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**The ethnobotany of the grain amaranths with special reference
to San Miguel del Milagro, Tlaxcala, Mexico**

Sobel, Gail L., Ph.D.

City University of New York, 1993

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**THE ETHNOBOTANY OF THE GRAIN AMARANTHS WITH SPECIAL
REFERENCE TO SAN MIGUEL DEL MILAGRO, TLAXCALA, MEXICO**

By

Gail L. Sobel

**A dissertation submitted to the Graduate Faculty in
Biology in partial fulfillment of the requirements for
the degree of Doctor of Philosophy, The City University of
New York**

1993

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This manuscript has been read and accepted for the Graduate Faculty in Biology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

THE ETHNOBOTANY OF THE GRAIN AMARANTHS WITH SPECIAL
REFERENCE TO SAN MIGUEL DEL MILAGRO, TLAXCALA, MEXICO

By

Gail L. Sobel

Advisor: Professor Thomas E. Jensen

The genus Amaranthus (Amaranthaceae) is composed of about 60 species widely distributed throughout tropical, subtropical and temperate regions of the world. The grain amaranths are of economic importance. They are noted for their high protein content, especially that of lysine. This thesis includes a taxonomic history of Amaranthus, history of amaranth use including Indian groups associated with amaranth use, names associated with the genus both past and present and foods associated with amaranth. Present day uses of amaranth have been reviewed and origins of amaranth have been discussed. The majority of the thesis concentrates on the town of

San Miguel del Milagro in the state of Tlaxcala, Mexico. Nearly all the people of this village are involved in some way with amaranth. This detailed study is aimed at providing information on the cultural practices associated with amaranth as well as providing data on what impacts this cottage industry has on the people of this village and their lifestyle. The interest of outside agencies and the introduction of new varieties, machinery and their effects have been studied. This study involved a six year period and changes during this period were explored. The data in this thesis provides a current look at the state of affairs relating to amaranth in San Miguel del Milagro and serves as a useful data base for assessing the impact outside influences have on such a community and the possible introduction of amaranth as a new crop into another village. Although much research has been done on the grain amaranths a study of such detail in one village has never been done before. It is hoped that this ethnobotanical study will be useful to the development of amaranth as a crop in areas that are in need of food sources and will help the burden of the hungry.

Acknowledgements

I wish to acknowledge the following people. I thank Dr. Thomas Jensen for being my advisor. Without his care and support the completion of this thesis would not have been possible. In the same way I thank Dr. Jack Valdovinos for his support. Both Dr. Jensen and Dr. Valdovinos are an asset to the Ph.D. Program and have provided me with hours of inspiration and support beyond what is normal for any Faculty member. Their good nature and care for me has helped me to complete this dissertation. When there were times I didn't think I would finish they provided the inspiration to go on. I am deeply grateful to them both. I am also grateful to Dr. Anthony LaRuffa for his great expertise and interest in my dissertation and for his support. I am grateful to Dr. Daniel Early for his great expertise, enthusiasm, thoughtful comments on the manuscript and help in the field in both Peru and Mexico as well as his friendship. I am also grateful to Dr. Neil Grant for his interest and support. All these people provided insight and helped make my graduate experience rewarding and fulfilling.

I wish to thank the following people for their valuable help. For their enthusiastic and friendly help

I thank all the people of the village of San Miguel del Milagro, Tlaxcala, Mexico who generously spent hour after hour talking about amaranth, opened their homes to me and allowed me to be a part of their lives. Without their generosity I would have no dissertation. To protect their anonymity, I will not name them, but there are many individuals that did much more for me than just provide data. They fed me, amused me and treated as a part of their families and I am deeply grateful. I am deeply grateful to Ing. Eduardo Espitia Rangel and the people of Chapingo for their help in providing a vehicle on some of my visits to Mexico. Ing. Espitia helped to local areas of grain amaranth and provided great insights to the situation of amaranth in Mexico and helped in the translation of some of my questionnaires into Spanish. I also thank Eduardo and Concepcion for hours of laughter and friendship and home cooking as well as for those green chilies. I wish to thank Maria Guadalupe Pedraza for helping to acquire some Mexican references and her entire family for being my Mexican family. Her parents, grandmother, husband, Javier and sister, Teresa will always have a place in my heart. Also I would like to thank Julia Caspistran for her hospitality in Peru.

I wish to thank Dr. Ghilleen Prance for helping me to acquire grant money for my fieldwork. I wish to thank Rodale Research Center and in particular the late Robert Rodale for supplying me with some of the money for my field work in Mexico. Mr. Rodale's vision, enthusiasm and funding has inspired many people to work on amaranth. Also I would like to thank Mr. Charles (Skip) Kauffman for his help during my visits to Rodale in the beginning of this study.

I would like to thank my parents, Vivien and Stanley Sobel for their continued love and support throughout my dissertation. They have always provided encouragement. I thank them for the many home-cooked meals, when I was too busy to feed both myself and my husband.

And finally I would like to thank Dr. Jeremy Strudwick for getting me interested in amaranth as well as hours of continued support and patience. Jeremy, you have been there for me always. Your love, support, encouragement and valuable criticism has helped make this dissertation. From hours of fieldwork, including you chasing away dogs with a stick, to driving in Mexico

City, to keeping me company during all-nighters of writing, to commenting on the manuscript, you have been there. I am indeed fortunate to have a husband to share every aspect of my life with, including my research. I love you.

DEDICATION

This thesis is dedicated to my late Grandmother, Bertha Sobel who kept asking me when I would be finished. She wanted to go to my graduation. I only wish she could be here now. She passed away in December, 1992. It is also dedicated to my Grandfather, Jacob Sobel, who at 98, has seen me finish.

I also dedicate this thesis to the memory of my Grandparents, Sally and Alex Leddo; to my parents, Vivien and Stanley and to my loving husband, Dr. Jeremy Strudwick.

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INTRODUCTION

The genus Amaranthus (Amaranthaceae) is composed of about 60 species widely distributed throughout tropical, subtropical and temperate regions of the world. Both cultivated and wild amaranth species have a widespread distribution in Asia, Africa, Europe and the Americas. Amaranths have been associated with man since ancient times. They have played an important role in the religious and economic lives of various Old and New World peoples as wild or cultivated grains, leafy vegetables, dye plants and ornamentals (Sauer 1976). Many of the species are aggressive weeds and are often called pigweed. Names associated with the genus Amaranthus include Joseph's coat, Prince of Wales' feather, loves-lies-bleeding, tassel-flower, Red Cockscomb, Velvet Flower, Strawberry Blite, Flower Gentle, Flower Velure, Floramour and Jacob's coat (Culpepper 1733, Grieve 1931), (see Table 4 for more complete list).

