds (1958, citing Smeds) estimated that, with an average consumption of 12 plants per head per year, an average space per plant of 10 m^2, an average five year's cutting cycle, and one sixth of the land under ensat, 0.36 ha may support one human being (which means 278 persons per square kilometer).

In spite of the common demographic factor, significant differences in the pattern of social and political organization between tribal areas exist. The extent to which the staple crop is supplemented by other crops also varies from tribe to tribe, but all have a vital interest in ensat cultivation. All culture traits based on ensat cultivation reveal a remarkable degree of similarity. On ecological and cultural grounds the ensat complex area distinguishes itself from the plough culture practised in the north, and the pastoral and mixed crop economies in the south and west of Ethiopia. Shack (1963) suggested to apply the term 'ensat culture complex' to delimit that area of the Horn of Africa where ensat is cultivated.

As far as staple food is concerned ensat is found among the Semitic speaking Gurage, and the East-Cushitic speaking Sidamo and related tribes. It is not the only staple food, but exists side by side to other crops, whether tuber crops or cereals, among the West-Cushitic speaking peoples in south-west Ethiopia, such as the Wollamo and the Kaffa. In some cases, as among the Gimirra, ensat even has yielded its position as staple food to other tuber crops, whereas the East-Cushitic Galla in west Ethiopia do not cultivate ensat exclusively, but in addition to other crops.

These four types of ensat cultivation will be treated more extensively in the next sections. For the occurrence of crops in the ensat-planting complex see Table 5.

6.5.2.1 Ensat as staple food

Ensat is the main food source for the tribes living in the south-eastern part of the Ethiopian Highlands in Shoa, or in the Riftvalley and partly in the Eastern Highlands of Sidamo. Representatives are (a) the Gurage, (b) the Hadya, Kambatta and Tambaro, (c) the Sidamo, and (d) the Darassa.

(a) The *Gurage* live south of Addis Abeba in the mountain region between Lake Ziwai and the Omo and Awash rivers. Ensat is extensively cultivated throughout the 'Sabat Bet' (the Seven Houses: tribes living in west and south Gurage district) except

The parts of ensat used as food vary from place to place. The pseudostem and corms are cut up and the pulp may be cooked when fresh or may be fermented in silos (Purseglove, 1972). It is also one of the chief fibre crops (Bezuneh, 1971). The main product, however, is a fermented starch of the pseudostem and the corm. The period of fermentation fluctuates between a few weeks and one or more years. Although slightly fermented, starch is suitable for consumption; the longer the product has fermented, the more it is appreciated (Huffnagel et al., 1961).

Ensat is extensively grown above 2000 m. It prefers an evenly distributed rainfall of 1100 to 1500 mm per year, although it can withstand a dry period if it is not too long. The soils in the ensat areas are moderately acid to slightly alkaline (pH 5.6—7.3); they contain 2—3% organic matter. The plant is propagated by suckers. To initiate shooting, a mature plant of 4—6 years is dug out and the pseudostem is severed from the corm so that the lower part of the leaf sheaths (20—30 cm) remains. The central part of the pseudostem (the stem basis of the inflorescence) is removed and the hole is filled with soil and dung. After burying new suckers appear after 4—6 weeks. From such a corm 40—200 suckers may emerge if left in the same place for at least a year, depending on the type of ensat, soil, climate, and altitude (Taye Bezuneh & Asrat Felleke, 1966).

At ca 1600 to 2000 m the suckers take one year from the pseudostem corm, at 2400—3000 m 1½—2 years, above 3000 m two or more years are needed prior to separating the suckers from the corm. Then the corm is dug out, the suckers are separated and transplanted in rows on a well-prepared plot, where they are left for 1—2 years. Under favourable conditions ensat plants are ready for transplanting into the permanent field three years after the emergence of the suckers from the parent plant corm. Soil, climate and altitude determine the development of the plants (Taye Bezuneh & Asrat Felleke, 1966). In general, the total period between the initiation of the suckers and the transplantation in the definite field varies between 3—9 years for each region and for each individual plant (Huffnagel et al., 1961).

After the ensat has been transplanted to its permanent place, maturation requires about three years at 1600—2000 m altitude, and more than four years at higher altitudes of 2500—3200 m (Taye Bezuneh & Asrat Felleke, 1966). Huffnagel et al. (1961) record three years at ca 1700 m, about five years at ca 2300 m, and six to nine years at ca 2800 m. As a rule plants are spaced ca 2—3 m square, which seems adequate for smaller types but too crowded for the larger, so that after a few years the plantation becomes almost impenetrable (and forms an excellent hiding place for antilopes in Sidamo, according to Smeds, 1955). Ensat has a single flowering period (being monocarpic) and harvesting, either for food or fibre and propagation, takes place before the plant starts to flower (Taye Bezuneh & Asrat Felleke, 1966).

An average family, dependent on ensat as a major food crop, cultivates 200—400 plants, and the yearly consumption per person averages from 10 to 20 plants. Cultivation is carried out during November till January with a two-pointed spade, and a wooden hoe is used for weeding and pulverizing the soil. Manure is collected in the stockyard where animals stay overnight; it is regularly applied throughout the year.

Table 5. Crops in the ensat-planting complex (see 6.5.2)[1].

Cereals	Oil crops	Tuber crops	Pulses	Vegetables	Fruits	Condiments and spices	Stimulants	Other crops
Ensat as staple food (see 6.5.2.1)								
(a) the Gurage								
barley+	*Brassica*+	ensat+	horse bean+	cabbage+	lime°	*Capsicum* pepper°	coffee°	cotton°
wheat+	niger seed°	potato°	pea+	onions°	lemon°	sweet basil°	ch'at°	sugarcane°
t'ef+	linseed°	taro°	chickpea+	garlic°	orange	rue°	tobacco°	
maize°	castor°		lentil+	pumpkin°	shaddock	coriander°		
sorghum°			fenugreek+	tomato°	citron	Ethiopian caraway°		
finger millet			common bean+	Jack bean	loquat	black cumin°		
					grape	fennel°		
					peach	buckthorn°		
					banana	thyme		
					papaya			
(b) the Sidamo								
wheat+	*Brassica*+	ensat+	horse bean+	cabbage+	peach°	sweet basil°	coffee+	cotton°
barley+	castor°	yam+	pea+	*Solanum dasyphyllum*+	passion fruit°	rue°	ch'at°	sugarcane°
maize°	sunflower°	taro°	common bean°	*S. nodiflorum*+	orange°	*Capsicum* pepper°	tobacco°	lemon grass°
sorghum°		sweet potato°	lima bean°	pumpkin°	lemon°	coriander°		
t'ef°		cassava	*Psophocarpus palustris*	tomato°	mandarin°	fennel°		
		Galla potato		onions°	lime°	buckthorn°		
		potato		garlic°	*Annona*°	mint		
					loquat°	ginger		
					banana°			
					grape°			
					papaya°			
					guava°			

Table 5 *(continued)*

Cereals	Oil crops	Tuber crops	Pulses	Vegetables	Fruits	Condiments and spices	Stimulants	Other crops
					pomegranate°			
					mango			
					black mulberry			
					shaddock			
Ensat as co-staple, with cereals and tuber crops (see 6.5.2.2)								
(a) the Wollamo								
wheat+	*Brassica*+	ensat+	common bean°	cabbage+	banana°	*Capsicum* pepper+	tobacco+	cotton+
barley+	castor°	Galla potato+	horse bean°	*Solanum dasyphyllum*+	lemon°	sweet basil+	coffee°	sugarcane°
t'ef+	linseed°	sweet potato+	pea°	*S. nodiflorum*+	lime°	ginger+		lemon grass°
sorghum+	safflower°	potato+	fenugreek°	pumpkin°	passion fruit°	buckthorn°		grain amaranth°
maize+		yam+		onions°	citron	rue°		
		taro+		garlic°	papaya	coriander°		
		anchote		cabbage tree° *(Moringa)*		fennel°		
		cassava				thyme°		
						bishop weed		
(b) the Amarro								
barley+	safflower°	ensat+	horse bean+	cabbage+	lemon°	*Capsicum* pepper°	coffee°	cotton°
t'ef+		Galla potato+	pea+	pumpkin°	lime°	ginger°	ch'at°	sugarcane°
wheat°		chich'e+ *(Araceae)*	common bean°	onions°	banana°		tobacco°	
sorghum°		taro°		garlic°				
maize°		yam°						
finger millet°		sweet potato°						

Table 5 *(continued)*

Cereals	Oil crops	Tuber crops	Pulses	Vegetables	Fruits	Condiments and spices	Stimulants	Other crops
(c) the east Gamu Gofa tribes								
barley+ wheat° t'ef° maize°		ensat+ Galla potato+ kolto+ *(Araceae)* yam° taro°	pea°	cabbage° pumpkin°	banana° lemon°		coffee° tobacco°	cotton° grain amaranth°
(d) the Janjero								
barley+ wheat+ t'ef+ sorghum+ maize° finger millet°	linseed+ castor+ sesame° safflower° *Brassica*°	ensat+ Galla potato° taro° yam° kusho° *(Dioscorea?)* sweet potato° potato°	horse bean+ pea+ lentil+ common bean°	cabbage+	peach+ banana° grape°	coriander° black cumin° Ethiopian caraway° ginger°	coffee° tobacco°	cotton° sugarcane°
(e) the Kaffa								
maize+ sorghum° barley° wheat° t'ef° finger millet°	niger seed° linseed° castor° *Brassica*°	ensat+ taro+ yam+ anchote+ *(Cucurbitaceae)* Galla potato° sweet potato° potato° cassava°	common bean° horse bean° pea° lentil° cowpea° pigeon pea	cabbage+ tomato+ onions° garlic° pumpkin° *Solanum dasyphyllum*° *S. nodiflorum*°	banana° papaya° orange° lemon° lime° citron° tree tomato° passion fruit°	*Capsicum* pepper+ false cardamom+ buckthorn° ginger° black cumin° Ethiopian caraway°	coffee+ ch'at+ tobacco°	cotton° sugarcane° lemon grass° grain amaranth° poppy

Table 5 *(continued)*

Cereals	Oil crops	Tuber crops	Pulses	Vegetables	Fruits	Condiments and spices	Stimulants	Other crops
					pine apple°	rue° fennel° sweet basil° coriander°		
(f) the west Gamu Gofa tribes								
barley+ t'ef+ sorghum+ maize° finger millet°		ensat+ taro+ yam+ sweet potato°	common bean° horse bean° pea° cowpea° zati° *(Papilionaceae)*	cabbage+ pumpkin° tomato° onions° garlic° cabbage tree° *(Moringa)*	banana°	*Capsicum* pepper° ginger° anise°	coffee+ tobacco°	
Ensat not as co-staple, with tuber crops dominant and cereals of secondary importance (see 6.5.2.3)								
(a) the Gimirra tribes								
barley° t'ef° maize° sorghum°	castor°	ensat+ yam+ taro+ karka bada° *(Dioscorea?)*	common bean° lima bean° cowpea° bak'era° *(Papilionaceae)*	cabbage+ pumpkin°		false cardamom+ *Capsicum* pepper°	coffee+ ch'at° tobacco°	grain amaranth°
Ensat not as co-staple, with cereals dominant and tuber crops of secondary importance (see 6.5.2.4)								
(a) the Galla of Kefa								
maize+ sorghum+ t'ef+ barley°	*Brassica*° castor° sunflower°	ensat+ taro+ yam+ Galla potato+	lentil° chickpea° common bean° lima bean°	cabbage° pumpkin° onions° garlic°	banana° papaya° guava° passion fruit°	*Capsicum* pepper+ coriander° rue°	coffee+ ch'at+ tobacco°	cotton° sugarcane° lemon grass° grain amaranth°

Table 5 *(continued)*

Cereals	Oil crops	Tuber crops	Pulses	Vegetables	Fruits	Condiments and spices	Stimulants	Other crops
wheat° finger millet°		anchote° *(Cucurbitaceae)* sweet potato° cassava° potato°	runner bean° horse bean° pea° pigeon pea	tomato° *Solanum dasyphyllum*°	orange° lemon° lime° citron° loquat° grape° tree tomato° peach° black mulberry° pomegranate° shaddock mandarin mango pine apple Italian apple gooseberry	sweet basil° fennel° ginger° buckthorn° rosemary° garden cress° thyme		

1. The occurrence of the crops is indicated as follows: frequent with +, infrequent with ° and rare without a mark.

in the colder parts where cereals and pulses are grown. Additional in the lower parts are t'ef, maize, sorghum and niger seed, in the daga barley, pea, horse bean and linseed; the woyna daga is favourable for coffee, tobacco and ch'at. Cotton is grown in the river valleys in the west (Shack, 1966).

Social and economic life of the Gurage rests on the cultivation of ensat, which satisfies many of their essential needs. They practise a system of semi-permanent cultivation marked by an extensive use of manure and crop rotation that enables them to use the same plots indefinitely (Shack, 1966).

Space required for planting a new crop only becomes available after a mature ensat crop has been harvested. Hence, the agricultural season actually begins at harvest. Preparation of the soil, the setting of ensat and sowing of secondary crops take place in the dry season from September through March. Ensat fields vary in size, but the lay-out of fields in connecting with the four stages of ensat growth is everywhere the same. Each section of land takes its name from the age of the plants grown there. From the first to the last stage they are named 'fanfa', 'takat', 'matka' and 'heba'. After some weeks young sprouts are transplanted close to the hut. They are never planted in the ensat-field along with older, mature plants. By the end of one season 'suma' (a one-year-old ensat plant) is transplanted to the field and this is the start of the ensat cycle, i.e. the system of transplanting. All ensat that have reached one of the four successive stages of maturity in a certain season are transplanted. A period of eight years elapses between planting of 'suma' and harvest of the full grown ensat. Thus 'suma', planted in a certain season, proceeds together as one group through each successive stage of the cycle, and is harvested in the same season, eight years later. Each 'suma' is transplanted to a manured planting hole from which a 'fanfa', having grown there for two years, has been transplanted to the second stage, 'takat'; the four year-old 'takat' advances to the next stage and is called 'matka'; transplanted, it becomes 'heba'. In the second year after transplanting 'heba' normally bears the 'false banana'. Gurage say that 'heba' should be harvested in the same season in which the 'false banana' appears; if not, the plant is said to wither and decay, the corm becoming coarse, fibrous and inedible (Shack, 1966).

On most Gurage plots a new ensat cycle is started each planting season, resulting in two overlapping cycles at any given time. Usually two ensat cycles contain a sufficient number of plants to maintain a more than satisfactory food supply. Consequently, the Gurage are capable to utilize a certain surplus of arable land for cash crop production. The average number of plants per year required for one adult is estimated about ten ensat plants. The final number is estimated on the basis of the family size, and thus regulated. By planting a definite number of 'suma' to provide for a concomitant number of matured plants, the harvest is rigorously controlled by the size of the farmer's family. Economic factors alone do not govern decisions to grow more or less ensat, also social factors are involved. If a Gurage can plant more ensat than his subsistence needs require, he will do so, since the status and prestige of a Gurage is related to the size of the ensat holding as well as to the height and girth of the matured plants. Most families grow a small surplus, the food from which may be

bartered for other food products. By mid-December harvesting in most homesteads has been completed. The cultivation of cash crops is made possible by making the most intensive use of the available land. Spacing alloted between the ensat plants seldom exceeds 3—4 m, and is used for growing secondary and cash crops (Shack, 1966).

(b) The *Hadya (Gudela)*, *Kambatta* and *Tambaro* live on the western escarpment of the Riftvalley south-west of the Gurage and north of the Wollamo. They rely heavily on ensat, and their crops are similar to those of the Gurage.

(c) The *Sidamo* live south of Lake Awasa, partly in the Riftvalley, partly in the Eastern Highlands of Sidamo. The main feature of this area is the ridge of the Eastern Highlands running north-east to south-west, with its highest parts the Garamba Plateau in the north and the Hula-Agere Selam Plateau in the south. Its western slope is broad, the eastern slope passes into a broad plain (at 2300—2600 m) dissected by the upper reaches of the Ganale Doria. The region is characterized by large ensat plantations; furthermore there are coffee gardens around Dila, cereal crops around the Amhara settlements on the Hula Plateau, and pastures on the Garamba Plateau (Smeds, 1955).

In addition to ensat, between ca 1700 and 2000 m, numerous coffee shrubs occur,

Photograph 62. Hut with ensat (left) and banana (right) in Wondo valley, Sidamo.

together with small surfaces of cabbage, taro, yams, maize, sorghum, beans, tobacco and condiments (Kuls, 1958).

In January or February, ensat corms are buried; after three months the newly formed suckers are transplanted; after about one year the young plants are brought to the definite field, previously cultivated either also with ensat or one year with maize or sorghum. Young ensat is never planted on new land or in places which have been fallow for some time. In the final plantation it takes 5 to 7 years before the crop can be harvested. Age classes are not mixed, except near the huts where 2 to 3 years old plants occur between older specimens to maintain a row of large ones around the huts (Kuls, 1958).

The fermented starch, 'kocho', is mainly prepared in January and February. When the stock is insufficient till the next year or only till the maize harvest in September, more ensat plants are harvested in July (Kuls, 1958).

Coffee is sown close to the hut and after a year the seedlings are moved to the ensat plantation. After 4—5 years the first harvest is reaped, and the coffee shrubs remain there as long as they do not die. Harvest time of coffee is from mid-December till the beginning of February (Kuls, 1958).

Already in February the first preparations are made for sowing maize and sorghum. Next to the ensat plantation a part of the homestead is mostly used for cultivation of maize, sorghum and beans for only two years, and afterwards the land either is left fallow or used for a new plantation of ensat. The cultivated plots of the homestead are irregularly bounded and in two successive years these boundaries are generally not identical. Within the homestead small acreages of wheat, barley, t'ef and pea are found, but the cultivation of cereals is very limited. The harvest of the cereals starts in September and goes on until, in the beginning of December, maize, t'ef, barley, wheat and sorghum are reaped. In spite of the application of cattle dung in that part of the homestead on which ensat is grown, this crop is not cultivated permanently on the same spot, but rotates. As a consequence also the homestead undergoes a periodical shifting. Only ensat, coffee and cabbage are manured. In the ensat and coffee plantations an *Erythrina* is planted to profit from the nitrogen increase due to root bacteria (Kuls, 1958).

Outside the boundaries of the homesteads, the Sidamo regularly use land for a kind of shifting cultivation (the Wollamo, the Gamu tribes and the Darassa do not). It produces the bulk of the cereals. For this purpose, in January forest land is burnt and cleared on which end February maize, sorghum and t'ef are sown (rarely wheat and barley) for two to three years; up to ca 2000 m maize is preferred to sorghum. Afterwards these plots revert again to forest or they are planted with young ensat (Kuls, 1958).

Within the ensat area, different zones can be distinguished. Between ca 1800 and 2000 m, coffee is the most important cash crop. In this coffee zone maize is important, with small surfaces of t'ef, wheat, taro, beans (often mixed with maize), sweet potato and tobacco. At ca 2000 m, maize, sorghum and coffee decrease and wheat, barley, pea and horse bean appear. In this wheat-pulse zone, extending to ca 2500 m, the

Photograph 63. Field with young ensat, cabbage *(Brassica carinata)* and dying coffee south of Awasa, Sidamo.

Photograph 64. Ensat and stores for maize south of Awasa, Sidamo.

Photograph 65. Pseudostem of ensat plant.

homesteads are further apart and pasture areas become larger. Cereals and pulses alternate in an unfixed rotation, no manure is applied, mainly the hoe and the digging stick are used. Up to 2100 m, isolated coffee shrubs occur, but plantations are absent. Between 1900 and 2000 m, bamboo *(Arundinaria alpina)* appears; above 2000 m it forms an integral part of every homestead. Typical for this zone are the ensat nurseries: small bamboo-fenced plots one year grown with a cereal, the second year with fertilized ensat suckers, followed again by a cereal or by a pulse, and then returning to pasture. The young ensat plants are sold to people of the coffee zone who value them for their vigour (Kuls, 1958).

The upper ensat zone is the barley zone between 2400—2500 m and 3000 m. Characteristic are its bamboo fences and huts. Next to barley, cabbage (especially close to the huts) and ensat are important. The exit of the huts always immediately

leads to an ensat plantation. Cabbage is grown in the same place for several years; their leaves, an important market product, are cut when needed, and according to Scott (1952), the plants may reach an age of 3 to 4 years. Barley is cultivated, both near the houses and in the midst of pastures, and then in pure stands for several successive years. When yields drop, a new piece of pasture is selected and fenced with bamboo. Seeding is spread over a long period so that all growth stages are found together. Harvest extends from January to early March. Wheat is rare above 2500 m, t'ef disappears at 2400 m, sorghum and maize already far earlier. Only horse bean and pea can grow up to 2700 m, but they are unimportant in the barley zone. Above 3000 m, all agriculture has disappeared and the land is solely used for temporary

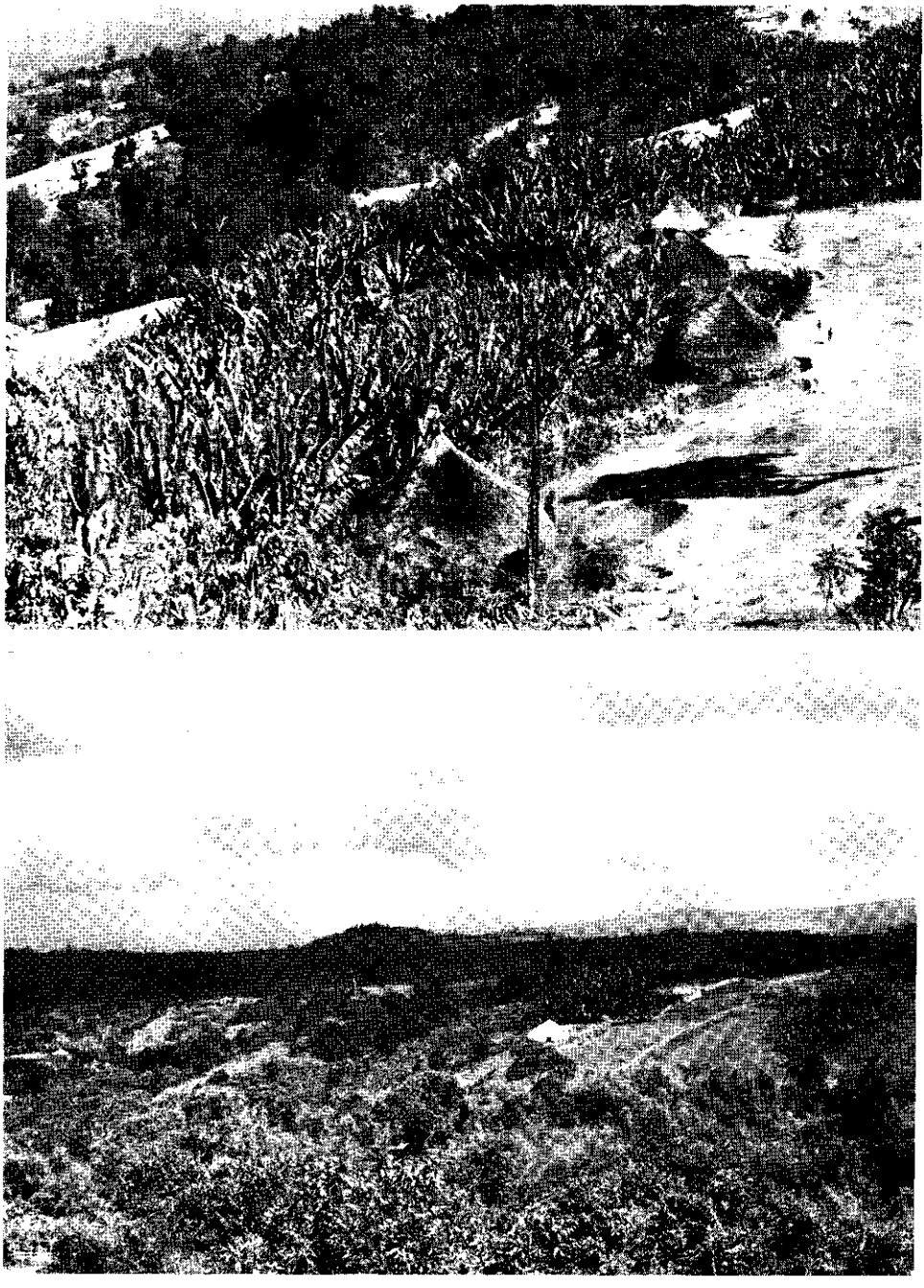
Photograph 66. Yam ('boye', presumably *Dioscorea abyssinica*) raised in the greenhouse at Wageningen from a tuber collected in a garden at Wenago (WP 2822), Sidamo.

Photograph 67. Detail of yam plant depicted in Photograph 66.

grazing (Kuls, 1958)[7].

In the dry lowlands of the Riftvalley, between Lake Abaya and Lake Awasa, the Sidamo tend cattle herds and agriculture is rare (only some small, carefully fenced plots with cotton occur). At ca 1500 m fields with maize and sorghum are present around permanent settlements. Ensat is absent there but appears from 1600 m on. Up to ca 1800 m, at the lower limit of the coffee zone of the ensat area, land is mainly used for pasture (Kuls, 1958).

7. In other parts of Ethiopia, barley reaches higher altitudes: Werdecker (1955) observed it at 3800 m in the north; Jackson et al. (1969), for the Gamu Highland, mentioned nearly 4000 m as its upper limit.



Photograph 68. Ensat plantations on the escarpment of high Sidamo south-east of Wondo, Sidamo.

Photograph 69. Bamboo hut and fences and an ensat plantation north of Agere Selam, Sidamo.

(d) The *Darassa* live south of the Sidamo. They heavily depend on ensat, but contrary to the Sidamo they do not use dung. Except for cabbage other food crops play only a very modest part in their diet. Coffee is such an important cash crop that the Darassa country looks like one large ensat-coffee plantation (Kuls, 1958). With the money earned by selling coffee, the people buy meat from other tribes (Stanley, 1966).

6.5.2.2 Ensat as co-staple, with cereals and tuber crops

Here ensat has lost its dominant position and shares its importance as food crop with cereals and tuber crops. This type of ensat cultivation is found in north-west Sidamo (Wollamo), Gamu Gofa (Amarro, east and west Gamu Gofa tribes), and Kefa (Janjero, Kaffa).