The grain amaranths played an important role in the early agriculture of the New World. The amaranths "are used as grain, leafy vegetable, for food coloring, ornament and for magical and religious purposes"

(Anderson 1952). They are also used medicinally (Culpepper 1733, Lucas 1977, Perry & Metzger 1980).

A great deal of interest has re-emerged in this forgotten crop. This can be attributed to a number of facts. Firstly, is the fact that amaranth has a high protein content, known especially for its high amount of lysine. This is one of the essential amino acids and is the limiting amino acid in both corn and wheat (see Tables 1 & 2). Amaranth contains 16% protein, while rice contains 7-10%, and corn 9-10% (Early 1985). The taste is another one of its assets.

Historically, people have cultivated amaranths from the tropics to semi-arid lands and from sea level to some of the highest farms in both the Andes and the Himalayas. It has been considered a promising new crop for people that live in parts of the world with arid climates as well as those in high altitudes (3500 m +) and dry-season monsoon areas (NRC 1984).

Amaranth was selected as one of the world's most underdeveloped promising crops by the National Academy of Sciences' 1975 study which appeared as a book entitled "Underexploited Tropical Plants with Promising Economic

TABLE 1 - Comparison of Protein (%) in Amaranth and other Grains

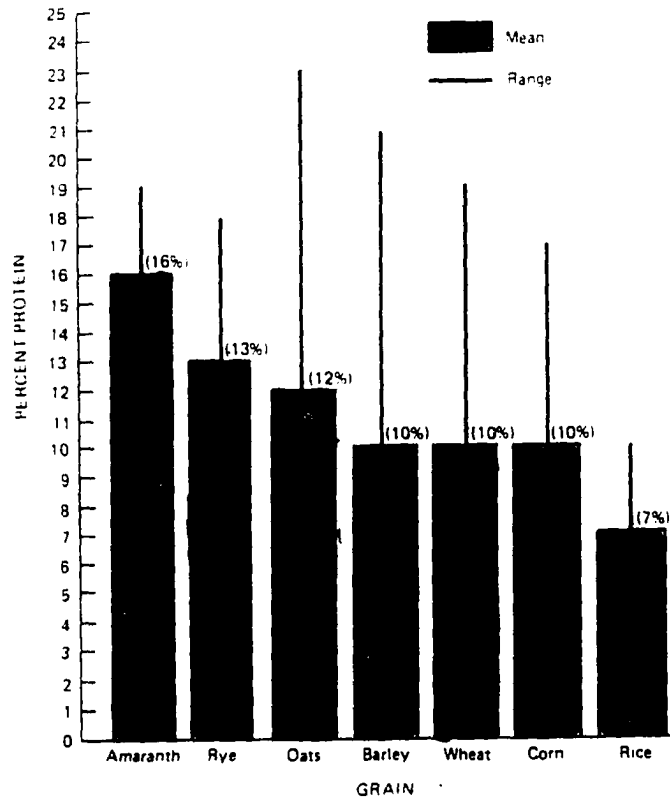


TABLE 1

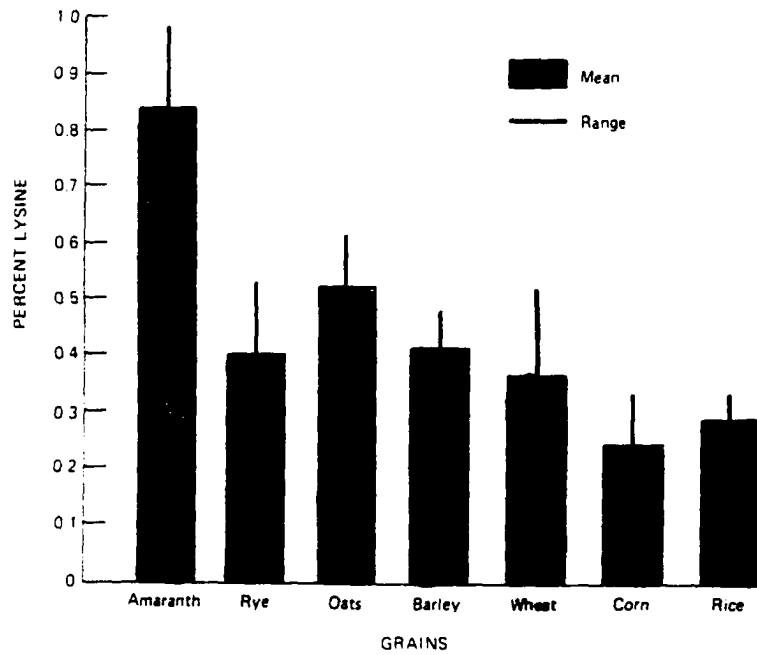


TABLE 2

TABLE 2 - Comparison of Lysine (%) in Amaranth and other Grains

Value". Since then Rodale (1981, 1985), Rodale Research Center in Pennsylvania (1974, 1977, 1980) and the National Research Council (1984) have done further research as have many individuals. The work done on amaranth is voluminous and cannot be completely reviewed in this thesis. It is, however, interesting to note the many areas of research. Some of them include taxonomy and uses (Sauer 1950, 1955, 1967, 1976, 1977; Hunziker 1943, 1952; Early 1977a, 1977b, 1985, 1992; Feine 1979, 1980; Feine-Dudley 1981), history (Agogino 1957; Bailey 1940; Callen 1965, 1967; Dressler 1953; MacNeish 1964, 1971; Nabhan 1980, 1978), genetics and breeding (Hauptli 1977; Hauptli and Jain 1977, 1978, 1980; Hauptli et al. 1980; Jain and Vaidya 1979; Jain et al 1980, 1982; Khoshoo and Pal 1972; Pal 1972; Pal and Khoshoo 1972, 1973), new products and marketing (Sanchez-Marroquin 1980a, 1980b; Bressani and Elias 1984), starch and protein composition (Carlsson 1977; Cheeke et al 1981; Elias 1977; Goering 1967; Goering et al. 1970), nutritional value to infants and adults (Singh et al. 1972), cultivation practices (Alejandre & Gomez 1986), yields and harvest (Rodale 1974; Rodale Press Inc. 1977, 1980, 1985), pests and diseases (Horvath 1975, 1977), and characterization and evaluation of germplasm (Espitia Rangel 1987a, 1987b, 1986; Haas 1980; Kauffman et al

1984a, 1984b; Weber 1986; Weber et al 1986; Kauffman and Reider 1986). In 1981, Senft et al. had already compiled a comprehensive bibliography on the genus Amaranthus that contained 2500 references (Kauffman and Haas 1984).

In 1984, the National Research Council published another book entitled "Amaranth - Modern Prospects for an Ancient Crop". This publication takes a more detailed look at amaranth and its prospects. It listed areas for further research and included ethnobotanical studies as one of the most needed areas.

Under the direction and advice of Dr. G. T. Prance in 1984 I decided to do an ethnobotanical study of the grain amaranths. Dr. Jeremy Strudwick had already been to an international amaranth conference at Rodale and had made herbarium voucher specimens of their collections which also stimulated my interest. I visited Peru, Nepal, Thailand and Mexico and this will be discussed later. I attended the First Amaranth Conference in Cusco, Peru sponsored by BOSTID (Board on Science and Technology for International Development) and networked with other amaranth researchers. After the conference I spent time in the field with Dr. Daniel Early, who was studying amaranth under a Fulbright Grant.

I visited places where amaranth was being grown near the Cusco area and saw the work being done at the University of Cusco under Luis Sumal Kalinowski, Director of the Amaranth Project. This work will be reviewed later. After visiting Peru I had the opportunity to visit Nepal and Thailand and was able to see what the BOSTID funded projects were finding out. While in Nepal I encountered amaranth in use in the Himalayas and the similarities to its use in Central and South America was startling.

In 1986 I went to Mexico with funding from Rodale Research Center and travelled throughout the country looking for uses of amaranth, particularly as a grain. I went out in the field with Dr. R. Bye and C. Mapes of UNAM (Universidad Nacional Autonomo de Mexico) looking for grain amaranths. We only saw A. hybridus used as "quelites" and we did not find amaranth used as a grain. From UNAM, I went to Chapingo in Texcoco, D.F. where I met Ingeniero Eduardo Espitia Rangel. Ingeniero Espitia made my trip a worthwhile one and was extremely helpful. With his help and the help of the people of Chapingo we travelled throughout the states of D.F., Tlaxcala, Morelos and Puebla. He was aware of the areas where amaranth was being grown as a grain and he showed me as many areas as possible. We were able to see many

areas where amaranth was being grown as a grain. Some of these included Huazulco and Amilcingo in Morales, Huaquechula in Puebla, Tulyehualco in D.F. and San Miguel del Milagro in Tlaxcala (Fig. 1).

During this visit to Mexico, the town of San Miguel del Milagro, in the state of Tlaxcala, was visited. Nearly all the people of this village are involved in some way with amaranth. This provided an unusually interesting phenomenon. While amaranth is grown throughout Mexico, nowhere else is it of such great importance. I know of no other village where so many people are involved in some way with the production of amaranth.

For this reason, the majority of this thesis has been devoted to the study of amaranth in San Miguel del Milagro. After this first trip in 1986, San Miguel del Milagro was visited a second time in August 1988, a third time in November 1988, and a fourth time in August 1992. This detailed study is aimed at providing information on the cultural practices associated with amaranth in this village. This information will be compared to other areas, as well as provide data on what impacts this cottage industry has on the people of this village and

**Fig. 1. Fields of Amaranth, Huazulco and Amilcingo,
Morales, Mexico.**



Fig. 1

their lifestyle. The effects of amaranth on San Miguel del Milagro provides important information for peoples of other areas where this crop might be introduced. The impact of the introduction of a new crop and food to a new place is important to those who live there. If amaranth is to be introduced to areas as a promising new crop, such a study offers some insight as to the effects on those people that are involved in the production of that crop. In San Miguel del Milagro, the effects of amaranth as a small cottage industry are great to those who live there. It is also of interest to note what effects the interest of outside agencies such as Rodale Research Center, Chapingo and Mexican governmental agencies, among others, might have upon San Miguel del Milagro and its people. Has the offering of new seed varieties, for example, machinery or products affected the lifestyles, habits or livelihoods of the people of this village? Has the great interest in amaranth by outsiders caused those who live in San Miguel del Milagro to view the crop in a new light? Since my studies involve several visits over a six year period, were any changes noticeable during this time? Beyond this, the data offered in this thesis as to the current state of affairs relating to amaranth in San Miguel del Milagro may serve as a useful database in the future for

assessing the impact outside influences have on such a community. To answer these questions, it was necessary to gather as much data as possible from the people of San Miguel del Milagro. In order to accomplish this I used detailed questionnaires and attempted to survey all the people of San Miguel del Milagro. My methods will be discussed at length in the Methods section of this thesis and the results presented in detail in the Results section.

Another area of Mexico where amaranth is also important is Tulyehualco, in the capital state, Distrito Federal. This area was studied by Early (1977a, 1977b, 1978) and he considered it to be the principal center for amaranth in Mexico. Feine also visited this area (Feine et al, 1979) and it has been studied recently by the economist, Ramos Lopez (1992). I visited Tulyehualco in 1986 and talked to members of the co-op and farmers in that area. A comparison of cultural practices between Tulyehualco and San Miguel del Milagro will be made.

Amaranth also has a particularly fascinating history as an ancient crop of the Aztecs and Incas and this will be discussed. The origins of its use as a grain and of certain species has been an area of

controversy and will be explored here further. A history of ethnobotanical uses throughout the world will be reviewed and presented in a concise format.

Amaranth has been experiencing a renaissance since 1974. It is one of many traditional foods that has been introduced to new areas and has been reestablished in areas where it was previously grown. It is my hope that this ethnobotanical study as well as the studies of many others involved in amaranth throughout the world will help those suffering from hunger and improve the quality of life for all.

TAXONOMIC HISTORY OF AMARANTHUS

The taxonomy of Amaranthus is very complex. There are various reasons for this. These include the facts that it has a tendency to be weedy, has undergone wide cultivation not only as a grain but also as an ornamental (Fig. 2) and vegetable, and the floral parts are minute (Fig. 3). The great subtlety of differences between species has caused a proliferation of names. It is thus helpful to give a taxonomic summary of the genus in order to understand the species, varieties and cultivars that are dealt with in this dissertation. Because the main focus of this thesis is Amaranth in Mexico, special emphasis will be put upon taxa and names that occur in this region.

The family Amaranthaceae belongs to the order Caryophyllales and to the group of families known as the Centrospermae. There are 55 genera and about 900 species in the family (Heywood 1978). Feine (1980) considers there to be 800 species. Like many of the Centrospermae, the Amaranthaceae contain betalein pigments instead of the customary anthocyanins found in most other angiosperm families. The genus Amaranthus, as

Fig. 2. Amaranth grown as an ornamental, San Miguel del Milagro, Tlaxcala, Mexico.

Fig. 3. Amaranthus hypochondriacus and its minute floral parts.