(a) The *Wollamo*, living in north-west Sidamo north of Lake Abaya and between the Omo and Billate rivers grow more crops than the Sidamo, and in different proportions (ensat occupying only one fifth of the cultivated area) and the people apply other methods. Especially in eastern Wollamo the crops are arranged in an almost fixed pattern around the homesteads: on both sides of the entrance cabbage, tobacco, *Capsicum* and some other spices are grown, behind the hut is first a semicircle of coffee shrubs and then a relatively small ensat plantation. The fields with a mixture

Photograph 70. Ensat plantations and cereal fields near Soddo (Wollamo), Sidamo.

Photograph 71. Characteristic landscape east of Soddo (Wollamo) with ensat plantations and cereal fields (wheat, t'ef), Sidamo.

of maize, sorghum, beans and cabbage follow, and the most remote parts are occupied by pure stands of t'ef, wheat, barley, pulses and various tuber crops. Manuring is not restricted to ensat or the immediate surroundings of the house as in Sidamo, but includes other fields as well, though not all crops; it generally diminishes with the distance from the house. On the most remote fields crops rotate in certain successions, including irregular fallow periods. The boundaries change from year to year (Kuls, 1958).

The cultivation and use of ensat do not differ basically from those of the Sidamo; only the design of provisions is much less developed. Suckers are obtained by slicing a suitable corm into pieces and burying these. Most ensat types are harvestable after a growth period of four years (Kuls, 1958).

Farming requires much labour: land for cereals has to be carefully cleared, during the development of cereals and tuber crops weeding is necessary. In February the Wollamo start planting sweet potato on unmanured land, first ploughed and then tilled with the hoe. This cultivar has white, round tubers, that planted in June has small dark ones. After hoeing, or at least twice ploughing in March or April a mixture of maize, sorghum and beans, sometimes together with cabbage and pumpkin is sown. Immediately afterwards the field is ploughed again. It is possible to grow such mixtures for several years in succession without manuring at the same place. Then the land is left fallow for a year, or other crops are grown (preferably sweet potato).

Successively, the fields for wheat, pulses and barley are ploughed and sown in at the end of May or the beginning of June, and the second type of sweet potato is planted. In the same period the sweet potato planted in February is ready for harvest. Sweet potato is never planted on ridges. All fields are weeded at least once during the development of the crops, an operation that has to be finished before the seeding of t'ef in July. The harvest of the cereals starts in November with barley and ends in the beginning of January with maize and sorghum (Kuls, 1958).

Special attention is paid to the cultivation of taro and Galla potato. Taro fields are ploughed or hoed and planted in November; during the next twelve months, in which the crop develops, the soil is regularly tilled with the hoe. In March, maize is often sown between the other crops; later on it protects the taro against too heavy

Photograph 72. Young taro *(Colocasia esculenta)* near Buditi (Wollamo), Sidamo.

Photograph 73. Young ensat plantation and plot with dark coloured Galla potato *(Coleus edulis)* west of Soddo (Wollamo), Sidamo.

Photograph 74. Taddesse Ebba in field with flowering Galla potato investigating a dark coloured taxon of this tuberous crop west of Soddo (Wollamo), Sidamo.

Photograph 75. Plot with yam ('boye', presumably *Dioscorea abyssinica)* near Budíti (Wollamo), Sidamo.

insolation. The taro fields are situated either close to a stream for irrigation, or on black soil. The Galla potato is another crop characteristic for Wollamo and Borodda. It accompanies ensat till its upper limit of cultivation and also occurs in Amarro and the Gamu Highland, whereas the Sidamo and Darassa hardly cultivate it. Fields for the Galla potato are prepared with the hoe, broad furrows are dug in which the plant holes are made. Each hole is manured, and finally three or four tuber slices are planted per hole. About one month later, in the middle of May, the young plants are earthed up; this is repeated several times until finally, the plants grow on 10—20 cm high ridges. After the harvest, which begins in September, planting material for the next year's crop is kept in the field till December; then the tubers are wrapped in ensat leaves and grass and buried in the ensat plantation till April (Kuls, 1958).

Because two types of sweet potato are cultivated, together with taro, Galla potato, yams *(Dioscorea abyssinica* and *D. bulbifera)* and at present also potato, the Wollamo have some tuber crops at their disposal the whole year round. Thus their menu is much richer than that of the Sidamo as far as tuber crops are concerned (Kuls, 1958).

Each altitudinal zone has its own crops but, of course, their altitudinal limits are about the same for the various tribal regions. On the western escarpment of the Rift, ensat hardly exceeds 3000 m. There the lower limit of ensat cultivation is higher than on the eastern escarpment in Sidamo, due to less precipitation. In Fango (east Wollamo) the borderline is at ca 1950 m, in Kindo (west Wollamo) at ca 1450 m, again

due to the higher rainfall. In the lowland west of the Rift lakes, banana and the cabbage tree *(Moringa stenopetala)* are present. The last one is found close to Lake Abaya and in the Omo area of Wollamo, but also in the region of the Konso, Burji, Seisse, Male and Dime, and on Gedicho island in Lake Abaya. The upper limit of this tree is at 1700—1800 m. In Kindo (west Wollamo) a special feature is the frequent cultivation of ginger. The first Wollamo settlements appear between 1400 and 1500 m, close to the Omo river already at 1100 m. In this rather extensive lower cereal zone sorghum, maize, beans, yam, taro, tobacco and cotton are important crops. Around the huts dense stands of manured sorghum and maize are present, but already 10 to 20 m away manuring abruptly stops. Close to the homesteads, on plots of a few square meters, various yams grow. Further away, the crops are grown in rotation and large areas are under grass. Plots are often terraced, unlike those in the corresponding

Photograph 76. Yam plant from plot depicted in Photograph 75.

Photograph 77. Tuber of yam (WP 4047) collected in plot near Buditi (Wollamo), Sidamo.

Photograph 78. *Solanum nodiflorum* (leaf vegetable) and taro in garden near Buditi (Wollamo), Sidamo.

zone of the Sidamo and related tribes (Kuls, 1958).

Where ensat appears, at 1500—1800 m, larger areas are available for other crops. Up to 2000—2100 m ensat is accompanied by sorghum and maize, taro, sweet potato and yam. A zone with extensive coffee plantations is absent, both in Wollamo and in the adjacent southern region. Remarkable is the appearance of bamboo *(Arundinaria alpina)* between 2000 and 2100 m. Above this altitude Galla potato and potato become more significant, sorghum and maize reach ca 2300 m, wheat ca 2450 m, and from ca 2400 m onwards barley is the only cereal. In the higher parts potatoes have superseded cabbage; their cultivation is simple: fields are ploughed or hoed every 3 to 4 months. Tubers brought to the surface are collected, those left behind in the soil are sufficient for a new crop. After some years the harvest is so small that fields have to be left fallow or are used for barley. In the highest zone of ensat cultivation, barley is grown without terracing, but as a protection against erosion sloping furrows are dug (with the digging stick) to allow a rapid water run-off. Below ca 2500 m, two barley harvests a year are possible: the first sown in March, the second in July or begin August, quite often on the same place. In both cases manure is applied. Above 2500 m only one barley crop is possible; it is sown in July or August, at the height of the big rains (Kuls, 1958).

For the agricultural calendar of the Wollamo see Fig. 5.

The agriculture of the Borodda, who live between the Wollamo and the Gamu tribes, hardly differs from that of the Wollamo. Interesting is, however, that on many plots wild *Araceae* are grown *(Amorphophallus abyssinicus, Arisaema, Sauromatum nubicum)*, known under the collective name 'kolto'. Minor crops are e.g. grain amaranth and a tuberous *Cucurbitacea* called 'ushushe' *(Coccinia abyssinica)*. The first is sometimes found in Wollamo, the latter is not cultivated anymore (Straube, 1963).

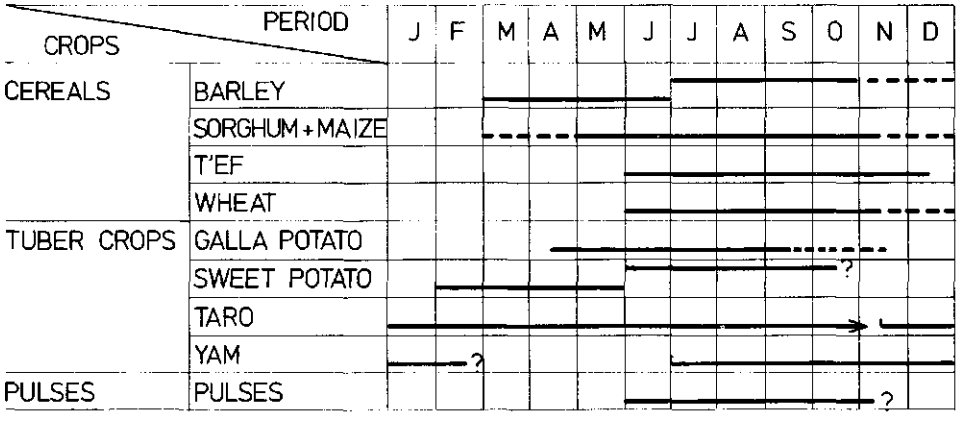


Fig. 5. Agricultural calendar of the Wollamo, Sidamo (source: Kuls, 1958).

(b) The *Amarro* (also called Koira or Badditu) live on the steep mountain range of Amarro. They are the only people on the east side of the Rift who speak a language of the Ometo group. As a result of the Pax Amharica, numerous Amarro have settled at the foot of the mountains where living conditions are more favourable. Large terraces and fields surrounded by stone walls are found on the slopes, but most of them have been abandoned. The Amarro still grow ensat as an important staple food. Since they do not ferment its starch, plants are harvested when they are needed (Straube, 1963).

In the highlands, next to ensat, cabbage, pea, horse bean and barley are grown. In addition two tuberous food plants are cultivated: the Galla potato, and an *Aracea* called ch'ich'o which grows wild in ensat plantations. Galla potato is planted in April in one year old ensat fields; it is harvested in August. Uncooked, the chi'ch'o is poisonous. Taro and yam do not occur at these altitudes, but they grow under irrigation in the eastern foot plains of the Amarro Massif. During July and August, the fields are prepared with a digging stick and a two-pronged hoe; in the flat plains at lower elevations the plough is used. Irrigation is practised in the highlands as well as in the foot plains. On high ground ensat plantations and pastures are irrigated, in the plains gardens and fruits. Ensat is manured, other field crops are not. Fields are left fallow for two years after a three year's cultivation with barley, a pulse, and again barley. In regions below 2300 m, where two crops a year are possible, pea and horse bean are grown in 'summer', barley in 'winter' (Straube, 1963).

In the eastern foot plains (ca 1600 m) barley, wheat, maize, sorghum, finger millet, t'ef, safflower, cotton and beans are cultivated. For several crops two harvests a year are possible. Cotton is planted in April and May and three pickings follow: in February, in September of the next year, and one year afterwards (Straube, 1963).

For the agricultural calendar see Fig. 6.

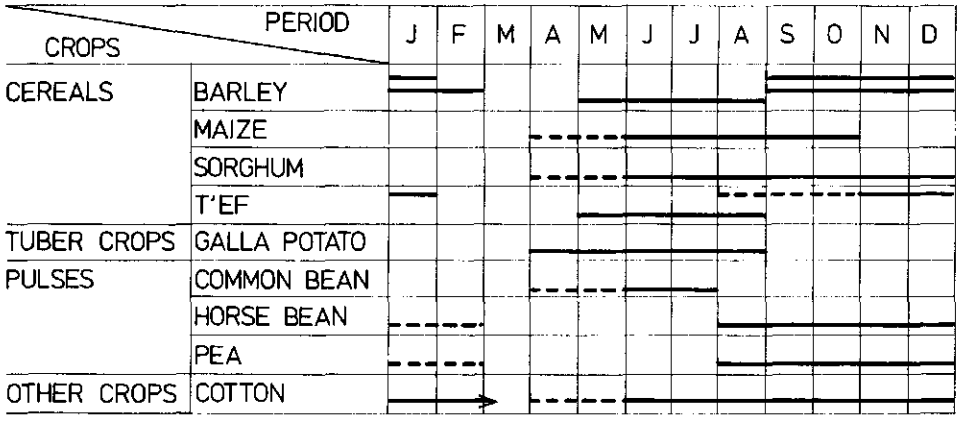


Fig. 6. Agricultural calendar of the Amarro, Gamu Gofa (source: Straube, 1963).

(c) The *east Gamu Gofa tribes* live in the Gamu Highlands, immediately west of the Riftvalley. Their settlement pattern in this area is the same as that in the other ensat growing areas of the lake region, except for the Ochollo, Gidole and Seisse who have a village type of settlement. Also here, ensat is not the only important food crop: the Galla potato is also frequent, next to barley and ensat. It is not grown in furrows, as in Wollamo, but on a kind of beds, on land that has been fallowed for one or more years. The ditches between the beds reach 50—70 cm deep and at mutual distances of 2—3 m. They irregularly divide the field and collect water during the rainy season. The cultivation of Galla potato (during June to October) is never repeated on the same field in the next year. For the cultivation of barley after the Galla potato, the field has to be levelled (Kuls, 1958).

Everywhere in the lake region between 2000 and 3000 m a wild *Arisaema* has some importance for the poorer people. According to Jackson et al. (1969), it is *A. schimperianum*, a native of the Chencha area. It is unique for the highlands of south-west Ethiopia. Some tribes in east Gamu Gofa also seem to grow this tuber crop between ensat plants or in barley fields. For planting the upper part of the tuber with some leaves is sufficient as it easily roots. After a few months a tuber as big as a fist has developed. Fields of pure *Arisaema* also occur, e.g. in the upper zone of ensat cultivation in Dita (Kuls, 1958).

Within the ensat region a coffee zone is absent, as in Wollamo, but in west Gamu Gofa coffee seems to be important (Kuls, 1958).

The extensive cultivation of barley in the highest zone of ensat cultivation is largely a field-grass rotation. Plots are preferably located on sloping ground and earthen terraces dominate the landscape of this zone. Fields are fixed and worked with the hoe, but the use of the plough is not unknown (Straube, 1963). The terrace surface slopes somewhat in the direction of the outer side and consequently the rainwater is carried off quickly. Often small furrows at the foot of each terrace are constructed through which the water runs off into larger drainage canals. To consolidate these terraces strips of grass are saved during the construction. Some tribes construct terraced fields of 10—20 m, sometimes up to 50 m long, with walls as high as 1—2 m (Kuls, 1958).

The dominant position of barley in the highest ensat zone is demonstrated by the fact that within the homestead barley grows on very well-manured plots. As in Sidamo, the homesteads and the ensat plantations shift after some time, not because of the poor development of the ensat, but because the land around the homestead is worked and manured so intensively during several years, that it becomes well-suited to cultivate barley. Up to ca 2500 m two barley crops are possible: sowing is in March and in July or in the beginning of August, mostly on the same plot and harvested in July and December respectively. In the barley zone it is sown in July or August (Kuls, 1958).

Typical for the higher regions of this ensat cultivation area is a small type of ensat, the corms of which are sliced and boiled. Plants are cut when one meter high. Probably this way of consumption is a result of the longer growth period of the plant (Kuls, 1958).

At the upper limit of cultivation, between 3000 and 3100 m, there is an abrupt change from agriculture to pastures. Only a few settlements are found which are surrounded by cabbage plots and barley fields, as in Sidamo (Kuls, 1958).

Among the east Gamu Gofa tribes, Straube (1963) has described several peoples of which the Dorse, Ochollo and Dita will be briefly discussed.

(1) The territory of the *Dorse*, living south of Chencha, is characterized by stone and earth terraces. The people are agriculturists and well-known as weavers. Important crops are ensat, Galla potato, barley and wheat. Ensat is harvested when needed and hardly stored. Galla potato, the second tuber crop, is planted in June, well-manured, weeded several times, and harvested in October. Since it is not a staple food, it is eaten only for some weeks after harvest. Taro and yam are infrequent, and occur only in the lowlands. Taro is planted in August, if food is scarce it is harvested five months later, otherwise after a year. It can be grown several years on irrigated fields. More important are two types of an *Arisaema* ('kolto'), collected in July and August. In particular barley and wheat are cultivated on terraced fields, barley twice a year (sown in July and February, harvested in December and June—July, respectively), wheat is sown in August and reaped in December. These cereals are dunged with cattle manure; leaves of trees present in the fields (preferably of *Croton macrostachys* and a *Vernonia*) and weeds serve as green manure. Ploughing has superseded the hoe. During harvest, the plants are pulled out and sheaved.

For some rotations see Table 4: 18—22; for the agricultural calendar of the Dorse see Fig. 7.

(2) Contrary to the dispersed homesteads of most Gamu tribes, the *Ochollo* live in villages (east of the Dorse). In some aspects they resemble the people of the Konso cluster, and they use human manure. In their gardens, starting at ca 1600 m altitude, they mainly grow cabbage, ensat and grain amaranth, together with some barley and many flowers. Most fields are on stone terraces on the eastern escarpment of the Gamu Highland; the important crops on manured fields are barley, wheat, maize, t'ef and Galla potato. Some fields are in the lowlands; there they are irrigated and cultivated with cotton, maize, lemon and banana.

(3) The *Dita* live in the central part of the Gamu Highland east of the Tola Massif. Stone and earth terraces are common. Important crops are barley, ensat, Galla potato, wheat and cabbage. Galla potato is cultivated on land unsuitable for other crops, alternating only with fallow periods. Two types are distinguished: one with red, the other with yellow tubers. Wheat is found at lower altitudes. Yams are sometimes grown. The ensat plantations are much smaller than those of the Dorse. Sometimes 'kolto' is encountered on a field scale. The land, permanently cultivated, is irrigated or intensively manured. Irrigation here has a fertilizing function and does not serve to moisten the soil, since rainfall is abundant at this altitude (2500—3000 m). The stock of cattle is very large compared with that of the Dorse, since extensive alpine pastures are available. Sheep dominate. During the night, the animals are kept in stables on a bamboo grate above a deep pit into which the dung falls. Arable land and pastures are kept strictly apart.

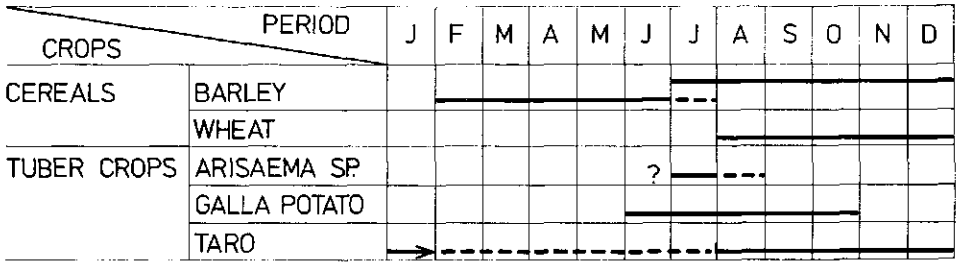


Fig. 7. Agricultural calendar of the Dorse, Gamu Gofa (source: Straube, 1963).

(d) The *Janjero* inhabit the area between the Little Gibbe and Omo rivers. Recent cultural influences are obvious because of their extraordinary rich stock of food plants. The diet is based on about equal parts of ensat, barley and wheat; pulses and several cabbage types are important. T'ef, sorghum, finger millet and maize are also grown. Pea (three types), horse bean (four types) and lentils are popular, horse bean being the most important. Besides ensat, Galla potato with red and white types, yam and taro are cultivated. In ensat plantations a wild *Arisaema* occurs as a weed but it is not eaten. In the forest of the Omo valley a climbing tuberous plant ('kusho') occurs whose tubers serve as a food; sometimes it is planted in the gardens. Straube (1963) assumed it to be a yam, as it resembles a wild one used by the Chako in Gimirra called 'karka bada'.

Tiffin (1965) reported the cultivation of potato, sweet potato and 'ajjo', not mentioned by Straube. According to Mooney (1963), 'ajjo' is *Coleus edulis*, but Straube gives for the latter the name 'duna'. Cabbage is found in every garden; six types are distinguished, three belonging to *Brassica carinata*. Oil plants in Janjero are safflower, linseed and sesame; spices and condiments include ginger, coriander, black cumin, and others (Straube, 1963).

In the lower areas, fields with cotton, maize, sesame, finger millet and sorghum occur. Most fields, however, are in the middle zone (above 2000 m), as is the case with the settlements. Between 2300 and 2700 m the principal cereals are barley, wheat and t'ef, barley being important in the upper part of this zone, t'ef in the lower parts. Maize and sorghum are not grown here. Linseed is common, and most homesteads have one or two castor trees (Tiffin, 1965). Fields with Galla potato are quite close to the houses and rotate annually. All crops are grown in monoculture, except horse bean and black pea ('karahatu') which occur together. Linseed and all peas (except the black type) are cultivated on small strips bordering cereal and horse bean fields. Safflower is found on small plots mainly on abandoned homesteads, on burnt wasteland, or on small plots in horse bean fields. Above ca 2000 m, coffee is absent (Straube, 1963).

The cultivation of ensat, of which the Janjero distinguish 46 types, is highly developed; it very closely resembles that of the ensat growing peoples in the lake region. The plant usually starts flowering after six years but the inflorescence is then quickly removed. The plantations are regularly manured. After nine years, three years after flowering, the ensat is harvested (Straube, 1963).

The extensive farming has led to serious erosion, though contour ploughing is standard, except on very steep slopes where the hoe, digging stick and spade are used. Drainage terraces are provided to prevent rapid runoff, though Straube reported sloping drains which carry off the water more quickly. Another type of terracing is obtained by using a special spade to form steps on the field. It has two points and a straight shaft. One man holds it at the top of the shaft and, standing on the slope above the place where the terrace is to be made, forces it down; another man, standing on the slope below, grasps the lower part of the shaft and pulls the broken earth outwards. On the slopes of the Omo gorge extensive terraces of this type are found.

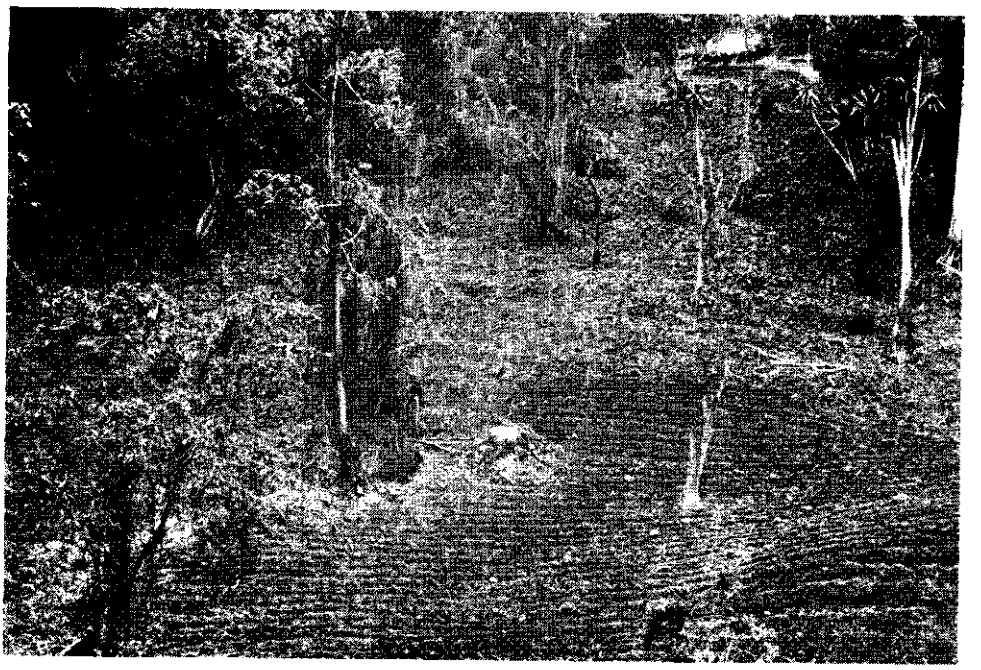
The size of the terraces varies; the walls consist of carefully fitted basalt stones, but the Janjero do not build them anymore. According to Straube (1963), they are still largely in use, but Tiffin (1965) reported that the people have completely abandoned them.

Crop rotation is practised but probably without fixed succession. It mainly involves alternating pulses, wheat or t'ef, barley, and fallow, the latter normally for three years, though periods of 1—5 years occur. The Janjero use manure for their fields, in the ensat plantation and for vegetable plots. At harvest, plants are pulled out. Straube reported that this also happened, in the past, with cereals, but at present a sickle is used to cut the plants at some 50 cm above the ground. After harvest, the fields are weeded, the weeds are piled, and at the end of the dry season they are worked under with the hoe. Before the rains start, these fields are burnt on a large scale, especially on the slopes of the Omo river (Straube, 1963). Soil burning is reported by Tiffin (1965), but it is not clear whether, perhaps, he means simply grass burning.

Normally, animals are kept on fallow or on uncultivated land (Tiffin, 1965).

(e) *The Kaffa*, with the Gonga once dominating the old Kaffa kingdom, speak Kaffinya (Bieber, 1920). They live south of the Gojeb river in the Kefa province.

In this high rainfall area, ensat is one of the staple foods. Its highly developed cultivation is concentrated around the houses. Many other crops are grown in addi-



Photograph 79. Shifting cultivation near Bonga, Kefa.

tion: barley, wheat, maize, sorghum, t'ef, various beans, pea, lentil, niger seed, potato, Galla potato ('ajo') and taro ('kido'). Farms, with their gardens and fields, are isolated in the forest. The latter are cultivated for four to five years, left fallow for one year, and then planted with another crop, or used as pasture and slowly reverting to forest which may, later on, be burnt for a new cycle. Bieber (1923) did not report the duration of the forest stage, probably because the Kaffa only partly follow a fixed system of shifting cultivation. In gardens and on small plots close to the huts the hoe is used. Crops include ensat, tobacco, ch'at, poppy, false cardamom, ginger, banana and lemon (Bieber, 1923).

Field preparation, with the plough or the hoe, is not restricted to a certain period, though it is concentrated in the months September to March. Manuring is unknown,

Photograph 80. *Aframomum korarima* (spice) growing wild in the forest, Bonga, Kefa.