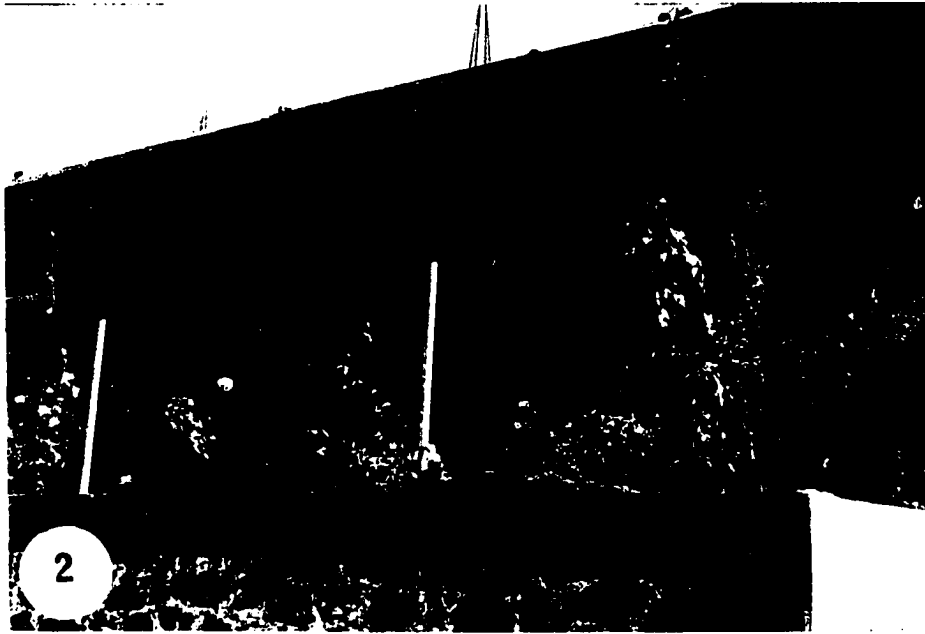


Fig. 2



FIG. 3

3

stated in the introduction, is estimated to have 60 species. Sauer (1950, 1967) pointed out the problems in classification in the genus and attributed them to plasticity under varying environmental conditions. Species identification has been made through classification of floral structures (such as shapes and proportions of the pistillate flower parts), types of leaves and types of inflorescences (Huang 1980; Pal 1972; Sauer 1950, 1967; Walton 1968; Coons 1975). Hybridization is said to be common. The flowers of the cultivated species are usually brightly colored ranging from pink to red or yellow to golden brown (Fig. 4 & 5). The leaves vary in color from dark green to magenta. The cultivated grains normally have pale cream colored seeds, while the vegetable amaranths and all wild species usually have very dark brown or black seeds.

Many authors have differed on the classification of the amaranths. Some of the work on the group included that of Moquin-Tandon from DeCandolle's Prodromus (1849), Uline and Bray (1894) and Stanley (1917) for North American species, Thellung (1914) and Aellen (1961) for Central Europe, Brenan (1961) and Sauer (1955) for the dioecious species. Covas' treatment (1941) deals with the Buenos Aires area. Kowal (1954) did a study of seed

Fig. 4 & 5. Flowers of cultivated species and their color ranges; pink, red, green, and brown.



Fig. 4



Fig. 5

characters. Both the work of Hunziker (1943, 1952) and Sauer (1950, 1967) studied both the taxonomy and the ethnobotany of amaranth. Coons (1975) studied the genus in Ecuador. Other authors who have worked on the genus of note include Jain et al (1982), Hauptli and Jain (1978), Pal (1972), Pal and Khoshoo (1972) Feine et al (1979), Takagi (1933), Murray (1940) and Singh (1961).

At present Sauer's treatments are the most widely accepted. Three "true" grain species are recognized: Amaranthus hypochondriacus L., originally from Mexico, A. cruentus L. from southern Mexico and Guatemala and A. caudatus L. from the Andes. Hunziker (1943, 1951, 1952) treated the Andean grain amaranths as members of two closely related species: A. mantegazzianus Passerini and A. caudatus. In Argentina, A. mantegazzianus is grown as a grain crop in the province of Tucuman under the name "quinoa de Castilla". "Quinoa de Castilla" is essentially an "encouraged weed". The weedy species A. hybridus L. has been suggested as a progenitor of A. caudatus (Sauer 1950, 1967; Coons 1982). Coons suggests that "quinoa de Castilla" might be "a sort of 'missing link' between the cultivated species and its weedy progenitor...or the remnant of the crop which might have been, in fact, A. caudatus". In Coons' work on

Amaranthus in Ecuador she includes the Ecuatorian dye plant called "sangorache" as A. hybridus var. sangorache Coons.

There is a proliferation of binomials (about 200 names) in Amaranthus due to the over-naming of species by botanists and the fact that few careful and comprehensive monographic studies have been done. Therefore, taxonomic problems remain and a monograph is badly needed for the genus (NRC 1984). Although Sauer's work provides a good framework for the section of grain amaranths, Coons' work on Amaranthus in Ecuador differs from Sauer's and clearly shows that there are still problems with the taxonomy of the group, especially with the progenitors of the grain amaranths and how many species and varieties there really are. A worldwide revision still needs to be done. A combination of floral characters (as past workers have used), seed coat morphology (as used by Kowal, 1954), a study of systematically related sections by molecular methods, descriptions of genetic variability (as done by Jain and others), and continued allozyme studies between wild, weedy and crop species may help us to understand the group better. The using of restriction enzyme analysis of chloroplast DNAs, (as has been done for Atriplex by Palmer, 1982), would provide a new set of

characters which may help better understand relationships in the group. The understanding of the role of hybridity in wild and cultivated species would help to better understand the real origins of certain species that have remained a controversy.

At present the monoecious species found in Central and South America have been divided into two sections as follows:

Amaranthus sect. Amaranthus - 5 tepals, terminal inflorescences, dehiscent fruits. This section is noted for its uses for grains, dyes, ornamentals, weeds and leafy vegetables (Grubben 1975; Sauer 1967). Included in this section are the following: Amaranthus cruentus L., A. caudatus L., A. hypochondriacus L. and A. edulis L. (which does not have terminal inflorescences).

Amaranthus sect. Blitopsis - 3 tepals, axillary inflorescences, indehiscent fruits. This section includes species used for leafy vegetables. Included in this section: A. gangeticus, A. tricolor and A. blitum (Grubben 1975).

Kowal (1954) further divided the genus into

another section, Puncticulatae, to include the dioecious species; however, Sauer (1955) disregarded this.

The chromosomes are very small and this makes them difficult to count. Numbers in the literature range from 32 to 34 (Takagi 1933; Murray 1938; Singh 1961; Pal 1972; Khoshoo & Pal 1972).

Feine-Dudley provided a provisional key to some edible species of the Amaranthaceae and it is included below (IBGR 1981).