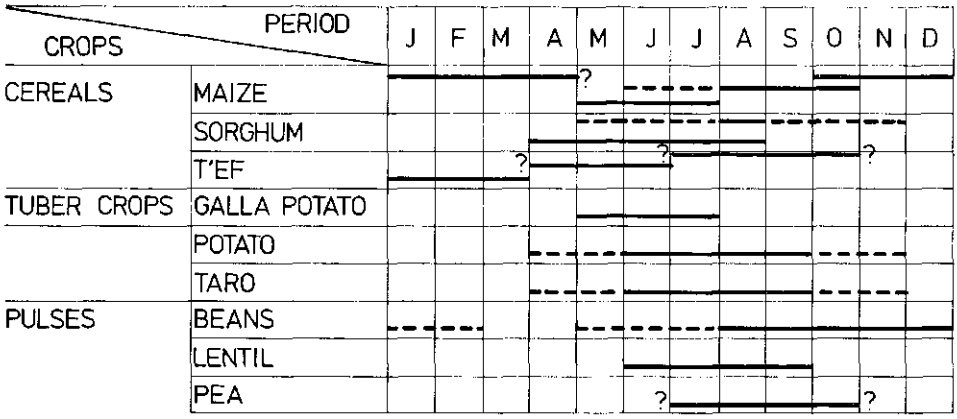


Fig. 8. Agricultural calendar of the Kaffa, Kefa (source: Bieber, 1923).

but cattle are allowed to graze the tilled land. In December, grass and crop residues are burnt and the ash is spread over the fields. The planting season generally coincides with the small rains between March and June (Bieber, 1923).

The leaves of the Galla potato are used as a vegetable and harvested when needed. Two types of beans are cultivated: 'gobbo' and 'otongoro', both *Vigna unguiculata*. They are sown at the same time as sorghum (which is the main crop), either mixed with it or pure. A special feature is the cultivation of 'wodisho' near streams in the forest; its tubers are a vegetable (Bieber, 1923).

For the agricultural calendar see Fig. 8.

(f) The *west Gamu Gofa tribes* live in the mountains that constitute a spur of the Ethiopian Highlands loosing height towards the south and dissolving into isolated mountain ranges. South of Bako (2200 m), they fall rather steeply into flat country at ca 1500 m, which ultimately passes into the lowlands of Lake Rudolf and adjacent areas at ca 300 m. In the lowlands several tribes dwell (e.g. the Chamako and the Geleba); in the 'midlands' live, among others, the Male and the Banna; above ca 1800 m the Ari, Basketto and Dime cultivate ensat (Pauli, in: Jensen et al., 1959).

Culture and economy of the Ari are extremely simple (Jensen, in: Jensen et al., 1959). Among the food crops sorghum dominates, whereas ensat is also very important. The various types of the latter, already reach a harvestable height of 4 to 5 m in three years. Among the Ari tribes fermentation in a pit is rather primitive and by no means reaches the standard of the highly developed and complicated fermenting procedure of other ensat-growing people. Next to sorghum, finger millet, barley and maize are grown; since the Amharan colonization t'ef is also present. The gardens contain a mixture of beans, cabbage, maize, taro, pumpkin, tobacco, tomato and some coffee shrubs. Three types of beans have been reported: horse bean, a bean called 'zati' with cordate leaves (maturing in 6 to 8 weeks), and a perennial bush bean. Also three cabbage types are found: two ('ekena' and 'godi') stay over for some years, the third

('patsa') does not stand the dry season (Pauli, in: Jensen et al., 1959).

At the end of the dry season, fields and pastures are burnt, the soil is broken with long digging sticks, and ultimately the lumps are chopped with a hoe. Occasionally a plough is used. Cereals are grown for seven years in succession on the same field which, thereafter, is left fallow for only two years. Maize is sown in February; at high altitudes it takes eight months before it can be harvested. Sorghum is probably sown later, the various types at different times. Only its panicles are harvested; the rest is burnt during the cleaning of the field. Barley plants, however, are pulled out (Pauli, in: Jensen et al., 1959).

Haberland (in: Jensen et al., 1959) gave the following information on the Basketto and Dime tribes.

(1) The *Basketto* tribes form a distinct unit, probably closely related to the Ari but strongly influenced in their culture by the Ometo, living north of the Ari in a hilly country not reaching over ca 2000 m. They inhabit a very fertile area, with ca 200 people per square kilometer; with that of the Konso, Wollamo, Dorse and Darassa this is one of the most densely populated regions of Ethiopia. Their agriculture has reached high standards. Characteristic is the cultivation of yam on numerous scattered quadrangular plots covering about a third of the fields. In the gardens around the huts ensat, cabbage, *Capsicum* pepper, tomato, onions, garlic, beans, pea, coffee, ginger, anise and other condiments are found. Adjoining these gardens, fields with yam, sorghum and maize occur. T'ef, finger millet and barley are rare. Taro and bamboo stands grow on wet places. Where close to the huts, poor fields are manured with dung and ashes. After 2 to 3 years, fields are left fallow for about the same period. Preferably yams follow sorghum on the same field. Ensat is either skillfully fermented or cooked.
(2) The *Dime*, like the Maji, dwell on rather isolated ridges surrounded by rivers and savanna. Although they speak a language related to that of the Ari, culturally they have nothing in common with them. Above all, their highly developed megalithic culture with huge stone terraces and stone houses distinguish them from the Ari. Some of them live in the lowland on cattle rising, but the majority are mountain agriculturists. T'ef is their pre-Amharan food crop; it plays the main role in their economy. Ensat, yam and taro are also cultivated on the terraces. Unlike other terrace-building people, the Dime do not fertilize or irrigate their food crops.

Around the huts, vegetables, ensat and tuber crops grow; cereals and cowpea, cultivated on a large scale, occur on fields further away. These fields are used for two years, followed by a fallow of another two years. As in the gardens, crops are cultivated in pure stands, except for taro and yam that grow together. Ensat and a number of t'ef cultivars are important food crops; in addition, sorghum, yam, taro and cowpea (of which the leaves are used as a vegetable) are grown. Less important are maize, barley, coffee, 'cabbage tree', sweet potato, white beans and banana. Ensat is mostly cooked. Wild ginger is abundant.

6.5.2.3 Ensat not as co-staple, with tuber crops dominant and cereals of secondary importance

Ensat lost its position as a co-staple and other tuber crops have become prominent to the neglect of cereals. This type of ensat cultivation is found in Kefa, e.g. under the Gimirra tribes.

(a) Most *Gimirra* tribes live in west Kefa, between the Gilo and Akobo rivers, an

area up from ca 1300 m covered with dense rainforest. Striking is a 'wild' type of *Ensete ventricosum*, called 'devil ensat', found both on humid places and on abandoned plots reverting into forest. In the lower strata of the forest grow coffee, *Catha edulis* and *Aframonum korarima* (Straube, 1963).

The Gimirra include several tribes. The most numerous are the Chako. The culture of the Gimirra is pre-Cushitic and Negritic elements predominate. It originates from root cultivators inhabiting the forest areas of south-west Ethiopia and it is probably older than the Nilotic culture based on cereals and cattle raising. The Gimirra are not the only survivors of this old stratum: the Ari and Maji also belong to it (Straube, 1963).

Gimirra agriculture still shows distinct primitive elements: terracing, manuring, irrigation and crop rotation are unknown or only very weakly developed. Shifting cultivation is applied on a large scale, mainly with yam, taro and ensat. Maize, sorghum and t'ef play a minor role and as a rule cereals are of secondary importance. Cattle raising is, economically, unimportant. The Gimirra are not familiar with complicated and specialized processes of ensat preparation as the ensat people in the lake region: the corms are simply cut into pieces and cooked (Straube, 1963).

Yams are the most valuable crop. Nine types are distinguished, including *Dioscorea bulbifera* ('woka'). In general, yam is planted in rows in fields. In the forest of the lowland zone, a wild or running wild type is found ('karka bada'); it is sometimes cultivated by the Chako in their gardens. Taro is grown on fields close to the huts; three types are distinguished. Ensat is less important as food than yam and taro. It is irregularly planted in the gardens, mixed with coffee and other crops; closed plantations are rare. Young plants are fertilized with domestic refuse. Cattle dung is spread only over fields on recently abandoned homesteads before ensat, yam and taro are planted. Ensat plants are harvested when three years old since, at this altitude, they will start flowering the next year. The Chako do not eat the wild ensat ('erfu') as food, the Bensho do, in times of scarcity (Straube, 1963).

Montandon (1913) reported two important tuber crops: taro and 'boure', the latter must be yam.

At present grain amaranth is grown mixed with maize. T'ef was already known to the Chako long before they contacted the Amhara, but nowadays it is almost absent. It resembles the t'ef grown by the Janjero. On newly cleared land maize is the first crop: three to four kernels are placed in holes one meter apart. Sorghum is sown in fields that are not cleared. Directly after sowing the weeds are cut and left to dry until they are removed one month later. Between two cultivation cycles the fields are left fallow for 1 to 3 years, sometimes even up to 6 years. By that time they are covered by an impenetrable vegetation that has to be burnt again. Fields with a short fallow period are cultivated in the sequence maize – sorghum – tuber crop. Maize and sorghum (for beer) are sown in February and harvested in August—September. Another sorghum type ('donka') is sown in May, reaped in January—February. A third sorghum ('shuri') and barley are sown in July—August and harvested in December—January. T'ef (Amharic type) is sown in September and reaped in December.

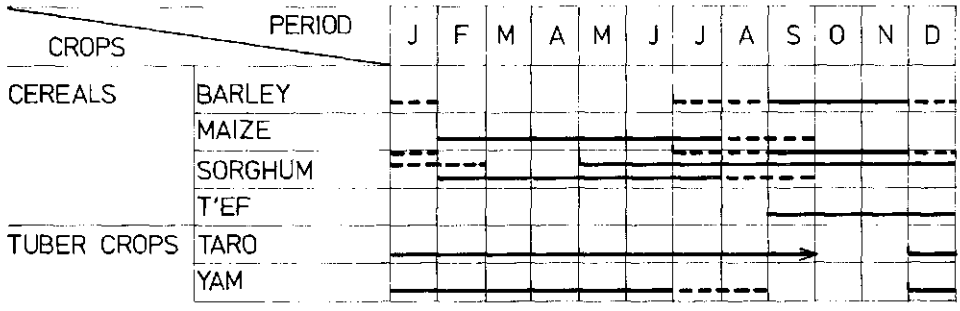


Fig. 9. Agricultural calendar of the Chako, Kefa (source: Straube, 1963).

Yams are planted in December and gathered in June—August. Taro is planted in December and collected after ten months; it may be grown up to five successive years (Straube, 1963).

In gardens four cabbage types occur, including *Erucastrum arabicum* and *Brassica carinata*. Three beans are found: common bean, a climbing one ('bak'ara') planted together with yam, and *Vigna unguiculata* whose leaves are used as a vegetable. Furthermore tobacco, coffee and grain amaranth are grown. Coffee is prepared in a very old fashioned way by roasting the leaves which then give a tea-like extract (Straube, 1963).

For the agricultural calendar see Fig. 9.

(b) For the *Maji* hardly any information on agricultural practices is available. Perhaps their methods do not basically differ from those of the Gimirra as yam, taro and ensat predominate and cereals are of secondary importance. But Cerulli (1956) reported that the Maji, unlike the Gimirra, intensively till the soil and have established terraces which would imply (if true) at least a semi-permanent system of land use, unknown with the Gimirra. In addition, Cerulli indicated that a kind of cassava is popular among the Maji.

6.5.2.4 Ensat not as co-staple, with cereals dominant and tuber crops of secondary importance

Ensat is cultivated in addition to other crops, of which cereals dominate. This type of ensat cultivation is found among the Galla in Wellega, Illubabor and Kefa.

(a) The *Galla of Kefa* live north of the Gojeb river. Not much is known about their ensat cultivation, but as a rule they grow it for security in case their other crops such as maize and t'ef fail. Indeed the altitude where the Kefa Galla live is not always well suited to ensat: the important ensat growing tribes live higher up in the mountains. The main area of the Galla's ensat is in the former Gibbe states (Jima, Gera, Goma, Guma, Limu), north of the Gojeb (Stanley, 1966).

For the Jima Galla economic life is based on mixed agriculture with the plough as the principal implement. Irrigation and terracing, although practised, play no

Photograph 81. Fields with t'ef *(Eragrostis tef)* and maize, and some bananas close to the Gibbe gorge near Abelti, Kefa.

Photograph 82. Fields with taro, ensat and maize south of Agaro, Kefa.

Photograph 83. Plantation of flowering Arabica coffee north of Jima, Kefa.

Photograph 84. Flowering shrub of Arabica coffee north of Jima, Kefa.

Photograph 85. Yam ('wocino', presumably *Dioscorea abyssinica)* raised in the greenhouse at Wageningen from a tuber collected at Jima market (WP 3311), Kefa.

Photograph 86. Detail of yam plant depicted in Photograph 85.

Photograph 87. Tuber of yam plant depicted in Photograph 85.

Photograph 88. Yam ('kotehare', *Dioscorea bulbifera*) raised in the greenhouse at Wageningen from an aerial tuber collected in a garden south-west of Jima (WP 5523), Kefa.

Photograph 89. Aerial tuber of yam plant depicted in Photograph 88.

Photograph 90. Tuber of yam ('kotehare', *Dioscorea bulbifera*) collected at a garden in Agaro (WP 3269), Kefa.

Photograph 91. Aerial view of huts with ensat and fields (e.g. cereals) south of Jima to Maji, Kefa.

important role. The climate and the wealth of crops in Jima enable the farmers to grow various crops throughout the year. Cereals dominate, t'ef being the most important. Maize is also frequent, especially as it is the only cereal available during the rainy season. Sorghum is another major crop. Finger millet, wheat and barley occur less. Other field crops include lentil, chickpea and taro. Among the main garden crops are ensat, Galla potato, sweet potato, several types of beans, pea, yam ('wocino' and 'kotehare'), a few leafy vegetables, and gourds. Ensat is not important, but, like maize, it fulfills a need during the rainy season and in other periods when few cereals are available.

The basic cash crop is coffee; it is mainly grown under the trees around houses and fields. Less important cash crops are ch'at, tobacco, and in some areas, cotton (Lewis, 1965). For a possible rotation in the Jima area see Table 4:23.

6.5.3 Shifting cultivation

Little information is available on shifting cultivation in Ethiopia. It has been reported for some tribes on the western and south-western fringes of the Ethiopian Highlands and in the lowlands (among the Gumuz, the Berta, the Kaffa, the Gimirra-Maji group, and possibly the Mekan-Surma group). It is also found in some parts of Sidamo. The Gumuz and Berta live in a region with deciduous woodland and extensive bamboo stands; the other tribes generally dwell in forest areas.

(a) The *Gumuz* dwell in the k'olla of western Ethiopia, from Metemma in Begemdir

Photograph 92. Yam ('kojo', *Dioscorea* sp.) raised in the greenhouse at Wageningen from a tuber collected at a market near the Didessa west of Nekemte (WP 3380), Wellega.

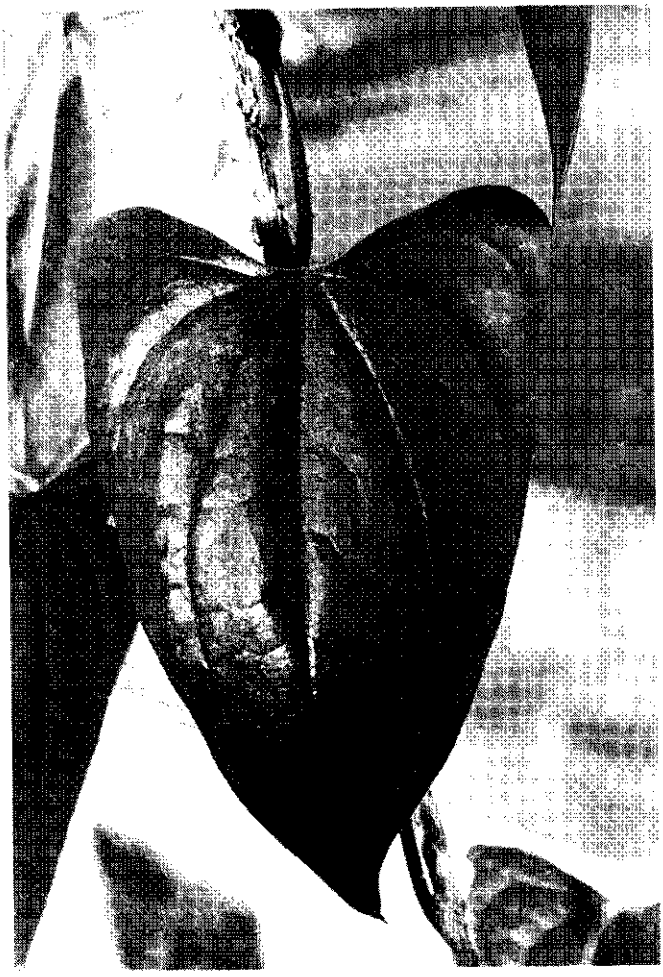
Photograph 93. Tuber of yam plant depicted in Photograph 92.

south in the lowland of the Balas in Gojam to the valleys of the Abbay, Dura and Didessa. Sorghum is the main food crop, cotton a prominent cash crop. Other food crops are maize, finger millet, sesame, groundnut and pumpkin. Simoons (1960) supposed that the Gumuz have neither tuber crops nor fruit trees and seem to have no knowledge of vegetative reproduction techniques. Kuls (1962), however, reported for the Gumuz in the Balas region the cultivation of yam and ginger.

Irregular plots, far from the settlements, are cultivated for one or two years and then left to be covered with woodland. The suitability of a piece of such woodland for repeated agriculture is judged on certain indicator plants, in particular grasses. During the dry January and February period, pieces of land are cleared and in March they are set on fire. When the rains come the crops are sown. Important implements are the bamboo planting stick and the hoe (Kuls, 1962).

The Gumuz distinguish the following five field types, depending on the crops.
(1) Fields for a *mixture of sorghum and finger millet* are sown between the end of March and May. Afterwards beans ('hopa'), pumpkin, bottle gourd and cabbage are sown in between. The cereals are harvested in December. The next year sorghum sprouts a second time from first season's shoots (ratoon), together with new sowings of sorghum, beans and pumpkin. Finger millet remains absent.
(2) Fields for pure *sesame* are found on level ground further away from the settlements. After clearing and burning they are sown once (in June and July) and harvested in December. Next year the cultivation is not repeated.
(3) Fields for *cotton* are sown in June and harvested end December/January till

Photograph 94. Yam ('kojo', *Dioscorea* sp.) raised in the greenhouse at Wageningen from a tuber collected at a market near the Didessa west of Nekemte (WP 3379), Wellega.



Photograph 95. Detail of yam plant depicted in Photograph 94.

May, after the sorghum. Afterwards the cotton fields are used for a second time. Sometimes sesame and sorghum are sown in between. Cotton is an important product on the highland markets of Begemdir and Gojam.

(4) Fields for *ginger* occur on the steep slopes of narrow valleys. Before burning, only the undergrowth is cleared. Ginger is an important product on the highland markets.

(5) Garden-like fields are close to the huts. Several crops are grown together, such as sorghum, cabbage, pumpkin, bottle gourd, yam ('eca'), maize, pea and beans. Simoons (1960) did not find yam with the Gumuz of Begemdir but reported lablab *(Dolichos lablab)*. The rather small fields are fenced with bamboo and fertilized with the manure of domestic animals that, during the night, are kept in enclosures that are shifted every four to seven days. At the end of the dry season yam is planted here,

followed by other crops in March and April (Kuls, 1962).

Other field types are unimportant. Some tobacco is grown on plots close to streams (sown in June, harvested in December). On the same places sometimes taro is found of which the leaves are eaten. Some wild plants are used for food, such as *Portulaca quadrifida* and bamboo sprouts (Kuls, 1962).

(b) The *Berta*, living south of the Gumuz in the k'olla of Wellega west of the Dabus cultivate sorghum, t'ef and chickpea. When soils become unproductive the plots are changed and the villages are moved. Where the people raise cattle, the villages are more or less permanent and the Berta use the recently introduced ox-drawn plough to cultivate the land (Hailu Wolde Emmanuel, 1963b).

(c) For shifting cultivation among the ensat growing *Kaffa* see p. 153.

(d) On the shifting cultivation among the *Mekan*, who live south of the Akobo between the Gimirra and Maji tribes, Cerulli's remarks (1956) suggested the presence of shifting cultivation among the Suri-Surma-Mekan group, but he is not quite clear at this point. The main crops are sorghum, beans, coffee, tobacco and coriander.

(e) Among the *Sidamo* a kind of shifting cultivation is practised in forest areas outside their homestead. Here cereals are grown (Kuls, 1958). North of Kebre Mengist, in an area with montane moist evergreen forest, plots have been observed in November 1967 with t'ef and tobacco, and old maize stalks in between.

6.5.4 The pastoral complex

The division of the Ethiopian agriculturists into seed farmers, ensat-planting farmers, and pastoralists (see Simmonds, 1958), though not always clear, is partly based on climatic and ethnical factors but mainly on the necessity (or its absence) to move from one place to another to feed the cattle. All three systems depend on the raising of livestock. To a greater or lesser extent seasonal migrations of livestock are common in all three systems. In the seed-farming areas, mainly in regions over ca 1600 m, cattle are kept chiefly for ploughing and breeders are needed to produce ploughing team replacements. Other livestock is limited because of the competition between arable land and the available pastures. In the ensat-planting areas domestic animals are very important in the economy, as dung is indispensable for the cultivation of ensat and other crops. As a rule, the ensat growing areas are situated at the higher altitudes from 1600 m to 3000 m and in those parts where rainfall is substantial and well-distributed. Both the population and cattle densities are high (Huffnagel et al., 1961).

The pastoral areas are usually, though not always, in the lower and drier parts of the country. Here large herds of cattle, sheep and goats are kept, as well as camels in the driest areas. The main areas of concentration are in the north, Hararge, the

Danakil Plains, the southern part of Sidamo, and the areas north of Lake Rudolf. Grazing systems among the pastoralists vary. Most pastoralists are nomadic, or semi-nomadic. Past invasions and migrations have brought some of them into areas where rainfall is adequate for arable farming, but the old traditions remain. In Ethiopia areas still exist which, though suitable for intensive farming, lack crops and ploughed land because the people carry on an extensive system of livestock raising (Huffnagel et al., 1961).

This situation, however, is not static. Administrative changes have often caused the land in these pastoral areas to be allotted to people who are arable farmers by tradition and who brought their ploughing culture with them. The colonization of such formerly pastoral lands proceeded quickly after the incorporation of the south into the Ethiopian Empire. Here the plough is not only used by immigrants from other parts of the country, but also by the local people (e.g. the Arussi). These pastoral areas are mainly inhabited by the Galla (such as the Borana, the Arussi), the Somali and the Danakil tribes in the south and east, and several tribes in the north (Huffnagel et al., 1961).

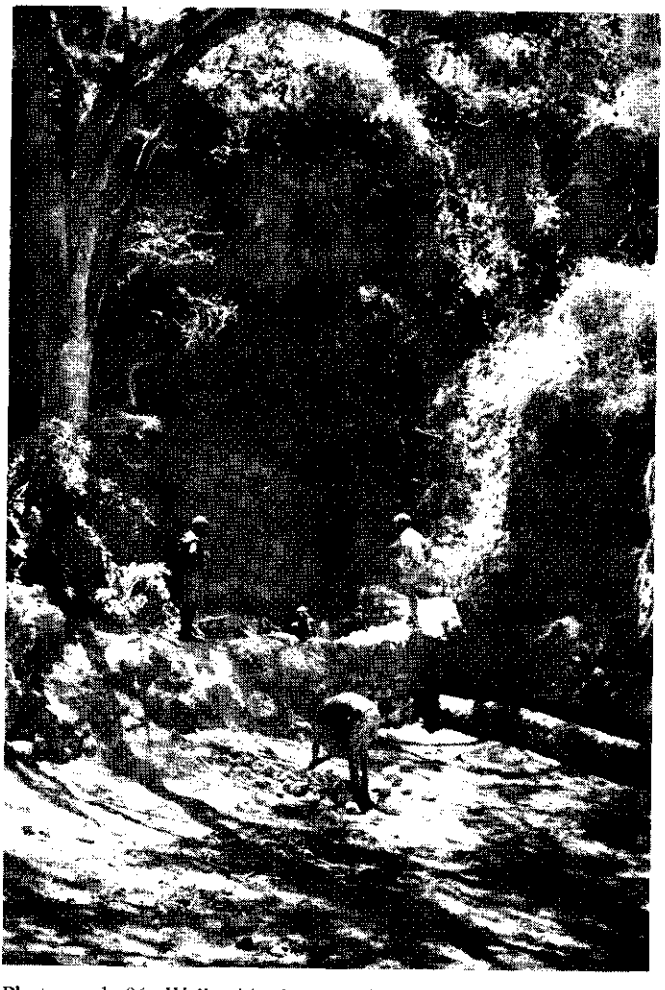
Some of the pastoral tribes will be treated now.

(a) The elements of *Galla* economy are cattle rearing and a very archaic form of cereal cultivation, given up when the tribes permanently settled in the lowlands. Their pastoral culture hardly differs from that of other tribes in east and south-west Africa (Haberland, 1963).

The Borana, Southern Guji (Jamjam), Northern Guji (Alabdu) and Arussi will be treated more in detail.

(1) The *Borana* originally lived in north Liban but were driven away by the Jamjam. Now they dwell in the savanna region south-west of the Dawa Parma, a territory suitable for large-scale grazing, the more so since great wells have been established. These show a peculiar structure with rows of water basins arranged one above the other. After their move to the lowlands, the Borana have completely abandoned agriculture and at present they live exclusively on the products of their herds, and on cereals which they obtain in exchange for butter, cattle and salt from neighbours. Wild fruits are important in their diet (Haberland, 1963).

The grazing system of the Borana, other Galla, and most of the south-Ethiopian tribes is characterized by the 'fora' ('place for cattle'). It indicates that most animals live on pastures far away from the semi-permanent settlements. For tribes practising the cultivation of crops and with little cattle the division between agriculturalists and cattle herders is sharp. For the Galla this division is not so marked, in particular not for the tribes living only in the highlands like the Southern and Eastern Arussi and the Mati. For other Galla tribes, however, which dwell both in the highlands and the lowlands (like the Western Arussi, the Alabdu, the Uraga and the Hoku) the system of grazing resembles that of other south-Ethiopian peoples: the cattle dwell either in the lowlands, or they developed a kind of transhumance. This means that part of the



Photograph 96. Well with the watering-place for cattle at right, Borana, Sidamo.

tribe moves with its cattle from the highlands to the lowlands during the rainy season, and returns to the high ground after the end of the rains. Sometimes cattle is also kept during the dry season in the lowlands (Haberland, 1963).

Even the Borana of south Sidamo, who exclusively live in the lower situated regions and have completely abandoned the cultivation of crops, still apply the system of 'fora'. Around their semi-permanent villages, close to the wells, only a part of the herds is found. The young men dwell on 'fora' with most of the cattle (Haberland, 1963).

(2) The *Southern Guji* or *Jamjam*, include the Uraga, the Mati and the Hoku. Originally they inhabited the highlands east of the Darassa and south of the Sidamo.

In the last hundred years they have greatly enlarged their territory at the expense of the Borana: in the west they have reached the plains around Lake Chamo and Lake Abaya. The old Galla type of cereal cultivation has been preserved under the Wantalju of the Mati, the Gagartu of the Uraga, and many of the Hoku (see 6.5.1.2). The grazing system of the lowland Alabdu does not differ much from that of the Borana, that of the highland Guji closely resembles that of the Alabdu and the Eastern Arussi (Haberland, 1963).

(3) The *Alabdu* or *Northern Guji* dwell on the ridge of the 'midlands' (ca 1700—1900 m) and in the lowlands east of Lake Abaya at ca 1300—1500 m. By peaceful negotiation they have handed over much of their land to the Darassa with which, despite a strong antagonism, they live in a close symbiosis. The rich grasslands around Lake Abaya and on the lower mountain slopes offer much excellent pasture that many Alabdu already gave up agriculture when the Darassa were still a small tribe without any cattle. At first, the Alabdu obtained cereals and ensat from the Darassa in exchange for milk and butter; at present both tribes have so greatly increased in number that pasture has become less plentiful and many Alabdu had to return to agriculture. Maize is now the staple food; taro and cabbage are also grown. Ploughing has replaced the archaic cultivation methods (Haberland, 1963).

Transhumance as sketched above still exists, but on a much smaller scale than in the past. In former times the Alabdu collected many edible wild plants; several tubers were highly esteemed, of which the 'bulesa' was most favoured (Haberland, 1963).

(4) The *Arussi* live in a large area from the Riftvalley in the west to beyond Bale in the east. In the Riftvalley and the western parts of the highland they are engaged in plough cultivation (see 6.5.1.3); how far this has penetrated eastwards is not known. Before 1900, the Arussi moved three times a year. During the driest months they stayed with their cattle in the highland above ca 2300 m. At the begin of the small rains most animals were transferred to the lower parts of the highland between ca 1800 and 2300 m. When, after about two months, the big rains came through they moved into the lowlands where they lived for several months till the beginning of the dry season when they returned to the upper highlands. At present these migrations have considerably decreased by the rapidly expanding crop cultivation in west Arussi, both in the lowlands and at higher altitudes (Haberland, 1963).

(b) The *Somali* live in south-east Hararge and south Bale, largely as semi-nomads. They camp on seasonal grasslands to feed their herds of camels, sheep and goats, and regularly move in search of water and new pasture, disregarding all international boundaries (Lipsky, 1962).

Among the few plants of economic importance indigenous to the Horn of Africa the Yeheb-nut *(Cordeauxia edulis)* is of particular interest. It grows in dense bushes scattered in a vegetation of tufted grasses, as far as known solely between Werder and

Photograph 97. A Somali family on his way between Harar and Jijiga, Hararge.

Shilalo and between Geladi and Bokh. Although rich in fat and sugar, the seeds are inferior to those of pulses with respect to protein and carbohydrate content. As far as known from many regions cited by earlier travellers the shrub has disappeared, partly due to overall deterioration of the vegetation by overgrazing and browsing, partly to thoughtless exploitation. If no protective steps are taken, it will soon disappear entirely (Bally, 1966).

(c) The *Danakil* are essentially nomadic herdsmen living with their goats in the Danakil Plain. Some tribes also rear camels and a few cattle. Most of them wander about, travelling long distances in search of herbage for their cattle. In the Aussa region, where the Awash forms a series of little lakes whose annual flooding irrigates the surrounding land, they perform some agriculture. Nomadic life is static, and the Danakil is an extreme example of close adaption to his environment. 'The equilibrium of the forces of man, animals, water and grass in his life is so exact, that all his energies are absorbed in the struggle for mere existence' (Trimingham, 1965).

(d) The *Saho* live on the mountain slopes of Akkele Guzay (Eritrea) and Agame (Tigre). They are mainly pastoralists, migrating in 'winter' towards the coast and in 'summer' through the area of the Tigrinya-speaking people far to the west, across the Mareb. In the past, these migrations have led some groups to remain on the plateau. The westward movement and gradual settlement of these people is continuously going on.

The Asaorta are the largest tribe; they migrate between the sea and Akkele Guzay. Essentially they are mountain dwellers and semi-nomadic in a state of transition to sedentary life (Trimingham, 1965).

(e) The *tribes dwelling in the lowlands of Eritrea*, such as the Beni Amer and the Bet Asgede, are mostly nomads. Only small groups are engaged in agriculture. The Baria and Kunama of the west Eritrean lowlands are sedentary agriculturists (Trimingham, 1965).

(f) The *tribes living north of Lake Rudolf* are pastoralists of whom hardly anything is known. Cerulli (1956) mentioned the Geleba (Reshiat) who own large numbers of cattle, goats, sheep and donkeys as well as camels; they grow sorghum and other crops along the banks of the Omo. The Mursi also strongly depend on livestock. So do several tribes north-east of Lake Rudolf, mainly living at higher altitudes, though basically they are sedentary agriculturists (almost exclusively growing sorghum). They are representatives of the Nilotic culture and include the Male, Banna, Hammar, Bashada, Karo, Chamako, Arbore and Bodi (Haberland, in: Jensen et al., 1959).

7 Markets, food and nutrition*

7.1 Markets

According to De Young (1967), Ethiopia knows four market types: the 'community', the 'regional', the 'rest of the nation', and the 'rest of the world' markets. They all serve to exchange most locally produced goods, the distribution among customers of goods from distant places, and to collect surplus products for shipment to other places (Simoons, 1960).

The *community market* is the most elementary type in Ethiopia. Most likely, in early times, the goods were bartered there, and even today this form of transfer dominates: vendors bringing in their produce to exchange them is only a step away from production for neighbours. A few goods from the 'regional' or the 'rest of the nation' markets may be present, such as salt (De Young, 1967).

These daily markets are found in all important villages and towns. From them the housewife can purchase the ingredients for her daily stew. In rural areas the market changes its site from day to day during the week, except on Sundays. Their attraction for the supplier is that it provides a regular, though small, cash income (Messing, in: Bohannan & Dalton, 1962).

Usually the 'community' markets are very attractive as a meeting place for the members of the community. It is also the first place where money becomes an important factor, as traders arrive to purchase crops for cash (De Young, 1967).

The *regional market* is a collecting centre for farm produce and a distribution point for manufactured goods, often from very distant places. It has its origin in the caravan-trail system which covered the interior from Massawa and other ports along the northern Red Sea in a generally north-east to south-west direction, or from the harbours on the southern Red Sea more or less towards the west into Shoa. These markets are usually situated at some distance from each other so that a caravan was able to visit all within one week. Caravans also came from the Sudan and occasionally, as in Gondar, from the Red Sea. The 'regional' markets were not always regular events, as they depended on the arrival of a caravan; they functioned only in the dry season (De Young, 1967).

The *rest of the nation market* was possibly the original market system in Ethiopia. It served interregional trade, with or without the occassional visit of a caravan. At

* J. M. C. Westphal-Stevels

Photograph 98. Butajira market in Gurage area, Shoa.

these markets goods from different climatic regions were exchanged, firstly between the altitudinal areas (the hot dry lowland, the temperate middle highland, and the cold highland), secondly between areas differing in rainfall (the hot dry lowland and the wet tropical lowland). Important 'rest of the nation' markets are, for example, Ankober and Bati (De Young, 1967).

The 'regional' and the 'rest of the nation' markets are usually on Saturday, though Monday, Tuesday and Thursday are also popular. Most are in the middle highlands, across which the trade routes run, because these areas produce the greatest variety of agricultural products and enjoy a position intermediate between the hot lowland and the cold highland (Simoons, 1960).

As mentioned above, important towns have daily markets as well, but they are always much smaller and mainly attract local people. Because they require much space, the weekly market may be held at another place, often outside the centre of the town (Simoons, 1960). They are still dominated by the basic cereals, pulses, oil seeds, spices, aromatics and stimulants which, together with chickens, sheep and goats, form the base of the Ethiopian diet. Vegetables, fruits and tuber crops, found only in small quantities (if at all) in the northern and central part of the Ethiopian Highlands, are regularly present in the south. In addition, these markets supply a number of services, domestic goods and imported articles. The domestic products include bars of salt, raw cotton, coffee, spices and surplus farm products, especially staple cereals. Imported articles are razor blades, needles, thread, cloth, umbrellas,

Photograph 99. Bars of salt at Woshi market, Kefa.

matches, soap and many other items, in the past often regarded as luxury goods but now common necessaries (Messing, 1962). Many of them are bought and sold by local people, but long-distance traders are also present. By selling exotic products and collecting local surplus goods, these traders are the link between these markets, and the wider economic system in Ethiopia, and even with the world market.

The *rest of the world market* occurs solely in geographically very favourable places with a large and diversified population, such as Addis Abeba. Formerly, they received the large caravans, often provided them with brokers (to supply 'regional' markets) and were the meeting places for the two internal flows of the 'rest of the nation' markets. They also, at least during the dry season, provided a temporary campsite for artisans and merchants between the regular market days (De Young, 1967). From here such goods as coffee, oil seeds, hides and skins found their way into the

Photograph 100. Cotton at Amussit market, Begemdir.

world market.

All markets are held in the open, most vendors simply sit on the ground, women often under an umbrella. Only Arab merchants shelter their wares. The markets are divided into sections according to the merchants' clan or to goods and services, especially obvious in the larger markets. Within a four hour period after the first traders have arrived, the market reaches its peak attendance (Shack, 1966; Simoons, 1960).

Selling is usually a friendly affair with neighbours and family grouped around their products and patiently waiting for purchasers. People often have to travel a long distance to reach a market, and what they bring is sometimes of such small value that the trip seems hardly worth the effort. But it is not the exchange of goods alone that is important: going to the market is a social event to meet relatives and friends and to gather news (Simoons, 1960).

7.2 Food

7.2.1 Food crops and their uses

Depending on climate and topography, the main food crops and diets vary from region to region; in addition, differences in race and religion play a role. Thus all general statements on Ethiopian diet need a cautious interpretation (Huffnagel et al., 1961).

The crops which play an important role in local diet and life have been listed below. The Food Composition Table for Ethiopia by Ågren & Gibson (1968) supplies many additional data.

(1) Cereals

Though the use of cereals varies from place to place, wheat, barley, sorghum and maize tend to have the same range of uses: roasting the heads over a fire, parching the grains, preparing various kinds of porridge, as ingredients in unfermented flat bread (k'itta), fermented flat bread (enjera), raised bread (dabbo), the hard bread balls (dabbo k'ollo) which are commonly carried by travellers, and beer. T'ef, finger millet and other cereals have more restricted uses (Simoons, 1960).

Wheat can be used for most purposes mentioned above (flat bread, porridge and beer, and for parching). It is much in favour for raised bread, but it is not a staple food (Simoons, 1960).

Barley is less appreciated for raised bread than wheat and less than t'ef for fermented flat bread, though in high mountain regions barley is a valuable substitute. For malting it is unsurpassed (Simoons, 1960).

Sorghum is by far the most important cereal in many of the lowland sections of the country, but it is also much cultivated in Hararge. It serves the same purposes as the other cereals but, in addition, the seed can be popped like maize and the sweet stems of some cultivars are used as a confectionary (Damon, 1962; Simoons, 1960).

Maize serves different purposes differing from place to place but as a whole it may serve all purposes. Its green stalks are often chewed as a sweet; tender green maize when boiled or roasted is a delicacy (Simoons, 1960).

T'ef in one of the most important food crops in the highlands. It is favoured above all other cereals for making enjera (its main use), the fermented flat bread which is the staple food for most Amhara. Sometimes it is used to prepare unfermented flat bread or hard bread balls. It is unsuitable for raised bread as it hardly contains any gluten. Occasionally it is used to make porridge or beer. White t'ef is preferred for making enjera; it is more expensive than red t'ef. However, the food value of red t'ef is higher than that of white t'ef. Many writers consider t'ef to be a cereal of Christian Ethiopians, although it gains in importance among many Galla and Sidamo (Rouk & Hailu Mengesha, 1964; Simoons, 1960; Taddesse Ebba, 1969).

Finger millet is commonly used for making beer, which is distilled into arak'i.

It is also an ingredient in unfermented and fermented flat bread, but rarely used to make porridge or raised bread and never roasted or parched (Simoons, 1960).

(2) Oil seeds

Vegetable oils are widely used in the local diets, since during a large part of the year religion among the Christians prohibits consumption of animal products. Niger seed is the main oil crop, followed by many others. Preparation has gradually moved from home to mill (Huffnagel et al., 1961). Vegetable oil is a common ingredient in wot', especially on fast-days as a substitute for butter; it is used to grease the frying plate (mit'ad) for the fermented flat bread (enjera). Niger seeds are sometimes crushed to prepare a non-alcoholic drink, as fenugreek, linseed and sesame (Simoons, 1960).

(3) Tuber crops

Among the tuber crops, ensat is a staple food in the south-western highlands. More than one sixth of the population of Ethiopia largely or partially depends on it for its food supply (Stanley, 1966).

During the vegetative stage the plant stores carbohydrates in its pseudostem (actually the leaf sheaths) and corm (the trunk of the 'tuber'). During flowering and fructification these carbohydrates are used up so that harvesting has to procede flowering (Smeds, 1955).

The parts of ensat that are consumed vary from place to place. In general, the pulp of the pseudostem, the young shoots and the corm are eaten; sometimes the upper parts of the roots are included. Fermentation changes the pulp into a dough-like substance or flour, the basic ingredient for various kinds of bread and porridge. In some parts of the country (but not in Sidamo) the pseudostem pulp, together with the young shoots, is boiled and eaten as a vegetable. When fresh, the trunk, and in some cases the upper part of the root, can also be cut up and boiled; they taste like cooked Irish potatoes. Sometimes the pith of the inflorescence stalk and the mealy substance of the seeds are boiled (Smeds, 1955; Taye Bezuneh & Asrat Felleke, 1966).

The fibrous leaf-sheath tissue and the veins of the leaves, after removal of the pulp can be made into ropes. The waterproof leaves are used for thatching, wrapping material, and to make baskets, mats, brooms, etc. (Smeds, 1955).

Other tuber crops are chiefly used in areas where ensat is consumed. They are eaten boiled or fried. Sweet potatoes are also cultivated in Hararge and only potatoes are widely distributed. They are cooked whole or in pieces in the stew or sauce (wot') which is eaten together with the enjera.

Photograph 101. Mixture of some pulses found in Ethiopia.

(4) Pulses

Pulses, either whole or ground, are largely used in cooking wot' or sometimes porridge. Often they are simply roasted. In many localities fresh green chickpea is sold on the stem and eaten raw. Sometimes also lentil and pea are consumed green. Chickpea flour, sometimes mixed with wheat flour, is used to make unleavened flat bread (Darby et al., 1959; Simoons, 1960).

Fenugreek is extensively used throughout the country as a medecine and spice. Its seeds are used as baby food, to flavour enjera and dabbo, to flavour and preserve butter, with other spices to season wot'. As a breakfast beverage (with honey or sugar added) it is believed to be fattening and a good body-conditioner because of its nutritive qualities; as a medecine it mends broken bones and heals stomac and skin troubles (Rouk & Hailu Mengesha, 1963).

(5) Vegetables and fruits

Vegetables and fruits are rare in the Ethiopian diet, except onion, 'goman' (a kale-like plant), pumpkin and (on a small scale) tomato. Fresh maize ears are seasonably available. Most vegetables are cooked in wot', rarely eaten raw (Darby et al., 1959). In ensat areas, goman leaves are eaten as a boiled salad with ensat bread (Smeds, 1955).

Photograph 102. A Sidamo with garlic (nach shenkurt, *Allium sativum*) on his way to Wondo market, Sidamo.

Although many fruits grow well in Ethiopia, they play an insignificant role in diets, except some *Citrus* fruits and bananas. Wild fruits are gathered by children, especially by shepherd boys; according to Simoons (1960), poor people sometimes collect them and sell them in the market, though the effort is rarely considered worth the return.

(6) Condiments and spices

Condiments and spices are grown in a great number or collected in the wild. Some are imported. They are extensively used in food preparation. Wot' is a highly seasoned stew or sauce to which large quantities of red pepper are added.

Buckthorn (gesho) is widely used as hops to give a slightly bitter taste to beer (t'alla) and to the distilled liquor arak'i (Simoons, 1960).

(7) Stimulants

Although stimulants are no food crops, three of them have to be included here: coffee, ch'at and tobacco.

Ethiopia is the centre of origin of *Coffea arabica*, of which the seeds serve to make coffee. Only in recent times it has come in general use in the Christian areas. Still the roasted seed is a luxury to many people; therefore drinks are prepared from

Photograph 103. Woman selling spices at Alemaya market, Hararge.

other parts of the coffee plant. Locally the green seeds are roasted with butter and salt. Other parts are used to prepare a beverage: dry crushed leaves are boiled in water (salt or milk are added), roasted dry hulls give a kind of tea (Siegenthaler, 1963).

Particularly Moslims chew (and usually swallow) the fresh leaves and twigs of ch'at for their stimulating effect, often in combination with cigarette smoking. Ch'at also plays an important part in their social life and is sometimes associated with certain religious activities. It is attributed with giving strength and power for hard labour. Workers, who are acquainted with its use, recommend it highly for this purpose. It has medicinal properties, keeps people awake, and is a substitute for tea or coffee. Chewing causes thirst, so that many people drink cold water or tea made from coffee leaves (Hill, 1965). The active principle consists of several alkaloids (cathine and others) especially present in young leaves (Krikorian & Amare Getahun, 1973). The effects of using ch'at are considered no more dangerous than those of coffee and tea and less than alcohol, sometimes it is said to work as a narcotic or to lead (in immoderate quantities) to a debilitated and semi-imbecilic condition, impotence and a deterioration of mind and character. Probably the truth lies midway as with the problem of alcohol (Hill, 1965).

Green tobacco leaves are chewed, dry leaves are crushed for pipe, waterpipe and cigarettes, powdered leaves are used as snuff (Siegenthaler, 1963). The christian Amhara avoid its uses (Simoons, 1960).

7.2.2 Preparation of food

Information suitable for a detailed treatment of food preparation in the various Ethiopian regions is as yet not available. Thus only some of the most important foods and drinks will be described. For analyses of prepared foods see Ågren & Gibson (1968).

(1) Enjera and wot'

They are the staple food of most Amhara; they gain in importance among many of the Galla and Sidamo.

Enjera is made from t'ef, barley, wheat, maize, sorghum or a mixture, depending on the available crops and what can be afforded for food. T'ef is preferred, however. Among the many kinds of enjera the most popular looks like a porous, soft and sour pancake, a few millimeters thick and 40—50 cm in diameter. It is usually served cold, broken into pieces, and dipped in the wot'.

To prepare the usual enjera, t'ef flour is mixed with water to form a batter. A fermented, thin, yellowish fluid saved from the previous fermentation is added. The mixture is thoroughly stirred and left to ferment for two to three days, depending on the altitude of the area, the concentration of the added fermented fluid, and the container. The batter is said to have sufficiently fermented when it produces gas in considerable quantities; then the yellow liquid that has settled on the batter is poured off (about one liter is saved for the next batter, which will be prepared immediately after baking has been finished). A portion of the fermented batter is mixed with three parts water and cooked until it has become thick; after cooling it is added again to the other fermented batter, mainly to produce clean-looking, porous and thin enjera. Ultimately the batter is diluted with water and allowed to rise.

Baking is done under a lid on a greased clay or iron griddle called a mit'ad, over an open fire during about five minutes, without turning. The batter is poured on the mit'ad with a circular motion, beginning at the outer rim and working to the centre. Usually enjera is prepared two or three times a week and stored until needed. A person will eat two to four pancakes a day (Selinus, 1971; Stewart & Asnake Getachew, 1962; Taddesse Ebba, 1969).

The ingredients of wot' depend on what is available, fasting requirements and local taste. Meat wot' is preferred, but poor people can afford it only on feast-days. Chicken wot' is prepared more often because chickens are cheap. Wot' made of peas, beans, lentils, or a mixture, is the daily food for many Ethiopians. Spices play an important role in the preparation of wot'. Each Ethiopian housewife seems to have her own recipes, both for the spices and the other ingredients used.

One recipe gives the following ingredients (1 ladle = 10 table spoons):

30 ladle red pepper	2 ladle bishop weed	¼ ladle black pepper
5 ladle shallots (and garlic)	1 ladle black cumin	¼ ladle cinnamon
1½ ladle fresh ginger	23 pods false cardamom	¾ ladle salt
½ ladle fenugreek	¼ ladle Indian long pepper	2 ladle water

Dry peppers in the sun and pound well. Pound shallots and garlic and add to peppers, sprinkle with some water, cover mixture, leave it for two to three days, then dry mixture in the sun. Peel, chop and dry ginger. Roast the fenugreek on the mit'ad, do the same with the other spices. Heat pepper-shallot-garlic mixture on mit'ad and mix with all other ingredients. Add salt. Ground finely and store in dry, cool place (Ethiopian and American cookbook).

There is much variation in the preparation of wot'. The basic method is as follows:

Fry onions (preferably shallots) and some garlic (if wanted) until golden brown. Add some water and spice mixture, stir, and cook well (add more water whenever necessary). Then add butter or vegetable oil, cook again. Add meat, chicken or pulses and more water. Let the stew simmer until well-cooked and add more spices or salt to taste.

Pulses may be prepared in advance as a pulse-spice mixture or cooked apart. Sometimes potatoes and vegetables are cooked in the stew as well. Chicken wot' is often served with hard-boiled eggs. Wot' prepared with butter is usually served hot, with a vegetable oil added it is better served cold. Alech'a is prepared in a similar way as wot', but without red pepper (Ethiopian and American cookbook; Selinus, 1971; Siegenthaler, 1963).

(2) T'alla and t'aj

These are alcoholic beverages often drunk with enjera and wot'.

T'alla is a kind of beer, a common household drink for many Ethiopians. It is prepared from water, malt, flour and gesho, the latter giving the beverage a slightly bitter taste.

To prepare it, the gesho leaves are dried, crushed and soaked in water for three days. Meanwhile barley grains are soaked in water for 24 hours, the water is then poured off, the barley is placed between two layers of leaves and stored until the sprouts are 2½—4 cm long after which they are dried in the sun and finally ground into flour. Then flour from unsprouted, roasted and ground grains is made into a paste and baked on the mit'ad, the resulting cake is broken and mixed with the malt flour, and this mixture is added to the container with water and gesho which is tightly closed and left four days to ferment. Then much more water is added, the container is closed again. When the beer is considered ready for drinking, it is poured from the container in which it was made in freshly smoked pots (Ethiopian and American cookbook; Selinus, 1971; Simoons, 1960).

T'aj is made of honey, gesho and water. For economic reasons sugar is added in various proportions. It has a delicious flavour which makes it the favourite drink of many people. Because honey is expensive, it is usually prepared only for special occasions.

Its preparation is simple. The ingredients are put in a well-closed pot where it is left for three to ten days (depending on the temperature) to ferment. Then the gesho leaves are taken out, and if the wax had not been removed previously the liquid is filtered and it is ready for consumption (Selinus, 1971; Simoons, 1960).

(3) Bread

There are several kinds of bread other than the fermented flat bread (enjera).

Unfermented flat bread (k'itta) can be made from several types of flour, but wheat flour is preferred. The dough is not left to ferment, and the bread does not keep longer than two days (Huffnagel et al., 1961; Taddesse Ebba, 1969).

Raised bread (dabbo) is usually prepared from wheat flour. To make it, a portion of enjera batter a few days old (or yeast, if available) is mixed with water, spices

and flour. After this mixture has been allowed to rise, the dough is kneaded and baked over a fire in a covered mit'ad (Simoons, 1960).

Hard bread balls (dabbo k'ollo) are made from wheat or another cereal flour mixed with spices and enough water to form a thick dough which is kneaded for five minutes and made into rolls about half a centimeter in diameter. These rolls are cut into tiny pieces which are roasted until brown. This product will last for days without becoming stale (Siegenthaler, 1963; Taddesse Ebba, 1969).

(4) Ensat

The raw material for food preparation consists of the carbohydrates (starch) stored in the parenchymatic tissue of pseudostem and corm (trunk).

To obtain the raw product, all leaves of the plant are cut off, the pseudostem is stripped until only the edible part remains. The earth around the corm is loosened, and the roots cut. The pseudostem is then cut so that a small column remains attached to the corm. With a stick worked under the corm, and by pushing against the pseudostem, the plant is lifted from its hole. The harvest is brought to the 'workshop', an open but shaded place in the plantation (in eastern Sidamo roofed with ensat leaves). There some boards of about two meter long are placed at an angle of about 40° against a horizontal pole fixed between two large ensat plants or the boards are placed against two large ensat plants (or against the roof of the workshop). The ground under the boards is covered with ensat leaves. A woman, sitting in front of each board, keeps a leaf sheath with one foot on it as high as up as possible with its convex side against the board. Holding a sharp piece of bamboo with both hands, she scrapes (downwards) the part of the leaf sheath below her foot. Starch, mesophyll and short pieces of fibre fall to the ground, the scraped fibre strands remain on the board. The leaf sheath is then moved down to scrape the next higher part, and so on until the whole sheath is finished.

The scrapings are stored close to the workshop in pits one meter in diameter and depth with walls and bottom carefully covered by fresh ensat leaves.

The innermost part of the trunk of an older plant needs no scraping as it does not contain fibres: it is treated with a wooden stamper and the pieces are added to the pit where a woman stamps down everything with her feet until the silo is full. Then it is closed with ensat leaves and stones. A few days later, the silo is opened to compress its contents once more.