A PROVISIONAL KEY TO SOME EDIBLE SPECIES OF THE FAMILY
AMARANTHACEAE

- A. Flowers unisexual
 - B Tepals 3
 - C Tepals equal to or longer than utricle; utricle circumscissile
 -1. Amaranthus tricolor.
 - C Tepals shorter than utricle; utricle indehiscent.
 - D Utricle smooth.....2. A. blitum.
 - D Utricle rugose.....3. A. viridis.
 - B Tepals 5

- E Tepals approximately equal in length and
incurved against utricle
- F Plants armed; inflorescence with upper
cymes pistillate.....4. A. spinosus.
- F Plants unarmed; cymes with initial flower
staminate and remainder pistillate
.....5. A. dubius.
- E Inner tepals shorter than outer, tepals
straight or recurved from utricle
- G Bracts exceeding style branches;
inflorescence either short and thick or
moderately developed; always dark seeded
- H Tepals longer than utricle, inner
tepals with apex obtuse or emarginate;
utricle not forming tower; inflorescence
short and thick
.....6. A. retroflexus.
- H Tepals shorter than utricle, inner
tepals with apex acute; utricle
narrowing into tower at apex;
inflorescence moderately developed,
.....7. A. hybridus.
- G Bracts not exceeding style branches;
inflorescence fully developed,
enormous

(domesticated species); seeds usually light, sometimes dark.

I Bracts equaling style branches; inflorescence stiff; style branches forming sharp cleft at base; tepals with apex acuminate
8. A. hypochondriacus.

I Bracts shorter than style branches; inflorescence lax

J Utricle narrowing into tower at apex; style branches erect; tepals with apex acute
9. A. cruentus.

J Utricle not forming tower, style branches spreading, meeting in saddle at base; tepals broad, often overlapping, inner tepals with apex obtuse
10. A. caudatus.

A Flowers perfect

K Flowers broadening into crest at apex, resembling a cock's comb
11. A. cristata.

K Flowers forming simple spikes
12. A. argentea.

from the work of L. Feine-Dudley (1981).

Descriptions of amaranth types have been grouped by use and physical appearance by Weber et al (1986), and a series of names have been given to varieties that are used for grains. These include the following:

Amaranthus cruentus

1. African grain type
2. Mexican grain type
3. Guatemalan grain type

Amaranthus hypochondriacus

1. Nepal grain types
2. Mercado grain type
3. Aztec grain type
4. Mixteco grain types
5. Spike types

Amaranthus caudatus

1. South American grain type
2. Cultivar 'edulis'
3. Ornamentals

Amaranthus hybridus

1. Prima grain types
2. 'Sangorache'
3. Ornamentals

Much work has been done on characterization of varieties. These include the works of Espitia (1986, 1987a, 1987b), Kauffman (1977), Kauffman and Reider (1986) and Weber (1987).

The species that can be found in San Miguel del Milagro that are of importance are Amaranthus cruentus, A. hypochondriacus and A. hybridus. Ingeniero Espitia accompanied me in the field on my first trip and helped with species identification as well as determining varieties. Herbarium specimens were collected and deposited at Chapingo and collections of seeds were made

for growing at Chapingo. The germplasm collected was from individual plants with very large inflorescences that were selected for their large seed production.

HISTORY OF AMARANTH USE

Much has been written about the history of uses of amaranth. The literature is extensive and it serves no purpose to reiterate all this information. Sauer has done most of the work bringing together the history of amaranth use (1950, 1967). It is useful, however, to try and present this information in a concise and more readily accessible format. Therefore, I have reviewed as much literature as possible and produced a series of tables which summarize the information known up to date to achieve this aim. The first of these tables (Table 3) includes the names of Indian groups associated in some way with amaranth. For the most part, these groups had some use for amaranth and either collected them from the wild, or collected them as weeds growing near their homes or cultivated them as a crop. Many references and names used by these groups are included in this table.

Many names have been associated with amaranth in the literature. Some of these names may not only refer to amaranth, but may be generic in nature, and there is also some confusion in the literature as to whether the names actually referred to amaranth. For example, amaranth or quinoa (Chenopodium spp.), are used as

TABLE 3 - page 1

Indian Groups Associated with the Use of Amaranth

- Jova (lived near Sahuaripa in Sonora, made drink of toasted and milled amaranth seeds (Anonymous 1760, Sauer 1950))
- Tarahumaras (grew pale seeded grain crops, guegui, Pennington 1963, 1969, Soule 1979. Nabhan 1978)
- Aztecs (Nahuatl) (Sauer 1950, Sahagún 1570, Tezozomoc 1598)
- Yaqui (Nabhan 1978, Sauer 1967) called it we'e
- Pima Bajo (Nabhan 1978)
- Incas (Early 1977)
- Hopi (Soule 1979 A. blitoides eaten and A. cruentus dye piki bread Whiting 1966)
- Tepehuanes (Chihuahua) (Nabhan 1978, Mapes 1986)
- Huichol (present use, pers. comm. J. Bauml, Sauer 1950, Lumholtz 1902)
- Tarascans of Michoacán (Anonymous 1540, Sauer 1950)
- Matlazincas (valley of Toluca, Sahagún 1570a, Sauer 1950, Tezozomoc 1598)
- Coras (present use, pers. comm. E. Espitia R.,)
- Seri tribes (Sauer 1950)
- Warihio Indians (northwestern Mexico, Sauer 1950, Nabhan

TABLE 3 - page 2

1978, Soule 1979)

Mayo (Sauer 1950, 1967)

Paiutes (Arizona, 1870's, cultivated weeds for bread and
mush Sauer 1950, Palmer 1878)

Salado (Sauer 1967)

Hohokam (Sauer 1967, Bohrer 1962)

Pima (Sauer 1967)

Mixtecs (Sauer 1967 Tomb 7 at Monte Alban)

Olmecan-Xicalancas (Nahua, Mixtec and Choco-Popoloca
Stuart 1992)

Navaho (Bailey 1940)

Huanca (Peru, Cole 1979)

Quechua Indians (Ecuador and Peru)

grains. Chenopodium looks somewhat like amaranth and has been often confused with amaranth. To an untrained eye a field of amaranth looks much like a field of quinoa (Fig. 6 & 7). Both plants have been used in both Central and South America as a grain. In some of the literature it is not clear which plant is actually meant. The drawings and names of both amaranth and quinoa have been confused and only a close look at ancient drawings seems to clear up some of the confusion. Clearly, in the Codice Florentino, amaranth and chenopods are featured under the name *huahtli* (Fig. 8). Sauer (1950) believes that Fig. 8 g, h, and i represent amaranth while Fig. 8 a, b, c, d, and e represent chenopods. Chenopodium has dentate leaves while Amaranthus always has entire leaves and this helps sort out the confusion. After viewing these ancient drawings I agree with Sauer's analysis.