After three to four weeks strongly fermented ensat is added and mixed with the contents of the silo; after seven to eight weeks a last rearrangement follows.

The total fermentation process takes from a few weeks to over one year; the older the product, the more people appreciate it. A slightly fermented product is already suitable for consumption. To ensure a regular supply, each plantation has several silos (Huffnagel et al., 1961; Smeds, 1955; Taye Bezuneh & Asrat Felleke, 1966).

The fermented product is pressed to remove the acid fermentation liquid, the dough-like material is mixed with spices and butter and baked into large thin breads (kocho) on the mit'ad. Boiled cabbage leaves are eaten with them. According to Kusin (1974, pers. comm.), more prosperous people eat it with local cheese or a bean stew. In the Janjero area, ensat pieces of various sizes are sometimes wrapped in ensat leaves and put in a pit somewhat smaller than that described above and covered with layers of leaves and soil. On top of the pit a fire is kept burning for at least twelve hours. The bread made from the ensuing product lasts for several days and is often used by travellers (Smeds, 1955; Taye Bezuneh & Asrat Felleke, 1966).

The dough-like fermented material that remains after the acid fermentation liquid has been removed, can be boiled with niger seed oil or butter to make a kind of porridge that is wrapped in an ensat leaf. A high-grade product is obtained by squeezing parenchymatic scrapings of the pseudostem and dehydrating the collected juice. This product is tightly packed in ensat leaves and left in a silo for fermentation. It is prepared as a kind of porridge called bulla (Taye Bezuneh & Asrat Felleke, 1966).

7.2.3 Nutritional habits

A discussion of food and nutritional habits would be incomplete without mentioning animal products, though strictly speaking they stay somewhat apart from the present subject.

(1) Livestock

In the pastoral areas of Ethiopia, especially among the nomads, the diet consists mainly of animal products (milk, meat and blood) from cattle, sheep, goats and camels. In other regions they play a more or less subordinate role but they are never entirely absent. In the arable areas, there is less dependence on livestock products and the bulk of the diet consists of cereals or ensat and other food crops. Nevertheless, both milk and meat are widely used in these areas (Huffnagel et al., 1961).

Most milk comes from cows; the supply from goats, camels and sometimes sheep is only small and its taste is less appreciated. Only sour milk is consumed (Simoons, 1960).

Milk products are butter and a kind of cheese. Fresh butter serves as a basis for medicaments or is mixed with aromatics to be used as pomade. As a food it is usually boiled with spices; in this form it can safely be stored for a month or two (Selinus, 1971; Simoons, 1960). The consumption of butter is limited because oil is much cheaper.

Meat is still a luxury and many people cannot afford to eat it often except on important feast-days such as the end of a long fast or a wedding. It is eaten either raw or slightly roasted, never thoroughly cooked, so that tapeworm is common. Mutton is less expensive than beef and more commonly eaten. Goats, mainly kept for their meat, live all over the country but especially in the lower arid areas. There also the camels live: they provide meat and milk. Chickens and eggs are both cheap and important, especially among the Amhara, but for many tribes their consumption is prohibited (Huffnagel et al., 1961; Simoons, 1960).

(2) Meals

People usually eat three meals a day. Breakfast at seven or eight in the morning, lunch at noon and supper in the evening after dark. In the late afternoon they sometimes eat a snack with beer or coffee, and whenever visitors arrive food is offered to

them. Breakfast is a slight meal, consisting of left-overs of the previous day, parched grain or grain porridge and coffee, if available. Country people often have no breakfast at all. At noon and in the evening people usually have a substantial meal. The traditional way of eating in most parts of Ethiopia is to take food from a communal dish or plate. The husband and guests are served first, after that the women and finally the children get their share, but at that time the good food may be finished (Knutson & Selinus, 1970; Simoons, 1960).

(3) Fasting

In Ethiopia all major religious groups have a tradition of fasts and feasts. The fasting rules of the Ethiopian Orthodox Church restrict the type of food eaten: on Wednesday and Friday and during the longer fasting periods (such as the eight weeks before Easter) people have to abstain from all animal food except fish. The common people are thus confined to a vegetarian diet for 110 to 150 days per year; for the more pious the total can be as high as 220. Although children, pregnant and nursing women and the severely sick and weak are exempt from fasting, actually nobody consumes animal food during the fast-days. The reasons are manifold: knowledge on the right of exemption is often limited, during fasting periods no animal foods can be purchased in the markets, and if occasionally meat and eggs can be found, the fasting women dislike to touch, let alone to prepare them. This means that children are practically always included in the fast, although everybody is aware of the dangers. The fasting rules of the Ethiopian Orthodox Church threaten the already precarious nutritional situation among adults and in particular among children (Knutson & Selinus, 1970; Kusin, 1973). On the other hand, according to Simoons (1960) the rules have been a stimulant to develop special foods made of grains, pulses, spices and oils and to cultivate more pulses and oil crops rich in proteins.

For the Moslems, eating and drinking is prohibited between sunrise and sunset during the month Ramadhan. Some people then even do not swallow their saliva. Children are fully or partly exempted and the usual food may be prepared for them. Pregnant and nursing women are permitted to postpone the observance of Ramadhan. The fast can be a real hardship, especially when Ramadhan falls in the hot and dry season. From a nutritional standpoint the abstinence of food during daytime does not cause any harm, except the danger of overeating afterwards, while the quality of the food is often better than at other times of the year (Knutson & Selinus, 1970; Kusin, 1973).

Usually long fast-periods are followed by great feasts, as Easter for the Christians. Especially the men then tend to overeat (Simoons, 1960).

7.3 The edible and other useful products in the markets

In 1967 and 1968 an inventory was made of the edible and other useful products for sale in 80 markets. To get a reliable idea of the presence or absence of items in a

market place, at least three visits a year, spread over different seasons, are necessary. But the great distances and the restricted time often made this impossible to achieve. Additional information was collected by Seegeler in 1972—1973, so that some 100 markets have been included in this inventory. Appendix II gives a list of the surveyed markets.

The following tables are intended to give an impression of the presence or absence of a great number of mainly edible products; the items have been grouped as follows:

Table 6: cereals
Table 7: oil crops
Table 8: tuber and root crops
Table 9: pulses
Table 10: vegetables
Table 11: fruits (cultivated)
Table 12: fruits (wild)
Table 13: condiments and spices
Table 14: stimulants
Table 15: other crops and useful plants

These tables should be considered together with Table 2 (Some crops and their altitudinal range), Table 3 (Crops in the seed-farming complex), and Table 5 (Crops in the ensat-planting complex).

Table 6. Cereals[1, 2, 3].

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 barley	88	100	100	94	100	96	100	100	92	—	50
2 bulrush millet	—	—	—	—	—	—	—	—	17	—	—
3 finger millet	44	100	50	58	73	15	30	100	8	—	—
4 maize	94	100	75	100	100	96	100	100	100	—	100
5 sorghum	94	50	100	94	91	77	70	100	100	—	50
6 't'ef' *(Eragrostis tef)*	94	50	88	94	100	77	40	100	58	—	—
7 wheat	88	100	100	94	100	92	90	100	100	—	50

1. Germinated grains of barley, maize and wheat were frequently found in the market places; infrequently of finger millet and sorghum.
2. Roasted grains of barley, maize, sorghum and wheat were infrequently encountered. They are consumed as a snack.
3. Rice is rare.

Table 7. Oil crops[1, 2].

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 castor	50	—	88	29	45	62	70	100	33	—	—
2 cotton seed	56	—	13	29	55	27	50	100	42	—	—
3 'gomanzar' *(Brassica carinata)*[3]	81	100	63	88	55	96	70	100	83	—	—
4 groundnut	6	—	—	—	—	23	—	—	25	—	50
5 'kalawa' *(Maesa lanceolata)*	6	—	—	24	—	4	20	—	—	—	—
6 linseed	75	100	100	82	82	88	60	100	83	—	50
7 'madafé' *(Argemone mexicana)*[4]	—	—	50	—	—	—	—	—	—	—	—
8 niger seed	75	100	25	41	45	50	50	100	67	—	—
9 safflower	38	50	38	24	18	35	30	100	75	—	—
10 'senafich' *(Brassica nigra)*	63	50	75	18	9	50	30	100	58	—	—
11 sesame	44	—	13	35	9	46	30	—	67	—	50
12 sunflower	19	—	—	6	—	—	—	—	—	—	—

1. Pumpkin seeds were frequently found in the market places of the agro-ecological regions 6, 7 and 9, infrequently or rarely in the regions 1, 3, 4 and 5. Seeds are eaten roasted as a snack; possibly they are also used for oil.

2. *Salvia schimperi* (WP 5565, WP 7390, WP 7391), collected at Debre Birhan market, was said to be used to grease the mit'ad.

3. A special kind of 'gomanzar', being 'masesha', has been found in about one-third of the market places. 'Masesha' is orange and used for greasing the mit'ad. It is also a general name for the substance used to grease the mit'ad. A kind of 'masesha' was found at Goro market in Bale (Sl. 1214) presumably being an *Erucastrum*.

4. WP 4027, WP 7370—WP 7372.

Table 8. Tuber and root crops.

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 'anchote' *(Coccinia abyssinica)*[1]	19	—	—	41	—	—	—	—	—	—	—
2 *Araceae*[2]	—	—	—	—	9	—	—	—	—	—	—
3 cassava	—	—	—	12	—	—	—	—	—	—	—
4 'ensat' *(Ensete ventricosum)*	6	—	—	47	91	15	90	—	—	—	—
5 Galla potato *(Coleus edulis)*[3]	19	—	—	—	18	—	—	—	—	—	—
6 potato	69	100	75	76	73	73	70	100	83	—	—
7 sweet potato[4]	50	50	—	65	73	58	80	100	33	—	—
8 taro	13	—	—	71	45	—	10	—	—	—	—
9 yam[5]	—	—	—	29	9	—	10	—	—	—	—

1. At a market 34 km north of Jima only seeds were found.
2. Presumably a species of *Amorphophallus*.
3. At the markets of Guder and Nekemte only young plants were sold.
4. At the markets of Guder and Nekemte also young plants were encountered.
5. The following types of yam were collected:
   (a) 'boye' at the markets of Shashamane and Soddo (WP 4041, WP 4046—WP 4048)
   (b) 'kojo' at the Shankalla market west of Nekemte and Gimbi market (WP 3379, WP 7394, WP 7395; WP 3380, WP 7396, WP 8620)
   (c) 'wocino' at Jima market (WP 3311, WP 7393, WP 8658, WP 8659).
   'Kotehare' *(Dioscorea bulbifera)* has never been found in market places.

Table 9. Pulses.

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 Abyssinian pea	13	—	25	—	—	15	10	—	17	—	—
2 chickpea[1]	94	100	88	71	64	54	60	100	83	—	50
3 common bean	44	—	13	82	64	65	60	100	75	—	—
4 cowpea	13	—	—	24	18	27	10	—	25	—	50
5 fenugreek	88	100	100	100	73	88	100	100	83	—	50
6 grasspea	50	100	50	—	9	15	—	—	17	—	—
7 horse bean	94	100	100	100	100	85	90	100	92	—	50
8 hyacinth bean	6	—	—	6	9	—	—	—	—	—	—
9 lentil	81	100	100	65	82	62	60	100	100	—	50
10 lima bean	—	—	—	29	—	4	—	—	—	—	—
11 lupin	—	50	—	—	—	—	—	—	—	—	—
12 mung bean	—	—	—	—	18	4	—	—	17	—	—
13 pea	100	100	100	100	100	92	90	100	100	—	50
14 pigeon pea	—	—	—	—	9	—	—	—	—	—	—
15 runner bean	—	—	—	6	—	—	—	—	—	—	—
16 velvet bean	—	—	—	6	—	—	—	—	—	—	—

1. Infrequently roasted chickpea is found, which is eaten as a snack.

Table 10. Vegetables[1].

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 chickpea (young seeds)[2]	19	—	—	6	—	8	—	—	17	—	—
2 cowpea (leaves)	—	—	—	—	—	—	—	—	—	—	50
3 garlic ('nach shenkurt': *Allium sativum)*	94	100	100	88	91	100	90	100	100	—	50
4 'goman' *(Brassica carinata)*[3]	81	50	63	71	91	85	100	100	50	—	—
5 horse bean (young seeds)[2]	13	—	—	6	9	12	40	—	—	—	—
6 maize ears	31	—	—	88	73	65	100	100	42	—	—
7 okra	—	—	—	—	—	4	—	—	17	—	—
8 onion ('shenkurt')[4]	25	—	13	29	18	38	100	100	25	—	—
9 pea (young seeds)[2]	—	—	—	—	—	—	10	—	8	—	—
10 pumpkin[5]	69	—	38	47	73	88	90	100	75	—	—
11 'senafich' (leaves, *Br. nigra*)	—	—	—	—	—	4	—	—	8	—	—
12 shallot ('k'ay shenkurt': *Allium ascalonicum)*	94	100	100	94	100	100	90	100	100	—	50
13 'shifara' (leaves: *Moringa stenopetala)*	—	—	—	—	18	—	—	—	—	—	—
14 *Solanum* sp. (leaves)[6]	—	—	—	—	—	—	10	—	—	—	—
15 tomato	63	50	75	71	55	65	70	—	92	—	—

1. Introduced vegetables are generally found in larger market places. Infrequently found vegetables: beetroot (roots and/or leaves), carrot, eggplant, leek, lettuce, paprika, round light green cabbage, squash and swiss chard.
Rarely found vegetables: artichoke, cauliflower, celeriac (roots and/or leaves), Chinese cabbage, common beans (young pods), cucumber, endive, gherkin, parsley, radish, round red cabbage, spinach and turnip or turnip tops.
2. Young seeds of chickpea, horse bean and pea are eaten raw. They are sold as green pods.
3. Leaves variable in size and shape with green or violet veines. At the markets of Buditi, Butajira, Debre Zeit and Ghion sold as 'gurage goman'.
4. It is found as dry bulbs without leaves or as young bulbs with fresh green leaves; rarely only fresh or dried leaves are sold.
5. Fruits variable in size and shape, often round to oblong; also sold in parts.
6. WP 4063.

Table 11. Fruits (cultivated).

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 *Annona* spp.[1]	—	—	—	—	—	23	—	—	17	—	—
2 apple[2]	6	—	—	12	—	—	—	—	—	—	—
3 banana[3]	38	—	25	71	45	62	70	100	75	—	50
4 citron *(Citrus medica)*	44	50	25	35	36	8	40	—	33	—	—
5 date[4]	—	—	—	—	—	8	10	—	8	—	—
6 grape[5]	6	—	—	—	—	4	—	—	—	—	—
7 grapefruit	6	—	—	6	18	—	60	—	—	—	—
8 guava	6	—	—	24	—	42	40	100	50	—	—
9 Italian apple *(Solanum muricatum)*	—	—	—	—	—	4	—	—	—	—	—
10 lemon	19	50	—	12	9	12	40	100	42	—	—
11 lime ('lomi': *Citrus aurantifolia)*	94	100	75	94	91	65	70	100	100	—	—
12 loquat *(Eriobotrya japonica)*	—	—	—	—	—	15	—	—	8	—	—
13 mandarin	13	—	—	6	—	27	30	—	33	—	—
14 mango	—	—	—	12	—	12	—	—	17	—	100
15 melon	—	—	—	—	—	—	—	—	8	—	—
16 orange	31	50	13	24	27	69	90	100	83	—	—
17 papaya	13	—	—	53	18	23	60	100	75	—	50
18 passion fruit	—	—	—	12	—	—	20	—	—	—	—
19 pineapple	—	—	—	29	—	—	—	—	—	—	—
20 peach	13	—	13	35	—	15	50	100	17	—	—
21 pomegranate	—	—	—	12	—	12	10	—	8	—	—
22 quince *(Cydonia japonica)*	—	—	—	—	—	8	—	—	8	—	—
23 sour orange *(Citrus aurantium)*	—	—	—	—	—	8	—	—	—	—	—
24 tree tomato *(Cyphomandra betacea)*	—	—	—	29	—	—	—	—	—	—	—
25 watermelon	—	—	—	—	—	—	—	—	8	—	—

1. Bullock's heart *(A. reticulata)*, custard apple *(A. squamosa)* and soursop *(A. muricata)*.
2. Imported apples at Addis Abeba market; local ones at Assendabo and Jima markets.
3. At Dila market also red bananas were encountered.
4. At Jijiga market dried dates were found.
5. Infrequently raisins are sold.

Table 12. Fruits (wild).

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 Cape gooseberry *(Physalis peruviana)*	—	—	—	—	—	4	10	—	—	—	—
2 'dok'ma' *(Syzygium guineense)*	—	—	—	18	—	—	10	—	—	—	—
3 'enkoi' *(Ximenia americana)*	—	50	13	6	—	—	—	—	—	—	—
4 fig (*Ficus* spp.)	—	—	25	—	—	15	—	—	—	—	—
5 'ghossa' *(Balanites aegyptiaca)*	—	—	—	—	9	—	—	—	—	—	—
6 'gilbo' *(Oncoba spinosa)*	—	—	—	—	—	4	—	—	8	—	—
7 'kaga' *(Rosa abyssinica)*	6	—	—	—	—	—	—	—	—	—	—
8 'kochim' *(Dovyalis abyssinica)*	—	—	—	—	—	4	—	—	8	—	—
9 'kurekura' *(Zizyphus spina-christi)*	—	—	50	—	—	4	—	—	8	—	—
10 prickly pear *(Opuntia ficus-indica)*	6	—	—	12	—	12	—	—	8	—	—
11 'wanza' *(Cordia africana)*	—	—	50	—	—	—	—	—	—	—	—

Table 13. Condiments and spices[1, 2, 3, 4].

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 'ades' *(Myrtus communis)*[5]	75	50	88	24	—	38	30	—	67	—	—
2 bishop weed *(Trachyspermum copticum)*	94	100	100	94	91	88	100	100	100	—	—
3 black cumin *(Nigella sativa)*	94	50	100	100	91	92	100	100	100	—	50
4 black pepper[6]	81	50	38	88	64	85	90	100	92	—	—
5 buckthorn *(Rhamnus prinoides)*	100	100	100	82	100	88	80	100	83	—	—
6 cardamom *(Elettaria cardamomum)*[7]	6	—	—	—	—	—	—	100	—	—	—
7 *Capsicum* pepper (fresh and/or dried)[8]	100	100	88	82	100	96	100	100	100	—	—
8 cinnamon	44	50	—	58	73	65	90	—	75	—	—
9 clove	88	50	50	71	82	81	100	100	92	—	—
10 coriander (fresh and/or dried)[9]	81	100	63	76	55	69	60	100	83	—	—
11 cumin[10]	19	50	25	—	—	4	20	100	33	—	50
12 false cardamom *(Aframomum korarima)*[11]	81	100	50	94	91	88	80	100	100	—	—
13 fennel (sometimes and/or anise)[12]	88	100	63	76	73	58	90	100	92	—	—
14 garden cress *(Lepidium sativum)*	63	—	88	71	9	65	60	—	75	—	—
15 ginger (fresh and/or dried)[13]	100	100	88	94	91	85	80	100	100	—	50
16 Indian long pepper *(Piper longum)*	69	100	38	76	73	77	90	100	83	—	50
17 'kassé' *(Lippia javanica)*[14]	25	—	—	18	36	19	20	—	25	—	—
18 mint *(Mentha* sp.)[15]	6	—	—	6	—	4	—	—	—	—	—
19 nutmeg	19	—	—	—	9	8	—	100	17	—	—
20 rosemary	13	—	—	6	—	4	—	—	8	—	—
21 rue (fresh and/or dried)	81	100	88	65	64	62	70	100	92	—	—
22 sweet basil (fresh and/or dried)[16]	88	100	100	82	73	85	80	100	100	—	—
23 tamarind	—	—	—	—	—	15	—	100	8	—	—
24 thyme (fresh and/or dried)[17]	19	—	38	12	36	46	40	100	75	—	—
25 turmeric *(Curcuma domestica)*	81	100	50	94	55	81	90	100	92	—	50

Table 13 *(continued)*

1. Black pepper, cardamom, cinnamon, clove, cumin, Indian long pepper, nutmeg and turmeric are imported. Recently, however, turmeric is occasionally cultivated in Ethiopia (near Gibbe river, Wushwush).
2. 'Bahar kemam' has been collected in the market place of Debre Birhan (WP 4013, WP 7367—WP 7369). It has been identified as *Vaccaria pyramidata.*
3. According to Nowack (1954), taro leaves are used as hops in making beer in the Konso area.
4. Parsley is rarely found and is a recent introduction.
5. Condiment in butter (WP 1301, WP 4068). Mostly sold fresh.
6. Dried fruits of *Schinus molle* (pepper tree) may be used as a pepper substitute.
7. Condiment in tea (WP 3022).
8. Fruits unripe to ripe, green to red, in many different shapes and sizes. 'Mit'mit'a' is a very small, very pungent pepper *(C. frutescens).*
Plants of *Capsicum* peppers were found in the market places of Agaro, Bedelle, Bonga, Ghion, Guder, Nekemte, Serbo and Shebe.
9. At Jima market also young plants were for sale.
10. Only those markets are recorded where pure samples were found. In most market places cumin is mixed with other Umbelliferous seeds *(Anethum graveolens, Foeniculum vulgare)*, and these mixtures are not recorded here.
11. Fresh fruits were found in the market places of Bonga, Dembi, Dila, Gimbi, Jemero, Jima, Metu, Nekemte, Shebe and Wondo. At Bonga market also seeds were sold.
12. 'Kamun', 'kamona' and 'ensellal' mainly refer to fennel, but sometimes to anise or a mixture of both. Fresh branches and leaves were found in the market places of Agaro, Debre Zeit, Jima, Soddo and 20 km south of Soddo.
13. Young plants were also found in the market places of Serbo an Shebe.
14. Condiment in butter. Sold mostly fresh (WP 1948, WP 2856).
15. As a tea (WP 1847, WP 4037).
16. At Axum and Debarek markets also seeds were sold.
17. *Thymus schimperi* (WP 3395).

Table 14. Stimulants[1, 2].

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 'ch'at' *(Catha edulis)*	31	—	—	41	45	58	10	—	50	—	—
2 coffee cherries (fresh or dried)	75	—	—	94	91	85	90	100	67	—	—
3 coffee hulls	31	—	—	29	18	65	50	100	58	—	—
4 coffee leaves (fresh or dried)	19	—	—	6	18	50	10	—	67	—	—
5 coffee seeds	94	100	50	76	100	96	100	100	100	—	50
6 tobacco *(Nicotiana tabacum* and *N. rustica)*	25	50	—	41	45	88	50	100	83	—	100

1. Young coffee plants were found in the market places of Bedelle, Serbo and Yibbu.
2. Young tobacco plants were observed in the Asella, Ethaya and Segure market places.

Table 15. Other crops and useful plants[1].

	% of markets (for each of the 11 agro-ecological regions) where item has been found										
	1	2	3	4	5	6	7	8	9	10	11
Number of markets visited	(16)	(2)	(8)	(17)	(11)	(26)	(10)	(1)	(12)	(0)	(2)
1 cotton	63	50	75	12	9	19	30	100	33	—	—
2 'endod' *(Phytolacca dodecandra)*[2]	63	50	88	—	—	27	10	100	25	—	—
3 grain amaranth *(Amaranthus caudatus)*[3]	—	—	—	—	—	4	—	—	—	—	—
4 medicinal plants:											
(a) 'ankoko' *(Embelia schimperi)*	63	100	88	59	64	54	70	100	75	—	—
(b) 'kachamo' *(Myrsine africana)*	19	—	13	—	9	31	10	—	75	—	—
(c) 'kosso' *(Hagenia abyssinica)*	44	—	25	35	73	85	90	100	83	—	—
(d) 'matare' *(Buddleja polystachya)*	44	50	—	6	—	23	50	—	17	—	—
(e) 'makmako' (*Rumex* sp.)[4]	13	50	75	—	—	—	—	—	8	—	—
5 perfume plants:											
(a) *Artemisia* spp.[5]	63	50	38	65	55	38	30	—	75	—	—
(b) 'azkuti'[6]	—	—	50	—	—	—	—	—	17	—	—
(c) 'tej-sar' *(Cymbopogon citratus)*	44	50	25	24	27	12	40	100	17	—	—
6 sugarcane	56	—	13	65	73	85	90	100	58	—	—

1. bottle gourd *(Lagenaria siceraria)*: seeds and fruits are frequently present in the market places. Fruits are used as containers.
2. Substitute for soap.
3. WP 3070.
4. Possibly *Rumex abyssinicus*. It is used as tea for medical purposes.
5. 'arriti' or 'chukun': *A. afra* (WP 188, WP 3194), mostly sold fresh; 'rehan': *A. rehan* (WP 3064), mostly sold fresh.
6. WP 4011 A, mostly sold fresh (*Ocimum* sp., possibly *O. basilicum*).

7.4 State of nutrition and health

In 1958 a nationwide nutritional survey, involving dietary, biochemical and clinical studies, was carried out in Ethiopia. The results indicate that the overall nutritional status of the Ethiopian was somewhat below that required for their level of activity. While intake was entirely adequate for several nutrients, for some others it was insufficient. Disruption of the food supply, as encountered in two areas during the survey (and recently occurring in major parts of Ethiopia) results in impending or actual famine (Darby et al., 1959).

The average daily dietary intake per capita as calculated from the dietary pattern in Ethiopia was approximately 2500 calories. This would appear adequate for persons of the Ethiopian physical stature if their light clothing, the often cool climate, and the heavy manual labour were not considered; actually there is an average calorie deficit of up to 400 calories per person per day. Consequently, the Ethiopian population is excessively lean. Local crop failure, caused for instance by insects or unfavourable weather, may add to this shortage, and endemic areas of starvation or semi-starvation exist. The conditions could be greatly alleviated by more appropriate storage reducing losses and spoilage, and expansion of locust control measures. In addition, transport facilities for agricultural products from one area of the country to another should be improved (Darby et al., 1959). Then, according to the report on the above mentioned survey, Ethiopian agriculture would be able to provide sufficient quantities of food for its population.

Harrison et al. (1967) are less optimistic and report that urgent action on a large scale is needed if expansion of food production has to keep pace with the rapidly growing population. In their opinion it will be difficult, without such action, even to maintain the present low level of consumption, so that also the country as a whole may reach a critical level in the next decade. The improvement of maize production to twice its present level, and an expansion of the present maize area from 11 to 20% of the country would be a major contribution to the solution of the threatening very serious food problem.