A table of names has been made with references so that one can better understand some of the literature and names (Table 4). The country where the name is used has also been included. References have also been included. I have only included names that I feel really were used for amaranth. This review of the literature was also done to see if any modern day names correspond to ancient names and if the names would add any new insight to the

Fig. 6. A view of a field of quinoa, Chenopodium sp.,
Peru.

Fig. 7. A view of a field of amaranth.

Fig. 8. The Codice Florentino.



Fig. 7

Fig. 6

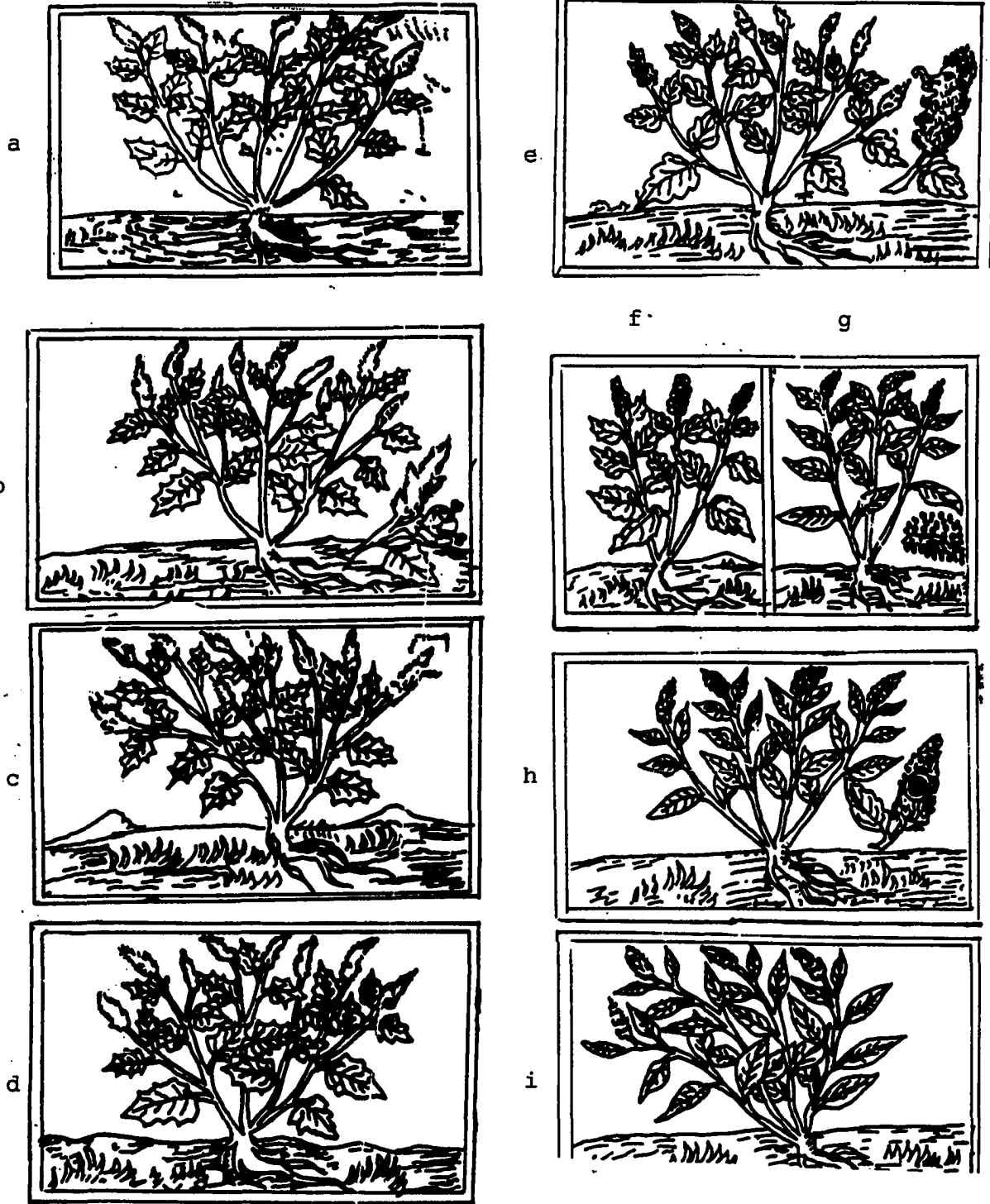


Fig. 8

TABLE 4 - p.1

NAMES ASSOCIATED WITH THE GENUS AMARANTHUS:Past and Present

<u>Name</u>	<u>Country used</u>	<u>Uses, other information</u>
kiwicha	Peru	seeds toasted, leaves (currently used name)
hatak'o	"	for leaves
kiwillo	"	edible seeds, lime form the ash for coca chewing
caramina	"	red dye associated with <u>A. quitensis</u> H.B.K.
Inca pachaqui	Bolivia	seeds, boiled, eaten or ground into meal
Ratago	Chile to Venezuela	(<u>A. celosioides</u>) H.B.K.
bledo	Ecuador, Mexico	current and ancient name, often wild forms, Central and South America
ataco	Ecuador	<u>A. cruentus</u> L., <u>A.</u>

TABLE 4 - p.2

		<u>gracilis</u> Dsf., <u>A. spinosus</u> L.
	Argentina	<u>A. hybridus</u> (Holm et al. 1977)
Tataco	Peru	(<u>A. hybridus</u> L.)
jataco	"	"
ataco casha	Ecuador	
quinoa de castilla	Ecuador	used for color (Heiser
quinoa de tostar	Ecuador	grains, (Heiser 1964 in Sauer 1967)
sangorache	Ecuador	dye plant (Heiser 1985)
Quihuicha		
Achita	Peru	synonyms for kiwicha (Kalinowski 1986)
Achis Coimi	"	"
Ocoyos	"	"
Trigo inca	"	"
Quinoa	"	"
Quinoa del valle	"	"
Millmi	"	"
Inca - hataco	"	"
airampo	Peru	flowers used to treat toothache & fevers, red flowers color maize

TABLE 4 - p.3

		and chicha (Early 1992).	
flower-gentle		English-speaking countries	
		(Culpepper 1733)	
flower-velure	"	"	
floramor	"	"	
Velvet - flower	"	"	
Jacob's coat	"	(Herklots 1972)	
Prince's feather	"	(Culpepper 1733)	
love-lies-bleeding	"	(Grieve 1931)	
Red cockscomb	"	"	
Strawberry blite	"	"	
fox-tail		(Sauer 1967)	
red-hot-cattail		"	
scourge-of-the-nun		"	
Calaloo	Caribbean Islands	(A. <u>retroflexus</u> & A. <u>dubius</u>)	
horsetooth	"	A. <u>blitum</u>	
vleeta	Greece	"	"
amaranto	Mexico		
Ueimi	"	Guarigia language, (Martinez 1979)	
quintonil	Mexico	(Oaxaca A. <u>hybridus</u> greens) (Messer 1972, A. <u>hypochondriacus</u> Hidalgo & D.F. (Martinez 1979)	
petzicatl	"	black seeded (Sahagún 1570a,b, Sauer 1950)	