Protein malnutrition is especially manifest in the growth retardation of children and in the occurrence of the disease kwashiorkor. Cereals and pulses constitute the major sources of dietary protein. Analytical results of sorghum have shown that selection for high-protein cultivars should not be difficult. Barley might also be selected for a higher protein content of the seed. T'ef has an excellent balance of the essential amino acids except for lysine, so that lysine supplementation could considerably improve its protein quality, e.g. from fenugreek, which is rich in this protein. Perhaps also other protein-rich Ethiopian pulses might be considered for this purpose (Di Maio et al., 1962; Beyene Chichaibelu, 1965).

Maize diets can be greatly improved, either by supplementing them with synthetic amino acids, or by adding small amounts of good quality protein, or by appropriate combinations with other vegetable proteins. Certain combinations might be possible in Ethiopia: experiments have shown that a maximum supplementary effect of a

maize-bean mixture is obtained when 50% of the protein in the diet is supplied by the pulse, 50% by the cereal. This corresponds with 72% maize and 28% beans on dry weight base. Cowpeas are less effective in this respect, probably because of their lower lysine content (Kusin, 1973).

The increase of meat protein consumption is limited by the high costs and the many fast-days on which people even have to abstain from milk, butter and eggs.

The dietary data have revealed suboptimal intakes of Vitamin A. Physical lesions attributable to a deficiency of this vitamin have been observed in a significant number of people. In four regions intakes of ascorbic acid (Vitamin C) were low, but sufficient to prevent scurvy. Apparently the low intakes of Vitamins A and C are due to insufficient consumption of fruits. When vegetables are eaten, they are cooked for such a long time that most of the vitamins are destroyed. An increase in the amount of fresh vegetables and fruits in the Ethiopian diet would correct this deficiency (Darby et al., 1959). To combat this evil, school gardens may be useful in the extension programme as vegetables and fruits can be inserted in the dietary pattern without major changes in the customary methods of food preparation. Cooking demonstrations in the schools, using locally available food resources and basic equipment could encourage people to accept new recipes (Louis, 1964).

Darby et al. (1959) found mild rickets in approximately one third of the infants and children examined, which indicates a moderate deficiency of Vitamin D. This could be prevented by encouraging exposure to the sun.

According to Darby et al. (1959) and Hofvander (1970), goitre is endemic in many areas; it is due to a too low iodine intake. Although the basic food items contain this element in at least the same average amounts as those in non-goitrous regions in the world, the salt used by the people is low in iodine. The introduction of iodated salt could minimize this deficiency.

It is noteworthy that intakes of thiamin (Vitamin B1), riboflavin, niacin and calcium are adequate and that iron reaches high levels in the diet. The latter is probably due to the consumption of t'ef which shows an unusual high iron content (Darby et al., 1959). According to Melak Hail Mengesha (1966), this must be inherent to the species and it is not only a result of contamination. His experiments with uncontaminated t'ef confirm this viewpoint. However, investigations of Ålmgard (1963) and later Hofvander (1968) lead to a different conclusion. They found that the high iron content of t'ef as well as that of other Ethiopian crops is mainly due to contamination from the iron-rich soil. Parasitological studies revealed widespread investations with intestinal and other parasites among all age groups throughout Ethiopia. It is well-known that parasites (especially hook worm) deplete the body supply of iron and thus cause anemia. Yet on the whole anemia is much less a problem in Ethiopia than in most developing countries. This can be explained by the high iron content in food, which has its major source in contamination from the iron-rich soil. Nevertheless, Molineaux & Biru Mengesha (1965) found that t'ef prevents iron deficiency associated with parasitological investations.

Other favourable aspects of the Ethiopian state of health are the low percentage of

dental caries (though lesions of the gum indicate poor oral hygiene), a strikingly low cholesterol level in the blood, a low average blood pressure, and the infrequency of hypertension (Darby et al., 1959; Belew et al., 1972).

Since the establishment of the Ethiopian Nutrition Institute in 1962 (previously the Children's Nutrition Unit) comprehensive studies have been carried out and nutrition programmes have started. During 1963—1965, dietary as well as clinical, anthropometric and biochemical studies were made in one urban area and in four rural areas considered representative for half of the Ethiopian population. The prime target was to collect basic information on the health situation among children, especially those between 6 months and three years old.

These five areas were:
(1) a low income quarter of Addis Abeba;
(2) Ijaji, a roadside market village in Shoa, 215 km west of Addis Abeba on road to Nekemte;
(3) an area near Lake Ziwai inhabited by Arsi Galla, cattle breeders gradually turning to growing maize;
(4) Garbicho, a village in Sidamo, near Yirga Alem, with mainly ensat;
(5) Merimiti in Tigre, 21 km south of Mekele, with enjera and wot' as the main dishes.

The differences in the amounts of nutrients could be attributed mainly to the staple food. The diets were usually low in calories and proteins, especially those of animal origin. The intake of Vitamin A, ascorbic acid, thiamin, riboflavin, niacin, calcium and iron varied from adequate to grossly deficient. In all areas, and in almost all nutrients, the dietary intake of the young children was inadequate in calories according to the standards of the World Health Organization. This implies that, even though the protein intake in three areas (1, 3 and 5) was reasonable, there was a protein deficiency since protein has to be burnt to provide energy. In the other areas (2 and 4) the protein intake as well was low, thus creating an even worse situation. The situation may vary with the season: in the Lake Ziwai area, for instance, at the end of the rainy season the supply of cereals was ample and relatively large quantities of milk were produced, but in the dry season most food was scarce, whereas in the ensat area of Garbicho no important seasonal effects were found (Belew et al., 1972; Miller & Rivers, 1972; Selinus et al., 1971a-c).

The deficiencies and strengths of the Ethiopian diet are clearly related to the attitudes towards food. It is likely that Ethiopian dietary deficiencies become more acute during periods that religious customs require the abstinence from animal products. It is then, when the resistance of the people so much decreases that they are most likely to succomb to the frightening array of respiratory, venereal, intestinal, skin and other diseases (Simoons, 1960).

8 Enumeration of Ethiopian useful plants*

The Ethiopian peoples use a great number of plants or plant parts for food and other purposes. The main species are the cultivated field, orchard or garden crops; those growing wild or only occasionally in plantations, though far exceeding the others in number, are less important.

The following enumeration includes many taxa, alphabetically arranged by their Latin species names. The most common vernacular names are added; their use is indicated; the source of information is in the last column.

Besides the collection of Mrs Westphal-Stevels and the author, the following literature has been used.

1. F. von Breitenbach, 1963: The indigenous trees of Ethiopia. 2nd ed. Addis Abeba.
2. G. Cufodontis, 1953-1972: Enumeratio Plantarum Aethiopiae, Spermatophyta. Bull. Jard. Bot. État Brux. volumes 23-42.
3. G. Cufodontis, 1957: Bemerkenswerte Nutz- und Kulturpflanzen Äthiopiens. Senckenb. biol. 38: 405-415.
   G. Cufodontis, 1958-1969: Systematische Bearbeitung der in Süd-Äthiopien gesammelten Pflanzen. Senckenb. biol. 39: 103-126, 289-314; 41: 367-392; 43: 273-300; 46: 89-114; 47: 251-271; 50: 235-280.
4. G. Cufodontis, 1962-1969: Beitrag zur Flora von Godjam. Senckenb. biol. 43: 301-330; 46: 115-120; 47: 273-282; 50: 281-288.
5. E. G. Damon, 1962: The cultivated sorghums of Ethiopia. Exp. Stat. Bull., Imp. Ethiop. Coll. Agric. Mech. Arts 6.
6. E. Haberland, 1963: Völker Süd-Äthiopiens 2: Galla Süd-Äthiopiens: 763-770. Stuttgart.
7. H. P. Huffnagel et al., 1961: Agriculture in Ethiopia. FAO, Rome.
8. D. Lemordant, 1971: Contribution à l'ethnobotanique éthiopienne. J. Agric. Trop. Bot. appl. 18(1-3): 1-35; 18(4-6): 142-179.
9. I. E. Siegenthaler, 1963?: Useful plants of Ethiopia. Exp. Stat. Bull., Imp. Ethiop. Coll. Agric. Mech. Arts 14.
10. E. Westphal, 1974: Pulses in Ethiopia, their taxonomy and agricultural significance. Agric. Res. Rep. Wageningen 815.

* In 1971, the first version of the manuscript of 'Agricultural systems in Ethiopia' was sent to the College of Agriculture, Haile Sellassie I University, for comment. In 1974, part of the chapter on useful plants was used by Amare Getahun without authors' permission to draft an article on 'The role of wild plants in the native diet in Ethiopia' (in: Agro-Ecosystems 1 (1974): 45-56).

The transliteration of the local names collected by Mrs Westphal-Stevels has caused some difficulties. At first, the system of Drewes as used by Huffnagel et al. (1961, p. 469) was followed. But as the names in most other publications are written without diacritical marks, this system had to be dropped. Though the spelling has been kept as simple as possible for the English reader, the following directives should be followed for the pronounciation: *ch* as in church; *sh* as in sheep; *j* as in jump; *ch*, *k* and *t* are aspirated, *ch'*, *k'*, and *t'* (in Amharic) are not, which means that before them the vocal chords have to be closed.

The local languages are indicated as follows:

A = Amarinya	Ch = Chako	K = Konso	T = Tigrinya
Am = Amarro	G = Gallinya	Ka = Kaffinya	W = Wollamo
Ar = Arussi	J = Jamjam or Guji	S = Sidamo	
B = Borana	Ja = Janjero	Som = Somali	

Table 16. Enumeration of Ethiopian useful plants.

Scientific name	Family	Vernacular names	Uses	Sources
Abelmoschus esculentus (L.) Moench	Malvaceae		edible fruits	2
Acacia abyssinica Hochst. ex Benth.	Mimosaceae		gum arabic	7
Acacia bussei Harms var. benadirensis Chiov.	Mimosaceae		edible young twigs	2
Adansonia digitata L.	Bombacaceae	dema, dima (T), fart'at'ta (?)	leaves as vegetable, fruit pulp as refreshment	2, 8
Adenia ellenbeckii Engl. ex Harms	Passifloraceae	kaguta (K)	in Konso leaves as vegetable	3
Aframomum korarima (Pereira) Engl.	Zingiberaceae	korerima (A)	seeds as condiment	3
Agave sisalana Perr.	Agavaceae		fibre crop, also grown on plantations	7
Ajuga crenata Hochst. ex Chiov.	Labiatae	tale (W)	around Soddo medicinal crop against diarrhoea	3
Allium ascalonicum L.	Liliaceae	k'ay shenkurt (A)	vegetable crop	
Allium cepa L.	Liliaceae	shunkurt (A), tukisho (Ka), kullubi-dimtu (G)	vegetable crop	2, 8
Allium sativum L.	Liliaceae	nach shenkurt (A), kullubiadi (G), zada-scigurti (Tigre)	vegetable crop	
Amaranthus angustifolius Lam.	Amaranthaceae	aluma (A), bernaheo (T), aiyu-guri (Som)	edible leaves	2, 8
Amaranthus caudatus L.	Amaranthaceae	lishalisho, farengi-t'ef, cifogot (A); zelal-enne-mariam (T), katilla, iyaso, jolili (G); gagabsa (W), halib (?)	cooked seeds as porridge, ground seeds with t'ef for making injera, medicinal plant (tapeworm)	2, 3, 9, 10
Amaranthus gracilis (Desf.) Poir.	Amaranthaceae		leaves as vegetable	2
Amaranthus hypochondriacus L. (= *A. hybridus* L. var. *hypochondriacus* Thell.)	Amaranthaceae		edible seeds	2
Amaranthus sylvestris (Desf.) Vill.	Amaranthaceae	aluma (A), birnaheo (T)	medicinal plant (tapeworm), leaf vegetable	2
Amaranthus thunbergii Moq.	Amaranthaceae	rafu (B), ransu (S)	food	2

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Amorphophallus sp.	Araceae	bagana (K)	edible tuber, frequently cultivated in Konso	3, 10
Amorphophallus abyssinicus (Rich.) N.E.Br. (= *A. schweinfurthii* (Engl.) N.E.Br.)	Araceae	ch'ich'e (Am), bagana (K), ambatcha (T), schido (Ka)	edible tuber	2, 3, 8
Ampelocissus abyssinica (H. ex Rich.) Planch.	Vitaceae		edible fruits	2
Ananas comosus (L.) Merr.	Bromeliaceae		fruit crop	7
Anethum graveolens L.	Umbelliferae	silan, sadan-shoa (T)	condiment	2
Aningeria adolfi-friderici (Engl.) Rob. & Gilb. (= *Pouteria ferruginea* Chiov.)	Sapotaceae	kararo, kasa, shuddo (G), gudubo (S)	seeds with edible oil, timber	1, 8
Annona muricata L.	Annonaceae	ambasho, ambasha (G?), geshta (A)	edible fruits	7
Annona reticulata L.	Annonaceae	yé-baré-leb (A)	edible fruits	2
Annona senegalensis Pers.	Annonaceae		edible fruits	1
Annona squamosa L.	Annonaceae	cononcona (Som), k'omaté (G), t'akko (?)	edible fruits	2
Antidesma venosum E. Mey. ex Tul.	Euphorbiaceae	mitanbera (G), huda (Ar)	edible fruits	1
Aphania senegalensis (Juss. ex Poir.) Radlk.	Sapindaceae	sombo (A), machesa, ororah, kororas (G)	edible fruits	1, 3, 6
Apodytes dimidiata E. Mey. ex Benth. ssp. acutifolia (Hochst. ex Rich.) Cuf.	Icacinaceae	tch'ellaleka (A), dannisa (G)	timber	2, 8
Arachis hypogaea L.	Papilionaceae	lewiz (A), ocholloni (G)	field crop, oil crop	2, 7, 10
Argemone mexicana L.	Papaveraceae	madafé (A, T)	seeds for greasing the mit'ad (WP 4027, WP 7370, WP 7371)	2
Arisaema sp.	Araceae	bude, kolchoma (S)	edible tuber	2, 3, 10
Arisaema enneaphyllum Hochst. ex Rich.	Araceae	embatch'a (?)	in times of food scarcity the flour made of the tubers is mixed with cereal flour	2, 8

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Arisaema schimperianum Schott	Araceae		edible tuber, according to Jackson et al. cultivated in Gamu Highland	10
Artemisia abyssinica Schtz-Bip. ex Rich.	Compositae		medicinal plant, condiment in coffee	3
Artemisia afra Jacq. ex Willd.	Compositae	arrity (A), chukun, k'odo (G)	crushed leaves as perfume; also against stomach troubles, and for cleaning containers (WP 3194)	2, 9
Artemisia rehan Chiov.	Compositae	arriti (A), saghyo (G), rehan (?)	perfume (WP 3064)	8
Arundinaria alpina K. Schum.	Gramineae	shinato (K), karkaha (A), laymana, lemen, liemmen (G)	building and construction	2, 6
Asparagus racemosus Willd.	Liliaceae	sariti, ya set qast, qastantcha (?)	roots eaten cooked	2, 8
Astragalus boeticus L.	Papilionaceae		sometimes cultivated (Fiori, 1939)	2, 10
Avena abyssinica Hochst. ex A. Rich.	Gramineae	sinar (A)	cultivated near Debre Markos at 2800 m (Gojam); cultivation questionable.	4
Avena sativa L.	Gramineae	gerbu (J), ssa-a (T)	much cultivated (?); not seen as such by the authors	2
Azanza garckeana (F. Hoffm.) Exell & Hillc.	Malvaceae	aureta (K)	edible fruits	3
Balanites aegyptiaca (L.) Del.	Balanitaceae	ghossa, shifarau (A), badana, bedena (G), hangalta (K), muttch'a (?)	edible fruits; in Konso leaves + flowers as vegetable	1, 2, 3, 6, 8
Balanites gillettii Cuf.	Balanitaceae	badano, badana (G), kulan (Som)	edible fruits, leaves may be eaten	2, 6

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Balanites scillin Chiov.	Balanitaceae		edible fruits	2
Borassus aethiopum Mart.	Palmae		edible seeds surrounded by edible pulp	1, 2
Boscia octandra Hochst. (ex Schwfth) ex Radlk.	Capparidaceae	hamta, zahet (T)	edible fruits	1
Boswellia carteri Birdw.	Burseraceae		gum incense, medicinal plant	7, 8
Boswellia freereana Birdw.	Burseraceae		gum incense	7
Brachystelma lineare Rich.	Asclepiadaceae	embatch'a (?)	edible tubers	2, 8
Brassica carinata A. Br.	Cruciferae	goman, gommen (A), hamli (T), shea-fishu, fofa (Ja), kosa, yeken (Ch)	garden crop, leaves as vegetable, oil crop (gomanzar)	2, 3, 10
Brassica napus L.	Cruciferae			7
Brassica nigra (L.) Koch	Cruciferae	kafo-dugunta (W)		3
Brassica nigra (L.) Koch var. abyssinica A.Br.	Cruciferae	senafitch (A, T), senaficcia (G)	garden crop, edible leaves, seeds as medicin against rheumatism	2, 10
Bridelia micrantha (Hochst.) Baill.	Euphorbiaceae	yene-brutefir (A), regaraba (G)	edible fruits	1
Bromus cognatus Steud.	Gramineae	guntch'o (?)	eaten by poor people	2, 8
Brucea antidysenterica J. F. Mill.	Simaroubaceae	shoitan-buna (A), waginos (?)	more or less universal medicinal plant for the Amhara	1, 8
Buddleja polystachya Fresen.	Loganiaceae	matare (T)	medicinal plant	
Butyrospermum niloticum Kotschy	Sapotaceae		edible seeds	1
Cajanus cajan (L.) Mill.	Papilionaceae	yewof-ater (A), ohota-farengota (K), salboco-ghed (Som)	field crop, pulse	3, 10
Camellia sinensis (L.) O. Kuntze	Theaceae	shay (A)	stimulant	8
Campanula edulis Forsk.	Campanulaceae	yä galla balenjera (?)	edible	2, 8
Canavalia ensiformis (L.) DC.	Papilionaceae	dir-daguer, saar-sar (Som)	edible seeds	2, 10
Canavalia virosa (Roxb.) Wight & Arn.	Papilionaceae	ged sav (Som), sjef (Arabic)	edible seeds	2, 10

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Canthium schimperianum Rich.	Rubiaceae	galo (G)	edible fruits	3
Canthium setiflorum Hiern	Rubiaceae	sutana k'abadu (G)	edible fruits	2
Capparis cartilaginea Decne	Capparidaceae	ajehada (T), goa-kulul (Som)	edible fruits	2
Capparis decidua (Forsk.) Edgew.	Capparidaceae	malussa (G)	edible fruits	1
Capparis tomentosa Lam.	Capparidaceae	k'ontar (A), hunt'ut'i (A, G)	edible fruits	
Capsicum annuum L.	Solanaceae		garden crop, spice	2
var. acuminatum Fingerhuth				
var. cordiforme (Mill.) Sendtner				
var. oblongo-conicum (Dun.) Cuf.		berbere (A)		
var. grossum (L.) Sendt.		k'aria (A)		
Capsicum frutescens L.	Solanaceae	berbere (A, T, G), mit'mit'a (A), kerch'a (G)	garden crop, spice	2
Carica papaya L.	Caricaceae		edible fruits, sometimes on plantation scale	2
Carissa deflersii (Schwfth ex Lewin) Pichon	Apocynaceae		edible fruits	2
Carissa edulis (Forsk.) Vahl	Apocynaceae	agam (A, G), d'agamsa, agamsa (G)	edible fruits	1, 2, 3, 4, 6, 8
Carissa schimperi DC.	Apocynaceae	merens, cararu, gararoh (A), kararo, renge, marese (G), kanarichu (S)	edible fruits	1, 2, 3
Carthamus tinctorius L.	Compositae	suf (A, T), sufi (G)	field crop, oil crop	2, 10
Carum carvi L.	Umbelliferae		condiment	2, 7
Cassine aethiopica Thunb. var. pubescens (Oliver) Cuf.	Celastraceae		edible fruits	1
Catha edulis Forsk.	Celastraceae	jimma, ch'at, k'at (G), ch'at (A), kath (Arabic)	garden and orchard crop, stimulant, medicinal plant	2, 6, 8, 10
Caylusea abyssinica (Fres.) Fisch. & Meyer	Resedaceae	arencho, jerenci (A), rench'we, aranci (G), merrerat (T)	leaves as vegetable	2, 3, 9

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Ceropegia aristolochioides Decne ssp. aristolochioides	Asclepiadaceae		edible tubers	2
Ceropegia convolvuloides Rich.	Asclepiadaceae		edible tubers	2
Chenopodium opulifolium Schrader ex DC.	Chenopodiaceae	darandara (K)	in Konso as fodder	3
Cicer arietinum L.	Papilionaceae	shimbera (A, G), ater-cajeh (Tigre, T)	field crop, pulse	2, 7, 9, 10
Cissus adenocaulis Steud. ex Rich.	Vitaceae		edible roots	2
Citrullus colocynthis (L.) Schrad.	Cucurbitaceae	ya-medur-ombai (A)	edible fruits	2
Citrus aurantifolia (Christ.) Swing.	Rutaceae	lomi (A, G)	edible fruits	
Citrus aurantium L.	Rutaceae	bahr-lomi, lomin (A)	edible fruits	2, 3
Citrus grandis (L.) Osb.	Rutaceae	trunco (A)	edible fruits	2
Citrus limonia Osb.	Rutaceae	terungo (A), lomi (G), narage (Hamasen)	edible fruits	2, 3
var. limetta (Risso) Engler			edible fruits	2
var. pusilla (Schwfth) Schwartz		lomi (A, G), narige (T)	edible fruits	2
Citrus medica L.	Rutaceae	turungu (A), trungui (T)	?	2
Citrus paradisi Macf.	Rutaceae		edible fruits	7
Citrus reticulata Blanco	Rutaceae		edible fruits, mostly on plantation scale	7
Citrus sinensis (L.) Osbeck	Rutaceae	bretukan (A)	edible fruits, mostly in gardens but also on plantation scale	2
Clematis simensis Fresen	Ranunculaceae	azzo araq (?)	eaten cooked	2, 8
Coccinia abyssinica (Lam.) Cogniaux	Cucurbitaceae	ushushe (W), ajo (Ka), anchote (G, A)	garden crop, edible tubers, sometimes leaves as vegetable	2, 3, 10
Coccinia grandis (L.) Voigt	Cucurbitaceae	roho (Danakil)	edible fruits	2
Cocos nucifera L.	Palmae	gawz (?)	edible fruits	2, 8
Coffea arabica L.	Rubiaceae	buna (A, T), buna, buno (G)	stimulant, also on plantation scale	2, 3, 7, 8, 9, 10

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Coleus comosus Hochst. ex Guerke	Labiatae	gemé (?)	edible tubers	2, 8
Coleus edulis Vatke	Labiatae	wolamo-dinich, dinisch, dinecha-oromo (A), donike, dinnischta (G), janga, ganga (Darassa), sobbe (Am), wolaita-dono (W), ajo (Ja, Ka)	mostly a field crop, tuber crop, sometimes leaves as vegetable (Kefa)	2, 3, 8, 10
Coleus lanuginosus Hochst. ex Benth.	Labiatae	andeffdeff, zommer (T)	edible tubers	2
Coleus rotundiflorus A. Chev. (= *C. dysentericus* Baker)	Labiatae		edible tubers	2, 8
Colocasia esculenta (L.) Schott	Araceae	godari (A, G), godere (G), godarre, goderreh (G, Ka), garabo (W), boneya, kido (Ka), kalchoma (G in Bale)	mostly a field crop, tuber crop	2, 8, 9, 10
Colutea istria Mill. var. sericea (Rich.) Cuf.	Papilionaceae	gwaye, gwayeta (T?)	edible fruits	2, 8
Commelina africana L. var. africana?	Commelinaceae	burko (?)	edible	2, 8
Commelina benghalensis L.	Commelinaceae	hola-gabis (G), dilisha (W)	animal feed	2, 3
Commelina latifolia Hochst. ex Rich.	Commelinaceae	berqu-berqo (?)	edible tubers (Eritrea)	2, 8
Commelina pyrrhoblepharis Hassk.	Commelinaceae		leaf vegetable (Matakel area of Gojam)	4
Commiphora ancistrophora Chiov.	Burseraceae		edible fruits	2
Commiphora boiviniana Engl.	Burseraceae		edible fruits	1, 2
Commiphora crassispina Sprague	Burseraceae		edible fruits	2
Commiphora molmol (Engl.) Engl. ex Tschirch (= *C. myrrha* (Nees) Engl.)	Burseraceae		gum resin for medicinal and industrial purposes	2, 7
Corchorus olitorius L.	Tiliaceae		leaves as vegetable	2
Corchorus tridens L.	Tiliaceae		leaves as vegetable	2
Cordeauxia edulis Hemsl.	Caesalpiniaceae	yeheb (Som: fruit), gud, guda (Som: plant)	edible seeds	2

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Cordia africana Lam. (= *C. abyssinica* (R.Br. ex DC.) Rich.)	Boraginaceae	wanzay, wanza (A), auhi (T), wadessa (G), uadicho (S)	edible fruits, wood for building and furniture	2, 3, 6, 8, 9
Cordia gharaf (Forsk.) Aschers.	Boraginaceae		edible fruits	1, 2
Cordia ovalis R. Br. ex DC.	Boraginaceae	mandiro (G)	edible fruits	2
Cordyla africana Lour.	Caesalpiniaceae	antorro, ontor (Som)	edible fruits	2
Coriandrum sativum L.	Umbelliferae	dimbelal (A)	garden crop, fruits as condiment	2, 9
Crambe abyssinica Hochst. ex R. E. Fries	Cruciferae		seeds containing oil	2
Croton macrostachys Hochst. ex Rich.	Euphorbiaceae	besana (A), makanisa, bakanisa (G), mokanisa (Ar), massagonta (K)	crushed leaves with kosso as medicin (Konso), flowers give a good honey, leaves as green manure (Dorse)	2, 3, 6
Cucumis melo L.	Cucurbitaceae	unun (Danakil)	edible fruits	2
Cucurbita maxima Duch.	Cucurbitaceae	dube, duba (A), abubbi (G), dubba (T), hamham (Tigre), dabakula (Ar)	edible fruits, seeds containing oil	2, 6
Cucurbita moschata Duch. ex Poir.	Cucurbitaceae		edible fruits	2
Cucurbita pepo L.	Cucurbitaceae	baharkel, dubba (A), wuschisch (A, T), hamham (Tigre), buko, bukeh (Ka)	edible fruits	2
Curcuma domestica L.	Zingiberaceae	urd (A)	spice	2
Cydonia japonica Loisl.	Rosaceae	kook (G)	edible fruits	7
Cymbopogon citratus (DC. ex Nees) Stapf	Gramineae	tej-sar, zumblet (A), masarafta (G)	aromatic grass	2
Cynara scolymus L.	Compositae	karshuf (G)	vegetable	2
Cyperus bulbosus Vahl var. spicatus Böckeler (= *Hemichlaena bulbosa* Hochst. ex Rich.)	Cyperaceae	getch'a (?)	edible tubers	2, 8
Cyperus esculentus L.	Cyperaceae	kwenti (A?)	edible tubers, edible fruits (in Eritrea)	2, 8

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Cyphia glandulifera Hochst. ex Rich.	Campanulaceae	t'equr alem (?)	edible tubers, young tubers and young shoots as vegetable	2, 8
Cyphomandra betacea (Cav.) Sendt.	Solanaceae	ambarut (G)	garden crop, edible fruits	2, 9
Digera alternifolia (L.) Asch.	Amaranthaceae	kogata (K)	leaf vegetable (in Konso)	2, 3
Dioscorea sp.	Dioscoreaceae	kusho (Ja)	edible tubers, wild and cultivated in Janjero area	
Dioscorea sp.	Dioscoreaceae	ocheno (Ka)	tuber crop (Jima area)	10
Dioscorea sp.	Dioscoreaceae		wild plants with edible aerial tubers; in Sidamo, Kefa (WP 2638, WP 3145, WP 3337)	
Dioscorea abyssinica Hochst. ex Kunth	Dioscoreaceae	boëna (A), boye, bohe (S), maze (W)	tuber crop in Sidamo, Wollamo (Kindo)	3, 8, 10
Dioscorea bulbifera L.	Dioscoreaceae	kotehare (G)	edible aerial tubers	2, 9, 10
Dioscorea schimperiana Hochst. ex Kunth	Dioscoreaceae	ankorumba (G)	wild plant with edible tubers	3
Diospyros kaki L. fil.	Ebenaceae		edible fruits	7
Diospyros mespiliformis Hochst. ex DC.	Ebenaceae	ayeh (T)	edible fruits	1
Diphasia dainellii Pich.-Serm.	Rutaceae	lelcho (S), hadesa (G), hirk'amo (Ar)	edible fruits	3, 6
Dobera glabra (Forsk.) Juss. ex Poir.	Salvadoraceae		edible fruits	1
Dobera glabra (Forsk.) Juss. ex Poir. var. macalusoi (Matt.) Fiori	Salvadoraceae		edible fruits	2
Dolichos lablab L.	Papilionaceae	amora-guaya (A), o-cala (K)	field and garden crop, pulse	2, 3, 10
Dovyalis abyssinica (Rich.) Warb.	Flacourtiaceae	kochim (A), ankakute (W), ankakute (G), aihada (T)	edible fruits	1, 2, 3
Dregia abyssinica (Hochst.) K. Schum.	Asclepiadaceae	schanqok (T, Tigre)	leaf vegetable	2
Duranta repens L.	Verbenaceae	kombolcha (A, G)	edible fruits	2
Edithcolea sordida N.E. Br.	Asclepiadaceae		edible stems and leaves	2

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Ehretia cymosa Thonn.	Boraginaceae	urqessa (A)	edible fruits	2
Ehretia cymosa Thonn. var. abyssinica (R. Br. ex Fresen.) Brenan	Boraginaceae	ulaga (A, G)	edible fruits	2
Ekebergia capensis Sparrm.	Meliaceae	limich' (A), ulmay (G)	edible fruits	
Eleusine coracana (L.) Gaertner	Gramineae	dagusa, tocusso (A), daguggia (G)	field crop, for beer and bread	2, 10
Eleusine jaegeri Pilger	Gramineae	akirma (A)	widely used in basketry	2
Embelia schimperi Vatke	Myrsinaceae	ankoko, imkoko (A), kanko (S), swaria (T)	edible leaves, fruits contain oil used as vermifuge, medicinal plant	1, 2, 8
Emilia sonchifolia (L.) DC. ex Wight	Compositae		edible young leaves	2
Ensete ventricosum (Welw.) Cheesman	Musaceae	ensat (A), wese (G)	garden crop, important starch crop in south-west Ethiopia; fibre crop	3, 6, 7, 8, 9, 10
Eragrostis tef (Zucc.) Trotter	Gramineae	t'ef, taf (A, T), tafi (G)	field crop, important cereal	2, 10
convar. fescescens Cif. & Bald.				
var. zuccagniana Cif. & Bald.				
var. alabastrina Cif. & Bald.				
var. opaca Cif. & Bald.				
var. viridis Hochst.		t'ef sergenia (A)		
var. dschangar Schimp.				
convar. purpurascens Link				
var. violascens Cif. & Bald.				
var. rogevitziana Cif. & Bald.				
var. rubicunda Hochst.		t'ef-tikur (A)		
var. purpurea Hochst.		t'ef-nech (A)		
convar. albescens Cif. & Bald.				
var. trotteriana Cif. & Bald.				

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
var. curati (Hochst.) Cif. & Bald.				
var. adnensis Roshev.				
var. alba Hochst.		t'ef-bazra (A)		
Eriobotrya japonica Lindl.	Rosaceae	mushmalla (A?)	edible fruits	7
Eriosema cordifolium Hochst. ex Rich.	Papilionaceae	silink'a, silingo, silinga (Guji, Ar)	wild plant with small edible tubers (Guji and Arussi)	2, 3, 6, 8
Eruca sativa Hill.	Cruciferae		pot herb	2
Erucastrum arabicum Fisch. & C. A. Meyer	Cruciferae	shimpa (C), shalale (G)	vegetable	3
Erucastrum arabicum Fisch. & C. A. Meyer var. hararense (Engl.) O. E. Schulz	Cruciferae	yewofzer (A), chalale (G)	wild leaf vegetable, in former times used especially by the Arussi near Negelli (Arussi)	3
Eucalyptus globulus Labill.	Myrtaceae	ye bahar zaf, bahar-zaf (A), acca-chilti (G)	wood for construction and as firewood	2, 8
Euclea keniensis Fries	Ebenaceae		edible fruits	1
Euclea schimperi (DC.) Dandy	Ebenaceae	dedaho, kurkura (A), miesa, mihessa, ghino (G)	edible fruits	1, 6
Ferula communis L.	Umbelliferae	dog, tutche (?)	pith and young cooked twigs edible	2, 8
Ficus brachypoda Hutch.	Moraceae	k'iltu, k'ilta (G), k'ilitu (Alabdu), k'iltut (S), warka (A)	edible fruits	6
Ficus capreaefolia Del.	Moraceae	bellass (T), walantəi (G)	edible fruits	1, 2
Ficus dharo Del.	Moraceae		edible fruits	1
Ficus gnaphalocarpa (Miq.) Steud. ex Rich.	Moraceae	shola, worka, bamba (A), oda (G)	edible fruits	1, 6
Ficus mallotocarpa Warb.	Moraceae	harbu (G)	edible fruits	1
Ficus palmata Forsk.	Moraceae	balas (A), luga (G)	edible fruits	3, 6
Ficus riparia (Miq.) Hochst. ex Rich.	Moraceae	shola (A), harbu (G)	edible fruits	1
Ficus sur Forsk.	Moraceae	harbu, shola (G), shola (A), odako (S), koddo (T)	edible fruits and bark	1, 2, 6

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Ficus sycomorus L.	Moraceae	shola, worka, bamba (A), lugo, woda (G); sagla (T)	edible fruits	1
Ficus vallis-choudae Del.	Moraceae	bambuledeh (A)	edible fruits	1
Ficus vasta Forsk.	Moraceae	worka (A), dembi, kilti (G), dahro (T)	edible fruits	1
Flacourtia indica (Burm. fil.) Merr.	Flacourtiaceae	menedem (A), huda, hudaferda (G)	edible fruits	1, 2
Foeniculum piperinum (Ucria) Presl	Umbelliferae		condiment ?	2
Foeniculum vulgare Mill.	Umbelliferae	ensellal, silan (T), kamun (A), kamona (G)	condiment	2, 9
Gardenia erubescens Stapf & Hutch.	Rubiaceae		edible fruits	1
Gardenia jovis-tonantis Hiern	Rubiaceae		edible fruits	1
Gardenia lutea Fresen.	Rubiaceae	hatina (T), gambela (A), gambela, dambi, subdo (G), gambil (S)	edible fruits, timber	2, 3, 4, 8, 9
Girardinia heterophylla (Vahl) Decaisne ssp. adoensis (Hochst. ex Steud.) Cuf.	Urticaceae		leaf vegetable in northern Darassa area (Sidamo)	3
Gossypium arboreum L.	Malvaceae		fibre crop	2
Gossypium barbadense L.	Malvaceae	duht (A), othbe (Saho)	fibre crop	2
Gossypium herbaceum L. var.acerifolium (Guill. & Perr.) Chev.	Malvaceae	garatita (K), girbi (G), udbi (Som in Ogaden)	fibre crop	2, 3, 10
Gossypium herbaceum L. var. africanum (Watt)Hutch. & Ghose	Malvaceae	dut (T)	fibre crop	2
Gossypium hirsutum L. var. punctatum (Schum.) Hutch., Silow & Stephens	Malvaceae	futota (K), det (A)	fibre crop	2, 3, 4, 7, 10
Grewia bicolor Juss.	Tiliaceae	aroressa (A, G)	edible fruits	2
Grewia cerasifera Chiov.	Tiliaceae		edible fruits	2
Grewia flavescens Juss.	Tiliaceae	t'ayé (A), ussa-mussa (Som), ugumdi, badeno (G)	edible fruits	1, 2

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Grewia mollis Juss.	Tiliaceae	haroresa, aroresa (G), t'aye (A)	edible fruits	6
Grewia tembensis Fresen. var. ellenbeckii Burret	Tiliaceae	d'aka, akka (G)	edible fruits	2
Grewia tenax (Forsk.) Fiori	Tiliaceae	asha, ado, merayo, eka (G), kotjata (K), k'ach' k'ach'e (A)	edible fruits	1, 2, 3
Grewia villosa Willd.	Tiliaceae	agobdi, agamde, ogomde, udu k'abedu (G)	edible fruits	2
Guizotia abyssinica (L. fil.) Cass.	Compositae	nug (A), nugi, nuga (G)	oil crop, field crop	2, 7, 9, 10
Gymnema sylvestre (Retz.) R.Br. ex Schultes	Asclepiadaceae	schangok (T)	edible leaves	2
Gynandropsis gynandra (L.) Briq.	Capparidaceae		leaf vegetable	2
Hagenia abyssinica (Bruce) Gmelin	Rosaceae	kosso, koso (A), het'o, hatou (G), het'ot (S)	famous medicinal tree	2, 6, 8
Helianthus annuus L.	Compositae	nughi-adi (G), jabar-suf (A)	field crop, sometimes garden crop, oil crop	2, 7
Hibiscus cannabinus L.	Malvaceae	sugott, ahor-harrisch (T)	leaf vegetable	2
Hibiscus esculentus L.	Malvaceae	bameyah (A, G)	edible young fruits	
Hibiscus sabdariffa L.	Malvaceae	karkade (?)	edible leaves, calyx for preparing a beverage	2, 8
Hordeum vulgare L. H. vulgare convar. vulgare Mansfeld: var. coeleste L.; var. cucullatum Körn.; var. eurylepis Körn.; var. gracilius-nigrum Schwfth; var. nigrum Willd.; var. pallescens Schwfth; var. pallidum Sér.; var. parallelum Körn.; var. schimperianum-nigrum Schwfth H. vulgare convar. distichon (L.) Alefeld: var. breve Alef.; var. contractum Körn.; var. melanocrithum Körn.; var. nigrescens Körn.; var. nigricans Sér.; var. nudum L.	Gramineae	gerbu, garbu (G), gubs (A), segam (T)	important cereal	2, 3, 4, 7, 10

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
H. vulgare convar. deficiens (Steud. ex A. Br.) Mansfeld: var. macrolepis (A.Br.) Körn. H. vulgare convar. intermedium (Körn.) Mansfeld: var. atterbergii (Körn.) Mansf.; var. varians; var. noram H. vulgare convar. labile (Schiem.) Mansfeld				
Hydnora sp.	Hydnoraceae	t'uk'a (Som or G)	edible stamens (WP 3523, WP 4035)	
Hydnora hanningtonii Rendle	Hydnoraceae		edible rhizomes	2
Hydnora johannis Becc. var. gigantea Vacc.	Hydnoraceae	lekke, likke, lipti (Som)	edible	2
Hydnora ruspolii Chiov.	Hydnoraceae		edible fruits	2
Hyparrhenia rufa (Nees) Stapf	Gramineae	senbelet (A)	thatching grass, indicator grass on farmland	9
Hyphaene thebaica (L.) Mart.	Palmae	agad (Shire), anga (Saho), kombasch (T)	edible fruits, vegetable ivory (Eritrea), palmwine tapped from the stems	2, 8
Impatiens tinctoria Rich.	Balsaminaceae	girshed, eshoshila (A), osile (G), wosolua (W)	tubers for red nail dye	2, 3, 8
Ipomoea aquatica Forsk. (= *I. reptans* Poir. ex Roem.)	Convolvulaceae		leaf vegetable	2
Ipomoea batatas (L.) Lam.	Convolvulaceae	tinisha (K), matatish, mitasisi (G)	field crop, tuber crop	2, 3, 7, 10
Ipomoea garckeana Vatke	Convolvulaceae		edible tubers	2
Ipomoea wightii (Wall.) Choisy	Convolvulaceae	kuda (Ch)	animal feed collected by children of the Chako	3
Jasminum abyssinicum Hochst. ex DC.	Oleaceae	messertch, tambalal (T), teo (G)	medicinal plant	2, 8
Juniperus procera Hochst. ex Endl.	Cupressaceae	t'id (A), gatira (G), hind'esa (Ar, B, Guji)	important timber, medicinal plant	2, 6, 7, 8, 9
Lagenaria siceraria (Mol.) Standley	Cucurbitaceae	buk'e, dabacula, folla (G), kil (A)	fruits as container	2, 6

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Landolphia buchananii (Hall. fil.) Stapf	Apocynaceae	yetabonja inchet (A)	edible fruits, rubber-yielding plant	1
Lannea malifolia (Chiov.) Sac.	Anacardiaceae		edible fruits	2
Lannea schimperi (Hochst. ex Rich.) Engl.	Anacardiaceae	handaraka (G)	edible fruits	2, 6
Lantana camara L.	Verbenaceae	yawaf-k'ollo (A)	edible fruits	
Lantana trifolia L.	Verbenaceae	hamaressa (A, G)	edible fruits	2
Lathyrus sativus L.	Papilionaceae	guaya (A), gayu (G), sebbere (T)	field crop, pulse, fodder crop	2, 3, 9, 10
Launaea taraxacifolia (Willd.) C. Jeff.	Compositae	hangoleita (K)	wild growing vegetable (Konso)	3
Lens culinaris Med. (= *L. esculenta* Moench)	Papilionaceae	messer, missr (A), missera (G)	field crop, pulse	2, 7, 10
Lepidium sativum L.	Cruciferae	fet'o (A), sheffo, shimfi (G), shimfa (T)	garden crop, medicinal crop (flour mixed with honey against amoebae; against stomach cramps), appetizer (flour + chopped injera + water), seeds containing oil	2, 7, 9, 10
Linum usitatissimum L.	Linaceae	talba, telba (A), endadé, entati (T), k'ontor, talba, telba (G)	field crop, oil crop, seeds sometimes cooked as diuretic	2, 3, 7, 9, 10
Lippia adoensis Hochst. ex Walp.	Verbenaceae		condiment in butter and koch'o	3
Lippia citriodora Kunth	Verbenaceae		condiment in tea (WP 771)	
Lippia javanica (Burm. fil.) Sprengel	Verbenaceae	kosarat, kassé, basobila (A), kefo (W), kosorotia (?), soké (G)	condiment in wot' and butter	2
Luffa cylindrica (L.) Roemer	Cucurbitaceae		young fruits as vegetable	2
Lupinus albus L. cv.-group Albus (= *L. termis* Forsk.)	Papilionaceae	gebto, gibdo, gubto (A, T)	field crop in Gojam, pulse	2, 3, 10
Lycopersicon esculentum Mill.	Solanaceae	tematem (A), timatimi (G)	garden crop, fruit vegetable	2, 3, 7, 9

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Maesa lanceolata Forsk.	Myrsinaceae	akalua, kalawa, kalau (A), abaji, kalaua, abbaye, geshy (G)	fruits yielding oil for greasing pottery, vermifuge, firewood	1, 2, 3, 4, 6, 9
Majorana hortensis Moench	Labiatae	hassab (probably A)	condiment	2
Mangifera indica L.	Anacardiaceae		sometimes plantation crop, edible fruits	2, 7
Manihot esculenta Crantz	Euphorbiaceae	dek'ik'a (G)	mostly in gardens, root crop	3, 9
Maytenus arbutifolius (Hochst. ex A. Rich.) Wilczek	Celastraceae	kombolcha (A, G)	edible fruits	
Maytenus heterophylla (Eckl. & Zeyh.) N. Robson	Celastraceae	at'at (A)	edible fruits	
Maytenus ovatus (Wall. ex Wight & Arnott) Loes. var. argutus (Loes.) Blakelock	Celastraceae	atat (?)	fruits as condiment	2, 8
Maytenus ovatus var. ovatus forma pubescens (Schwfth) Blakelock	Celastraceae	kamo (T)	edible fruits (after cooking)	2
Mentha sp.	Labiatae	anana-k'ut'i (Adere)	condiment in tea (WP 1847, WP 4037)	
Meyna tetraphylla (Schw. ex Hiern) Robyns	Rubiaceae	cabu (Shankalla)	edible fruits	2
Mimusops kummel Bruce ex DC.	Sapotaceae	colati, dembi, bururi, konjo (G), ishe, shie (A)	edible fruits	1, 2
Momordica foetida Schum.	Cucurbitaceae	keré (Si)	edible pulp	2
Moringa oleifera Lam.	Moringaceae	mrongo (Som)	young fruits and leaves as vegetable, seeds containing oil	1, 2
Moringa stenopetala (Bak.) Cuf.	Moringaceae	shifara, shalchada (K)	leaf vegetable	3, 10
Morus mesozygia Stapf	Moraceae	shamgareza (A), shanto, satcho (G)	edible fruits	1
Mucuna pruriens (L.) DC. cv.-group Utilis	Papilionaceae		edible seeds	10
Musa spp.	Musaceae	muz (A)	fruit crop, sometimes on plantation scale	7

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Myrsine africana L.	Myrsinaceae	kachamo (A), k'achamo (G)	wood for building, fruits for medicinal purposes	2, 4, 6, 8
Myrtus communis L.	Myrtaceae	ades (A), barsanat, mersene (?)	mixed with butter as pomade, condiment in butter, leaves as condiment	4, 8
Nauclea latifolia Smith	Rubiaceae		edible fruits	4
Nicotiana rustica L.	Solanaceae	galla-tambo (W), tipize (Ja), tombaco (T)	mostly garden crop, stimulant	2, 3, 7
Nicotiana tabacum L.	Solanaceae	arado (S), karatumako (Ja), timbo (G), tombako, timbakho (A, T), wolaita-tambo (W), tuma-karmesha, shoma-tuma, tama-tuma (Ch)	garden as well as field crop, stimulant	2, 3
Nigella sativa L.	Ranunculaceae	t'ikur azmud (A), abasuda, nugi guracha, awosseda (T), orsuda (G)	mostly a garden crop, condiment in wot'	2, 3, 9
Ocimum basilicum L.	Labiatae	basobela, basobila (A), sessak (T), kefo (Galla Jima), urgo (Ar), atumbar (G)	garden crop, condiment in wot', leaves + flowers added to tea or coffee	2
Ocimum basilicum L. var. purpurascens Benth.	Labiatae	urgo (G)	condiment in milk and butter	3
Ocimum canum Sims	Labiatae	sahmar (T), sohmar (Tigre)	condiment	2
Ocimum graveolens A.Br. (prob. O. basilicum L. var. anisatum Benth.)	Labiatae	basobila, bachobila (A)	condiment	3, 4
Ocimum hadiense Forsk. (= *O. menthaefolium* Hochst. ex Benth.)	Labiatae	damakase, kase (?), kassé, koseret (A), kussae (G)	perfume plant	2
Ocimum lamiifolium Hochst. ex Benth.	Labiatae	damakase, kase (?), damakassé (A)	perfume plant	2
Olea africana Miller (= *O. chrysophylla* Lam.)	Oleaceae	woira (A), eghersa (G), wayra (?)	edible fruits, medicinal plant	1, 6, 8

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Oncoba spinosa Forsk.	Flacourtiaceae	jilbo, gilbo (G), borum-boka (Ch), akoko (A)	edible fruits	2, 3
Opuntia ficus-indica (L.) Mill.	Cactaceae	kulkwal (A), tini (G)	edible fruits	2
Oxalis anthelmintica Rich.	Oxalidaceae	mech'amech'o, abba tch'ago (T)	edible leaves and tubers, medicinal plant	2, 8
an Orchidacea (WP 1253)	Orchidaceae	meré (G)	edible tubers	9
Oxygonum atriplicifolium (Meissn.) Mart. var. sinuatum Baker	Polygonaceae	dashian-mirahat, meracut (T + Tigre), galla-schingua (Bilin)	edible leaves	2
Oxytenanthera abyssinica (Rich.) Munro	Bambusaceae	arkai (T), shemel, schimela (A)	edible cooked fruits, edible young sprouts, building material	2, 3
Oxytenanthera borzii Mattei	Bambusaceae	arkai (T)	edible fruits	2
Papaver somniferum L. var. album DC.	Papaveraceae	genbich'a (A), sciancoré (G)	condiment in bread (WP 4903, WP 7375, WP 7376, WP 7377)	2
Pappea capensis Eckl. & Zeyh. var. radlkoferi Schinz	Sapindaceae	bika (A), bik'a, bek'a (G)	edible fruits, firewood	1, 6
Passiflora edulis Sims	Passifloraceae		in gardens, edible fruits	2, 3
Pennisetum setaceum (Forsk.) Chiov.	Gramineae	alula (T)	cultivated	2
Pennisetum spicatum (L.) Körn.	Gramineae	bultuc (T, Tigre)	cultivated	2, 7
Pennisetum typhoides (Burm.) Stapf & Hubb.	Gramineae	bultuc (T, G), dukun (?)	field crop, cereal	2, 7
Peponium vogelii (Hook. fil.) Engl.	Cucurbitaceae	sorupa (G), tojo (Ka)	edible fruits	2
Pergularia daemia (Forsk.) Chiov.	Asclepiadaceae	korroda (K)	edible fruits, in Konso as leaf vegetable	2, 3
Persea americana Mill.	Lauraceae	tja-saré (G)	edible fruits, sometimes on plantation scale	7
Persica vulgaris Mill.	Rosaceae	kohk (A)	edible fruits	2
Phaseolus aconitifolius Jacq.	Papilionaceae		pulse (according to Cufodontis (1955) cultivated in Eritrea)	2, 10

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Phaseolus acutifolius A. Gray	Papilionaceae		pulse (according to Fiori (1939) cultivated in Hararge)	2, 10
Phaseolus coccineus L.	Papilionaceae		garden crop, pulse	2, 10
Phaseolus lunatus L.	Papilionaceae	fasoelea makke (?), atera bakerra (A), lodjo (G)	garden crop, pulse	2, 10
Phaseolus radiatus L.	Papilionaceae	fudjeelee (G), maaisjo (?), ogodde (Anyowah)	field and garden crop, pulse	2, 10
Phaseolus vulgaris L.	Papilionaceae	adanguaré (A), adagora, adagura (T), ashanguare (G)	field and garden crop, pulse	2, 3, 10
Phoenix dactylifera L.	Palmae	timer (A?), tamar (G)	edible fruits, also on plantation scale	2, 7
Phoenix reclinata Jacq.	Palmae	hosaina (A), zembaba (A), met'i (G)	edible fruits	1, 2, 9
Phyllogeiton discolor (Klotzsch) Herzog	Rhamnaceae		edible fruits	3
Physalis peruviana L.	Solanaceae	aut (A, G)	edible fruits	2, 3
Phytolacca dodecandra l'Hér.	Phytolaccaceae	andode, endod, indod (A), haranja (G), arencha (S)	substitute for soap, medicinal plant	3, 6, 8, 9
Piper capense L. fil.	Piperaceae		fruits chewed (with ch'at), used in arake	2, 9
Pisum sativum L.	Papilionaceae		field crop, pulse	2, 10
cv.-group Abyssinicum (= *P. abyssinicum* A.Br.)		agarea atar (A)		
cv.-group Sativum		atter, ater (A), atari (G), ater, ein-ater (T)		
Podocarpus gracilior Pilger	Podocarpaceae	zigba (A), bir-birsa (G)	important timber tree	2, 7, 8, 9
Portulaca oleracea L.	Portulacaceae	melkenna (T)	leaf vegetable	2
Portulaca quadrifida L.	Portulacaceae	mereita (K)	vegetable	3, 4
Premna resinosa Schauer	Verbenaceae	wurgecha (G)	edible fruits	2
Psidium guajava L.	Myrtaceae	zetun (A), zetuna (G)	mostly in gardens, edible fruits	2, 7