TABLE 4 - p.4

quintonilli	"	(Sahagún 1570a,b, Sauer 1950)
huauhtli	"	(Payne 1892, Urbina 1903, Safford 1917, Bukasov 1930, Martínez 1936, Sauer 1936, Caso 1937, Nuttall 1937, Sahagún 1570, Anderson & Barlow 1943,)
huajquilitl	Mexico	(azteca, (Martinez 1979)
ziim (shiim)	"	Seri, Sonora "
"wheat of Michoacan"	Mexico	(Payne 1892)
alegrias	"	(present day, fom Spanish)
chia de chapata	"	Michoacan, (Martinez 1979)
guatli	"	(Gallatin 1845, Sauer 1950)
guahtli	"	(Codice Mendocino)
huatle	northern Mexico,	Sonora (Nabhan 1978)
semilla de blede	"	" (Gallatin 1845, Sauer 1950)
michihuahtli (fish huahtli)	"	
tezcahuahtli (mirror huahtli)	"	
camoot	Arizona	bread and mush for meal
		<u>A. leucocarpus</u>
ki'ak	Arizona	Pima, used seed like popped corn (Sauer 1967)
komo	"	Hopi, red color used for piki bread (Cole 1979, Sauer 1967)
kiery	South India & Sri Lanka	(seed, flour (Roxburgh 1832, Sauer 1950).

TABLE 4 - p.5

quina	"	(Lutz 1986)
coquet	"	(Jovas, seeds were toasted, milled and stirred in cold water for a drink, Anonymous 1760, Sauer 1950)
quitlacoche		(State of Mexico, seeds that were small and black and considered inferior (Anderson 1946, Sauer 1950))
ojo de pajaro	"	(State of Mexico, larger and pale seeds (Anderson 1946, Sauer 1950))
cachuacentle	"	(largest and palest seeds, ibid.)
palanquetas	"	(another name for alegrías, state of Guerrero (Sauer 1950)
pari	"	(name of grain amaranths in Tarascan (Sauer 1950)
wá-vë	"	(Huichol name (Sauer 1950)
quaute		Mexico (Ymala, name used for seeds, Safford 1917, Sauer 1950)
weywi	Mexico	(Northwest Indian name (Sauer 1950)
oguigui	Mexico	(Tarahumare pueblo of Guéguachic in Chihuahua (Anonymous 1777, Sauer 1950)
quegui	(Mayo Indians (Sauer 1950), Sierre Madre Occidental (Alejandre and Gomez 1986))	
oauquiltamalli	tamales made of amaranth,	(Codice

TABLE 4 - p.6

	Mendocino, Alexandre and Gomez 1986))		
we'e	Yaqui in Sonora (Sauer 1967)		
quelites de las aguas	(wild greens of the rainy season)		
	northern Mexico, Chihuahua (Martinez 1979)		
quelite	throughout Mexico		
quelite blanco	Mexico	Cohuila (Martinez 1979)	
quelite morado	"	"	
quelite de cochino	"	"	
quilitl	"	Azteca "	
Ba-llaa	", Zapoteca language, Oaxaca (ibid)		
Ca'ara'i	"	Cora	" "
cani	"	otomi, Ixmiquilpan, Hgo. "	
Saua - shalsoco	"	Totonaca, El Tajin, Veracruz "	
Tsaua	"	"	" " "
Saua-sacaca	"	"	" " "
Shacua	"	Tarasca, Mich. "	
Chacua	"	"	"
Chu'yaca	Tarahumara, Chihuahua "		
tez	Guatemala	(Maya dialect)	
niguas	"	popped amaranth like alegrias but use black seeds too (Sauer 1950)	
hien	China (Hu 1948, Sauer 1950)		
jen hien	" medicinal use (Sauer 1950,		

TABLE 4 - p.7

rajgeerah	India (used for seed, unmilled (Sauer 1950, Sykes 1838)
sag	"
chuya	India (Cole 1979)
anardana	incorrect use of term "immortal grain"
shien	China grain (Hu 1948, Sauer 1950)
taj-kharus	Iran (Sauer 1950)
tien-shu-tze	China (millet from heaven) popped and made into confection (Bretschneider 1898, Sauer 1950)
huauhquilitl	Mexico, aztec form
kira	Anaimalai Hills, for seed, (Fisher 1921, Sauer 1950)
landesi	Sri Lanka grain (Hooker 1885, Church 1886, Trimen 1895, Sauer 1950)
ramdana	India (Sauer 1967) grain of god Rama
amardana	" "
keerai	Tamil name "
chian	Mixtec <u>A.cruentus</u> (Sauer 1967)
báthu	Himalayas grain and pot-herb (Sauer 1950)
batu	" " " "
Dhuti ghans	Nepal vegetable
Ban lure	" "

TABLE 4 - p.8

fotete	West Africa				
Redroot pigweed	United States	<u>A. retroflexus</u>			
Caribbean pigweed	"	"	"	"	
Huee'e	Mayo, Sonora,	<u>A. blitoides</u>	(Martinez 1979)		
Flor de seda	Chiapas	" <u>caudatus</u>		ibid	
Moco de pavo	"	"		"	
chaktez	Maya language,	<u>A. dubius</u>	(Martinez 1979)		
	Yucatan				
Xtez	"	"	"	"	
Sak-xtes	"	<u>A. polygonoides</u>		"	
bledo cimarron	Mexico, Chihuahua	<u>A. spinosus</u>	(ibid)		
epazote de mula	" El Tajin, Veracruz,	"	"	"	
guie-lachi	" Zapoteca lang., Oaxaca,	"	"	"	
guilachii	" "	"	"	"	
k'ii-k-xtec	" Maya	"	", Yucatan	"	"
kix-xtez	Mexico	Yucatan(Mayan)	<u>A. spinosus</u>	(ibid)	
xtes	"	"	"	"	"
ala de perico	" Jalisco	<u>A. tricolor</u>	(ibid)		
x'ohde'skidi	U.S., Navaho	leaves boiled	(Bailey 1940)		
tsim ip	Hong Kong	<u>A. tricolor</u>	used as spinach		
			(Herklots 1972)		
yuen ip	"	"	"	"	
huang ip	"	"	"	"	