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Psophocarpus palustris Desv.	Papilionaceae		edible fruits (WP 2666)	2, 10
Punica granatum L.	Punicaceae	roman (A)	in gardens, edible fruits, medicinal plant	2, 3, 8, 9
Pygeum africanum Hook. fil.	Rosaceae	akama, homa, t'equr entch'at (?)	timber	1, 2, 8
Rhamnus prinoides l'Hér.	Rhamnaceae	gesho (A), gesho, t'ado (G), tando (W)	field and garden crop, condiment, as hops in t'ela (beer) preparation, sometimes in t'ej (honey wine) preparation	2, 3, 6, 8, 9
Rhamnus staddo Rich.	Rhamnaceae	staddo, roddo (A, T, G), s'addo (?)	condiment, in t'ej (honey wine) preparation	2, 8
Rhus natalensis Bernh. ex Krauss	Anacardiaceae	dedalo (T), kabudeida (K), dabobesa, tatesa (G)	edible fruits	1, 3, 6
Rhus vulgaris Meikle	Anacardiaceae	k'emo (A)	edible fruits	2
Ricinus communis L.	Euphorbiaceae	gulo (A), kobo (G)	wild and garden crop, oil crop (greasing the mit'ad), medicinal plant	2, 3, 6, 8, 9
Ritchiea albersii Gilg	Capparidaceae		edible fruits	3
Rosa abyssinica R. Br.	Rosaceae	kaga (A, T), gora, gore	edible fruits	2, 6
Rosmarinus officinalis L.	Labiatae	k'ora (G)	condiment	
Rubus apetalus Poir.	Rosaceae	enjori (A), gorra (G)	edible fruits	
Rubus exsuccus Steud. ex Rich. (= *R. pinnatus* Auct. non Willd.)	Rosaceae	injori (A?)	edible fruits	2
Rubus pinnatus Willd.	Rosaceae	enjori (A), gura (G)	edible fruits	
Rubus rosaefolius Sm.	Rosaceae		edible fruits	
Rubus steudneri Schwfth var. aberensis Engl. ex Gustafss.	Rosaceae	enjori (A), gumorre, haltufa (G), garo (Ka)	edible fruits	2
Rubus sp.	Rosaceae	goragalo (G)	edible fruits (WP 822)	
Rubus sp.	Rosaceae		edible fruits (WP 3329)	

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Rumex abyssinicus Jacq.	Polygonaceae	makmako, mocmoco (A, T), ch'oldia (W), dangago (Darassa), ambadjo (?)	roots for medical purposes, as condiment, in butter against rancidness, edible leaves (in Tipa region)	2, 3, 6, 8
Rumex nervosus Vahl	Polygonaceae	umbacho (A), hachot (T), dangago (Alabdu)	roots as vermifuge, in Eritrea leaves and young twigs as vegetable	2, 6, 8
Rumex steudelii Hochst. ex Rich.	Polygonaceae	tult (A), chambobata (T)	roots as medicin against colic	2, 8
Ruta chalepensis L. var. tenuifolia d'Urville	Rutaceae	tcená-addam, saina-adam (T, A), gulla, taladdam (A), dscharta (G)	garden crop, condiment, fresh leaves added to coffee, medicinal plant	2, 3, 8, 9
Saba comorensis (Boj. ex DC.) Pichon	Apocynaceae	dugi (G)	fruits with edible pulp	1, 2
Saccharum officinarum L.	Gramineae	shunkora, shonkar (A, G), tinkish (A), maka (W), shenkor agada (?)	garden crop, also on plantation scale	2, 7, 8, 10
Salvia nilotica Juss. ex Jacq.	Labiatae	shokoksa (G), antate-wollakha (T)	edible fruits (containing oil)	2, 3, 6
Salvia schimperi Benth.	Labiatae	dabarak (A), abbadera (Asmara), mai-sendebo (T)	fruits containing oil (WP 5565)	2
Satureja paradoxa (Vatke) Engl. (= *Calamintha paradoxa* Vatke)	Labiatae	t'osinyi (A)	leaves for making a kind of tea	9
Satureja punctata (Benth.) Briq.	Labiatae	tossinj, tosia (A)	condiment	2, 3
Sauromatum nubicum Schott (= *S. venosum* (Ait.) Kunth)	Araceae	hamasserau, hambughaita (Tigre: Ghinda)	edible tuber	2, 3
Sclerocarya birrea (Rich.) Hochst.	Anacardiaceae	kumal, gomales (A), abengul (T)	edible fruits	1, 2, 3
Securidaca longipedunculata Fruw.	Polygalaceae		edible leaves (Terra, 1966)	
Securinega virosa (Roxb. ex Willd.) Pax ex Hoffm.	Euphorbiaceae	k'ach'achalo (G)	edible fruits	1, 2
Senecio tuberosus Schtz-Bip. ex Rich.	Compositae	embatch'a (?)	edible tuber	2, 8

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Sesamum indicum L.	Pedaliaceae	angada (T), salid (A), zedi (G)	oil crop, field crop	2, 3, 7
Sida cuneifolia Roxb.	Malvaceae		roots chewed	2
Sida orata Forsk.	Malvaceae		roots chewed	2
Solanum alatum Moench (= *S. miniatum* Bernh.) (= *S. scabrum* Mill.)	Solanaceae	awut, aut (A), mujulo (A, G), tunaye (G, Si), sara-korbo (G)	edible fruits	2
Solanum dasyphyllum Schum.	Solanaceae	santa-butua (Wolamo)	garden crop, leaf vegetable	2, 3
Solanum macrocarpon L.	Solanaceae		garden crop, edible leaves and fruits	2
Solanum melongena L.	Solanaceae	badardjan (?)	garden crop, fruit vegetable	2, 7, 8
Solanum memphiticum Gmel. var. abyssinicum (Dun.) Cuf.	Solanaceae		edible leaves and fruits	2
Solanum muricatum Aiton	Solanaceae	ambarut (G)	generally a garden crop, edible fruit	2
Solanum nigrum L.	Solanaceae	aut (A)	leaf vegetable, edible fruits	2
Solanum nodiflorum Jacq.	Solanaceae	had'oa (Ar, G)	garden crop, leaf vegetable	2, 3, 6
Solanum tuberosum L.	Solanaceae	dinnicia-frengi, dinnicia-scioa (G, prob. A)	generally a field crop, tuber crop	2, 7, 10
Solanum villosum Mill. (= *S. scabrum* Mill.)	Solanaceae	tunaye (S, G)	edible fruits	2
Sorghum spp.	Gramineae	misinga, mashinka, mashinga, bisinga (G), madela (A)	cereal	6
Sorghum aethiopicum Rupr. ex Stapf	Gramineae	dura (general), bald (Ogaden)	sometimes cultivated	2
Sorghum ankolib (Hack.) Stapf	Gramineae	dura, ankolib (Gallabat)	cultivated	2
Sorghum aterrimum Stapf	Gramineae		var. transiens Hack. and var. angustum Snowd. cultivated everywhere	2
Sorghum bicolor (L.) Moench	Gramineae	bachanka (S), sangada (G), mashilla (?)	cultivated, cereal	2, 3, 10

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Sorghum bicolor var. picigutta Snowden	Gramineae		cultivated	5
Sorghum caudatum (Hack.) Stapf var. feterita Stapf	Gramineae		cultivated	5
Sorghum caudatum var. fragile Stapf	Gramineae		cultivated	5
Sorghum caudatum var. gibbum Stapf	Gramineae	ondo (K), missinga (Som in Sidamo), rubba, rubbu (Arbore, Gheleba)	cultivated	2, 5
Sorghum cernuum (Ard.) Host var. cernuum	Gramineae		cultivated	2
Sorghum dochna (Forsk.) Snowden var. dochna (Forsk.) s.str.	Gramineae	sangada (T), tinkish (A)	cultivated	2
Sorghum durra (Forsk.) Stapf var. durra	Gramineae		cultivated	2
S. durra var. erythrocarpum (Chiov.) Snowden	Gramineae		cultivated	2
S. durra var. fiorii (Chiov.) Snowden	Gramineae		cultivated	2
S. durra var. fuscum Snowden	Gramineae		cultivated	5
S. durra var. maximum Snowden	Gramineae		cultivated	2, 5
S. durra var. melanoleucum (Chiov.) Snowden	Gramineae		cultivated	2
S. durra var. niloticum (Körn.) Snowden	Gramineae		cultivated	2
S. durra var. tomentosum Damon	Gramineae		cultivated	5
Sorghum membranaceum Chiov. var. membranaceum s.str.	Gramineae		cultivated	2
Sorghum membranaceum Chiov. var. ehrenbergianum (Körn.) Snowden	Gramineae		cultivated	2
Sorghum simulans Snowden	Gramineae		cultivated	5
Sorghum subglabrescens (Steud.) Schwfth & Asch. var. abyssinicum (Hack.) Snowden	Gramineae		cultivated	2, 5
S. subglabrescens var. albicaryopsis Damon	Gramineae		cultivated	5
S. subglabrescens var. arabicum (Körn.) Snowden	Gramineae		cultivated	5
S. subglabrescens var. keyila Damon	Gramineae		cultivated	5

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
S. subglabrescens var. latum Snowden	Gramineae		cultivated	2, 5
S. subglabrescens var. leiocladum Snowden	Gramineae		cultivated	2, 5
S. subglabrescens var. leucocarpum (Chiov.) Snowden	Gramineae		cultivated	2, 5
S. subglabrescens var. microcarpum (Chiov.) Snowden	Gramineae		cultivated	2
S. subglabrescens var. oviforme Snowden	Gramineae		cultivated	5
S. subglabrescens var. paniculatella (Chiov.) Snowden	Gramineae		cultivated	2
S. subglabrescens var. rubidum Snowden	Gramineae		cultivated	5
S. subglabrescens var. rubrocernuum (Körn.) Snowden	Gramineae		cultivated	2
S. subglabrescens var. rugulosum (Hack.) Snowden	Gramineae		cultivated	2, 5
S. subglabrescens var. schimperi (Hack.) Snowden	Gramineae		cultivated	2
S. subglabrescens var. subglabrescens (Steud.) Snowden	Gramineae		cultivated	2
S. subglabrescens var. vitricaryopsis Damon	Gramineae		cultivated	5
Sorghum sudanense (Piper) Stapf	Gramineae		wild? edible	2
Sorghum virgatum (Hack.) Stapf	Gramineae		cultivated	2
Sphenostylis stenocarpa (H. ex Rich.) Harms	Papilionaceae	adagora-barracha (T)	pulse, root crop (west Eritrea, west Begemdir-Gojam)	2, 10
Stathmostelma angustatum Hochst. ex K. Schum.	Asclepiadaceae	engascelice (A), enteltell (T)	edible tubers	2
Strychnos innocua Del.	Loganiaceae	unguaka (T)	edible fruit pulp	1
Strychnos spinosa Lam.	Loganiaceae	lokua, gura (T)	edible fruit pulp	1
Stylochiton kerensis N.E.Br.	Araceae	amotch' (?)	eaten in times of food scarcity	2, 8

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Syzygium guineense (Willd.) DC.	Myrtaceae	dokuma, dok'ma (A), laham (T), badessa (G), gutu, gosu (Ar, Guji), wararicho, duwancho (S), ocha, badessa (W)	edible fruits; the Mati distinguish 2 types which closely resemble each other: gotu and badessa	2, 3, 4, 6
Syzygium guineense var. macrocarpum Engl.	Myrtaceae	woraricho (S), ocha (W)	edible fruits	3
Tacca involucrata Schum. & Thonn.	Taccaceae		edible tuber in Konso (Hallpike, 1970)	
Talinum triangulare (Jacq.) Willd.	Portulacaceae		leaf vegetable	2
Tamarindus indica L.	Caesalpiniaceae	homar, humar (A, T), roka (G), raqq (Arabic)	fruit pulp extract as fever medicine and as laxative	1, 2, 3, 8
Tarenna graveolens (S. Moore) Brem.	Rubiaceae	galo (A, G)	edible fruits	2
Teclea nobilis Del.	Rutaceae	lala (W), hadesa or hirkamo (G)	timber	3
Thymus schimperi Ronn.	Labiatae	t'ossign (A)	condiment (WP 3395, WP 4033)	2
Thymus serrulatus Hochst. ex Benth.	Labiatae	tausi (A, T), t'ossign (A), tazé, tessni (T)	condiment, medicinal plant	2, 8
Tiliacora troupinii Cuf.	Menispermaceae	lukusho (S), hedafiti (G)	edible fruits	3
Toddalia asiatica (L.) Lam.	Rutaceae	gao (S)	edible fruits	2
Trachyspermum copticum (L.) Link (= *Carum copticum* (L.) B. & H. ex Hiern)	Umbelliferae	asmuth (T), nech-azmud (A), azmud adi, camuni, insilata (G), anejanet (near Kolito)	generally a garden crop, condiment	2, 9
Trigonella foenum-graecum L.	Papilionaceae	abacha, abakte (T), abish (A), ulbata, sunk'o (G), sunk'o, shuk'o, shumfa (Ar, Guji), fit'o, fet'o (B)	garden and field crop, condiment, appetizer (flour with water and honey), milk substitute for babies, medicinal crop (against rheumatism)	2, 4, 6, 8, 10
Triticum aestivum L.	Gramineae	adjah (A, G), kamado (G), sinde (A), sermai (T)	cultivated, cereal	2, 3

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
Triticum durum Desf.	Gramineae		cultivated, cereal	2
var. arraseita Hochst. ex Körn.				
var. compressum Körn.				
var. recognitum (St.) Körn.				
Triticum farrum Bayle-Bar.	Gramineae	adja, temej-send (A), arras (T), tebbo (Ka)	cultivated	2
Triticum polonicum L.	Gramineae		cultivated, cereal	2
T. polonicum var. abyssinicum (Steud.) Körn.	Gramineae			
T. polonicum var. villosum Desv.	Gramineae			
Triticum spelta L.	Gramineae		cultivated	2
Triticum turgidum L.	Gramineae		cultivated, cereal	2
Triticum vulgare Vill.	Gramineae	k'amadi, gamadi (G), dargaye (B)	cultivated, cereal	6, 9
Urtica simensis Hochst. ex Steud.	Urticaceae	samma (?)	sometimes cooked in oil	8
Vaccaria pyramidata Med.	Caryophyllaceae	bahar kemam (A)	condiment? (WP 4013, WP 7367, WP 7368, WP 7369)	
Vangueria linearisepala K. Schum.	Rubiaceae	bururi (G)	edible fruits	2
Vangueria madagascariensis J. F. Gmel.	Rubiaceae	maduganta (K), bururi (G)	edible fruits	2, 3
Vicia faba L.	Papilionaceae	baldenga (Tigre), ater-bahari, ater-bar-ativari (T), bakela, bagila (A, G)	generally a field crop, pulse	2, 7, 10
cv.-group Faba				
cv.-group Minor				
Vigna unguiculata (L.) Walp.	Papilionaceae			
cv.-group Biflora		atera babili (G?), atera kech'ene (A)	field crop, pulse	2, 10
cv.-group Sesquipedalis		didjire (Arabic)	rarely found, fruit vegetable	2, 10

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
cv.-group Unguiculata		adonguari (A, T), adagura (T), atera Argobba (G), fasolea-dima (G), nyoari (Anyowah), wuche, eka-wohe (W), gaisa (Ch)	field crop, pulse, edible leaves (Chako)	3, 10
Vitex doniana Sweet	Verbenaceae		edible fruits	1
Vitis vinifera L.	Vitaceae	ueine, woini (A, T), enaba (G)	garden and field crop	2
Ximenia americana L.	Olacaceae	enkoi, ankwai (A)	edible fruits	1, 2
Ximenia caffra Sonder	Olacaceae	inginkada (K)	edible fruits	3
Zea mays L.	Gramineae	bok'olo, bahr-maschilla (A), boqollo (G), baro, diko (Ka), badalla (B, S, W, Burji)	field crop, cereal	2, 6, 10
Zingiber officinale Rosc.	Zingiberaceae	jinjebel (A)	garden and field crop, spice	3, 7, 9, 10
Zizyphus adelensis Del.	Rhamnaceae		edible fruits	2
Zizyphus mauritania Lam.	Rhamnaceae		edible fruits	1
Zizyphus mucronata Willd.	Rhamnaceae		edible fruits	2
Zizyphus spina-christi (L.) Willd.	Rhamnaceae	kurekura (A, G)	edible fruits	1, 2
The scientific plant names of the following taxa are unknown		barkota (Ar)	looks like buri (Ar), edible tuber (wild)	6
		buk'e arba (Ar)	elephant gourd, edible tubers (Arussi)	6
		bulesa (G)	possibly the same as shoba (G) and enguday (A), edible tubers, leaves strongly smelling	6
		burri (B, Ar)	generally a name for edible tubers of wild plants	6
		bushe (Ar)	edible tuber	6
		chame (B)	edible roots (resembling carrot)	6

Table 16 *(continued)*

Scientific name	Family	Vernacular names	Uses	Sources
		galo (Ar)	edible fruits	6
		gumbu (B)	edible tuber	6
		k'araru (Ar)	probably Aningeria adolfi-friderici, edible fruits	6
		kusay (?)	Mentha sp., condiment in butter (Shoa Galla)	6
		k'ilichu, k'ilich'o (Ar)	large edible tubers	6
		langakeida (K)	as soap	3
		lend'o (Ar)	edible tuber	6
		maroda, moroda (G)	much liked edible tuber	6
		oya (Ar)	a bamboo-like plant, the stems of which are chewed by children of Arussi	6
		rafu (G)	name used for all cabbage types and for all wild plants used as leaf vegetable	6
		shokoksa (Shoa Galla)	oil containing seeds eaten by children, Salvia nilotica Juss. ex Jacq. (see Mooney, 1963)	6
		ugumdi (B) ogobdi (Ar)	edible fruits	6
		unkurumba, enkurumba (?)	edible tuber (Guji); it is said to be quite common in Duguna region of Wollamo. Following Cufodontis (see 1957) enkorumba = Dioscorea schimperiana Hochst. ex Kunth	6

Appendix I

Some crop yields (in kg/ha)*.

Cereals		Oil crops		Tuber crops		Pulses	
barley	860	castor	560	ensat	2400	chickpea	630
finger millet	510	cotton seed	330	potato	5300	common bean	770
maize	1070	'gomanzar'	410	yam	4270	fenugreek	600
sorghum	860	groundnut	560			horse bean	960
t'ef	610	linseed	520			lentil	610
wheat	760	niger seed	640			pea	940
		safflower	550				
		sesame	490				
Condiments & Spices		Stimulants		Other crops			
buckthorn	1020	ch'at	990	cotton	170		
Capsicum pepper	420	coffee	270	ensat fibre	100		
		tobacco	560	sisal	770		
				sugarcane	150.6 ton/ha		

*) Imperial Ethiopian Government, Central Statistical Office, Statistical Abstract 1970: 41.

Appendix II

Markets visited (arranged according to agro-ecological regions).

(1) Central part of the Ethiopian Highlands

Addis Abeba (2400 m, Shoa)
Alem Teferi (1600 m, Wellega)
Debarek (2650 m, Begemdir)
Debre Birhan (2730 m, Shoa)
Debre Zeit (1860 m, Shoa)
Defno (1750 m, Wellega)
Dembi Dolo (1900 m, Wellega)
Dese (2470 m, Wollo)
Elias (ca 2350 m, Gojam)
Gondar (2200 m, Begemdir)
Guder (1900 m, Shoa)
Haik (1900 m, Wollo)
Lalibela (2400 m, Wollo)
Nekemte (2100 m, Wellega)
Telili (ca 2400 m, Gojam)
Woldya (1950 m, Wollo)

(2) Lake Tana region

Bahar Dar (1860 m, Gojam)
Infranz (1950 m, Begemdir)

(3) Northern part of the Ethiopian Highlands

Adigrat (2350 m, Tigre)
Adi Kayeh (2250 m, Eritrea)
Adi Shoa (2300 m, Tigre)
Adua (1930 m, Tigre)
Axum (2130 m, Tigre)
Enda Medhane Alem (2350 m, Tigre)
Maichew (2300 m, Tigre)
Mekele (2060 m, Tigre)

(4) South-western part of the Ethiopian Highlands

Agaro (1720 m, Kefa)
Assendabo (1760 m, Kefa)
Bedelle (1950 m, Illubabor)

Bonga (1750 m, Kefa)
Buro (1650 m, Illubabor)
Ch'ena (2180 m, Kefa)
Dembi (1930 m, Illubabor)
Gimbi (2000 m, Wellega)
Gimbo (1710 m, Kefa)
Jemero (2100 m, Kefa)
Jima (1750 m, Kefa)
Maji (2190 m, Kefa)
Metu (1750 m, Illubabor)
Serbo (1780 m, Kefa)
Shankalla market (1450 m, near Didessa river on road from Nekemte to Gimbi, Wellega)
Shebe (1800 m, Kefa)
Yibbu (2100 m, Kefa)

(5) South-eastern part of the Ethiopian Highlands

Buditi (1950 m, Sidamo)
Butajira (2100 m, Shoa)
Ghion (2050 m, Shoa)
Giarso (1660 m, Gamu Gofa)
Gidole (2100 m, Gamu Gofa)
Hosaina (2300 m, Shoa)
market, 22 km east of Hosaina (2200 m, Shoa)
Kolito (1700 m, Shoa)
Shone (1900 m, Sidamo)
Soddo (2000 m, Sidamo)
market, 20 km south of Soddo (1660 m, Sidamo)

(6) Eastern Highlands

Agere Selam (2700 m, Sidamo)
Alemaya (2050 m, Hararge)
Asbe Teferi (1850 m, Hararge)
market, 28 km east of Asbe Teferi on Hirna road (2320 m, Hararge)
Asella (2360 m, Arussi)
Bedessa (1780 m, Hararge)
Bedeno (2300 m, Hararge)
Bekoji (2650 m, Arussi)
Bore (2600 m, Sidamo)
Deder (2300 m, Hararge)
Ethaya (2200 m, Arussi)
Gelemso (1930 m, Hararge)
Gergertu (1450 m, Hararge)
Goba (2600 m, Bale)
Goro (1850 m, Bale)
Hamaressa (1950 m, Hararge)
Harar (1856 m, Hararge)
Harawacha (2600 m, Hararge)
Hirna (1870 m, Hararge)
Jijiga (1720 m, Hararge)
Kebre Mengist (1650 m, Sidamo)

K'obbo (2100 m, Hararge)
Kofale (2760 m, Shoa)
Kulubi (2300 m, Hararge)
Robi (2475 m, Bale)
Segure (2500 m, Arussi)

(7) Southern Riftvalley and lake region

Awasa (1650 m, Sidamo)
Dila (1550 m, Sidamo)
Langano (1540 m, Shoa)
Shashamane (1850 m, Shoa)
Teferi K'ele (1800 m, Sidamo)
market, 9 km north of Wondo on Awasa road (1800 m, Sidamo)
Wondo (1840 m, Sidamo)
market 12 km from Wondo on Dila road (1800 m, Sidamo)
Yirga Alem (1660 m, Sidamo)
Yirga Chaffe (1890 m, Sidamo)

(8) Borana region

Negelli (1440 m, Sidamo)

(9) Middle and lower Awash region

Alamata (1520 m, Wollo)
Assebot (1475 m, Hararge)
Awash (990 m, Shoa)
Bati (1660 m, Wollo)
Dera (1600 m, Arussi)
Dire Dawa (1204 m, Hararge)
Erer Gota (1220 m, Hararge)
Nazret (1650 m, Shoa)
Mieso (1500 m, Hararge)
Mulu (ca 1500 m, Hararge)
Robi (1450 m, Shoa)
Wonji (1560 m, Shoa)

(10) Ogaden region

(11) Western Lowlands

Aytang (550 m, Illubabor)
Gambela (600 m, Illubabor)

Acknowledgements

Our thanks are due to

- the Department of Tropical Crops: Mr R. Boekelman (maps, figures and tables); Prof. Dr J. D. Ferwerda and Dr M. Flach (section 'Systems of agriculture' in Chapter 6); Ir C. J. P. Seegeler (contribution to market survey); Mr J. H. A. van Zee (photographs); Miss J. Th. van Barneveld, Miss E. J. van Dijk, Mrs C. E. Jongmans-Boekelman and Mrs J. Snijders-Timmer (typescript)
- the Laboratory of Plant Taxonomy and Plant Geography: Dr G. J. H. Amshoff (identification of plants); Mr G. Boelema (proof reading); Mr C. T. de Groot (librarian); Dr J. J. F. E. de Wilde (Chapters 4 and 8); Prof. Dr H. C. D. de Wit; Mrs J. M. van Medenbach de Rooy-Ronkel (typescript)
- Dr J. A. Frahm-Leliveld (for her comments on the manuscript)
- the Department of Soil Science and Geology: Ir N. van Breemen (Chapters 1 and 3), Prof. Dr J. D. de Jong (section 'Geology' in Chapter 1)
- the Department of Physics and Meteorology: Dr F. A. Bottemanne (Chapter 2)
- the Department of Plant Breeding: Dr A. C. Zeven (section 'Ethiopia as a gene centre of cultivated plants' in Chapter 6)
- The Central Typing Room of the Agricultural University
- Prof. Dr A. J. Drewes, University of Leiden (Chapter 5)
- Dr J. A. Kusin, Royal Tropical Institute, Amsterdam (Chapter 7)
- Prof. Dr R. E. G. Pichi-Sermolli, Instituto Botanico Hanbury, Genoa, for permission to reproduce the Ethiopian part of the vegetation map of north-east Africa from Webbia 13 (1957)
- Mr J. S. Trimingham, American University of Beirut, for permission to reproduce the Ethiopian part of the language map of north-east Africa from 'Islam in Ethiopia' (1965)
- the Imperial Ethiopian Mapping & Geography Institute, Addis Abeba, for permission to reproduce the maps on average annual rainfall and on climatic regions
- the FAO and Unesco for permission to reproduce a simplified version of the Ethiopian part of the FAO/Unesco Soil Map of the World (1974)
- Mrs R. W. de Wilde-Bakhuizen (photographs 1, 2, 3, 8, 12, 16, 20, 21, 24, 26, 28, 30, 35, 36, 51, 57, 59, 73, 74, 91, 96, 97, 99, 100). All other photographs were taken by the authors, except those of Ir C. J. P. Seegeler (103), Professor H. C. D. de Wit (101), and Mr J. H. A. van Zee (66, 67, 85—89, 92—95)
- the Centre for Agricultural Publishing and Documentation (PUDOC): Mr R. J. P. Aalpol, Mrs E. Brouns-Murray, Mr T. Goedewaagen and Dr E. Meijer Drees (preparing the manuscript for the press)
- the Board of the Stichting 'Landbouw Export Bureau 1916/1918' for financial support to publish this book.

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Index of scientific plant names

Synonyms are in italics. Taxa listed in Table 16 of Chapter 8 are not included, except synonyms, and scientific plant names mentioned under 'Uses'.

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