TABLE 4 - p.9

paak ip	"	"	"	"
ts'ing ip	"	"	"	"
ma ch'e	"	"	"	"
Ranga sak	India	spinach		"
lal sak	"	"		"
lal sag	"	"		"
bayam puteh	Malaya			"
" merah	"			"
in ts' oi	"			"
fu ip	Taiwan	tiger leaf	(Herklots 1972)	
red root	New Zealand		(Holm et al. 1977)	
caa-ruru	Argentina			"
yuyu colorado	Argentina			"
moco de pavo	Chile			"
penacho	"			"
visnaga	"			"
bajem kejong	Indonesia (Javanese)			"
bajem merah	"			"
singgang bener	" (Sudanese)			"
hosoageito	Japan			"
queue de renard	Morocco			"
bwamanga (Ndao)	Rhodesia			"
imbuya	"			"
imbuya jamabize	"			"

TABLE 4 - p.10

cape pigweed	South Africa	"
kaapse misbredie	"	"
phak khom	Thailand	"
slim amaranth	Australia	(Holm et al. 1977)
pigweed	U.S., E.Africa, Zambia	"
blero	El Salvador	"
lero	"	"
green amaranth	United States	(Hedrick 1972)
goosefoot	East Indies	"
wild blite	temperate and tropical zones	"
thorny amaranth	Asia, Africa America, Jamaica	"

origins of species of amaranth and their uses. The table includes names found for amaranth worldwide, but in no way is it completely comprehensive.

Finally, I thought it would be appropriate to have a table of names of foods associated with amaranth (Table 5). This includes both past and present day foods. It was necessary for me to separate names for amaranth (the plant), from actual foods made with amaranth. I did this because some of these names are also generic and can be applied to other foods that are not made with amaranth. In some cases, it was hard to decide whether to put the name as a name for amaranth, the plant, or as a food and there is some overlapping. For example: the word alegrias actually refers to the candies made from popped amaranth seeds but this name is also often used to refer to the entire plant.

TABLE 5 - p.1

FOODS ASSOCIATED WITH AMARANTH

turrone - amaranth balls, Peru

mash'ka - (similar to Mexican pinole, Peru)

chicha - beer (Ecuador, Peru)

airampo - Peru, medicine made with flowers

caramina - Peru, red dye associated with A. quitensis

HBK.

cuhuisi - (Warihio term for pinole)

wastomari - (atole in Warihio)

atole - (Mexico, a drink, toasted or powdered amaranth
seeds)

pinole - (Mexico)

drague - (A. hybridus) boiling flowers added to
aguadiente- Peru- "purifies the blood" and restores
regularity of menstrual cycles)

tuycen - (bread made into animal figures)

tzouatl - (bledos with honey)

zoales - (idols made of amaranth dough)

suale - (rosaries made of little balls of amaranth dough,
Indian village near Guadalajara (Safford 1917,
Sauer 1950)

TABLE 5 - p.2

- niguas - (alegrias made in Guatemala (Sauer 1950))
- alboroto - (confection made sometimes of sorghum and
amaranth (Sauer 1950))
- jaleas - (Guatemala, for home use, toasted and milled
for pinole)
- tortillas - (in Guatemala, black seeds of amaranth used
alone or with maize dough (Sauer 1950), also
made in Mexico but not common)
- alegrias - confection (candy) made in Mexico
- licuados - drink made with amaranth, Mexico
- michiatolli - a drink once sold in Tenochtitlan market
(Early 1992)
- hauaquiltamalli - special tamales made from popped
amaranth ground flour (Mendocino Codex)
- cauhquilmolli - a sauce from amaranth leaves
- tzoallaxcalli - popped amaranth with syrup from the maguey
cactus
- cuales - ball of bean paste covered with amaranth flour
(a type of tamales prepared on Christian feast
days (Early 1992))
- chuales - (same as above, Cole 1979)

USES OF AMARANTH TODAY

Amaranth is used still today throughout the world. This section will review what has been written about uses and will include personal uses I have observed.

Amaranth is an important part of the diet in areas of Latin America, Africa and Asia (Grubben and van Sloten 1981). It is used as a grain and vegetable (potherb) and in some instances supplies a substantial portion of dietary nutrients (Vermeulen 1974). Because of low production costs and high yields, amaranth is one of the least expensive leafy vegetables found in tropical markets (Saunders and Becker 1983). Amaranth greens are considered very nutritional, containing a high amount of calcium, magnesium, iron, vitamin C, and the vitamin A precursor carotenes, as well as a good supplemental amount of high quality protein (Daloz 1981). It has also been noted for its vitamin E content recently (Tangley 1992).

The use of amaranth greens is of particular importance in Africa, some parts of Europe and Southeast

Asia (especially Malaysia and Indonesia), southern China, southern India and the Caribbean. In North American deserts, when the summers are too hot for lettuce or cabbage, Amaranthus palmeri is used as a wild green among Indians (NRC 1984). Such species as A. tricolor, A. dubius, A. hybridus and A. cruentus are used as vegetables to name just a few. Amaranthus blitum leaves have been a favorite salad in Greece since the days of Homer and are called vleeta (NRC 1984). Vegetable amaranths can be picked fresh, washed and used in salads or made into relishes. They are eaten after being steamed, blanched, stir fried, sauteed or baked, making a cooked vegetable similar in taste to spinach. The cooked amaranths are popular in soups and can be used as an ingredient in baby food, casseroles, lasagna, pasta, pie crusts, quiche, souffle etc. (Saunders and Becker 1983, NRC 1984).

Amaranth grain has a relatively high protein, fat and mineral content. It is a particularly attractive protein source due to its high content of the amino acid, lysine. If consumed with other cereals (it is lacking in the amino acid leucine) it provides a protein "balanced" to human dietary requirements (FAO 1970). Species used for grains include A. hypochondriacus, A. cruentus, A.

caudatus (Fig. 9) and A. hybridus.

Traditional recipes vary among cultures as to the preparation of amaranth seeds and greens (Saunders and Becker 1983). However, there are many similarities in their uses. In Mexico and other Central and South American countries the grain is ground and used as flour as an ingredient in foods such as pinole, tamales and atole (Nabhan 1980). The seeds are also popped and made into candies called "alegrias" in Mexico (Fig. 10). In Asia and Africa there are similar products made. Grain amaranth is popular among the hill tribes in India, Pakistan, Nepal, Tibet and China. In the Himalayas, a flat bread made from the seeds is a common food in certain local areas. Amaranth is said to occupy more than half of the non-irrigated cropland of the higher elevations in the hills of Northwest India (NRC 1984). In southern India amaranth is known as "rajgira" (king seed), "ramdana" (seed sent by God) and "keeri". "Laddoos" are a confection made from popped amaranth grain mixed with honey or syrup and resemble the "zoales" of Aztec and Mayan days. Hindus pop amaranth grain and soak it in milk during festivals when traditional cereals are forbidden (NRC 1984).

Fig. 9. Amaranthus caudatus, the South American species.

Fig. 10. "Alegria" candy being sold in the Mercado de Dulces, Mexico City.



Fig. 9

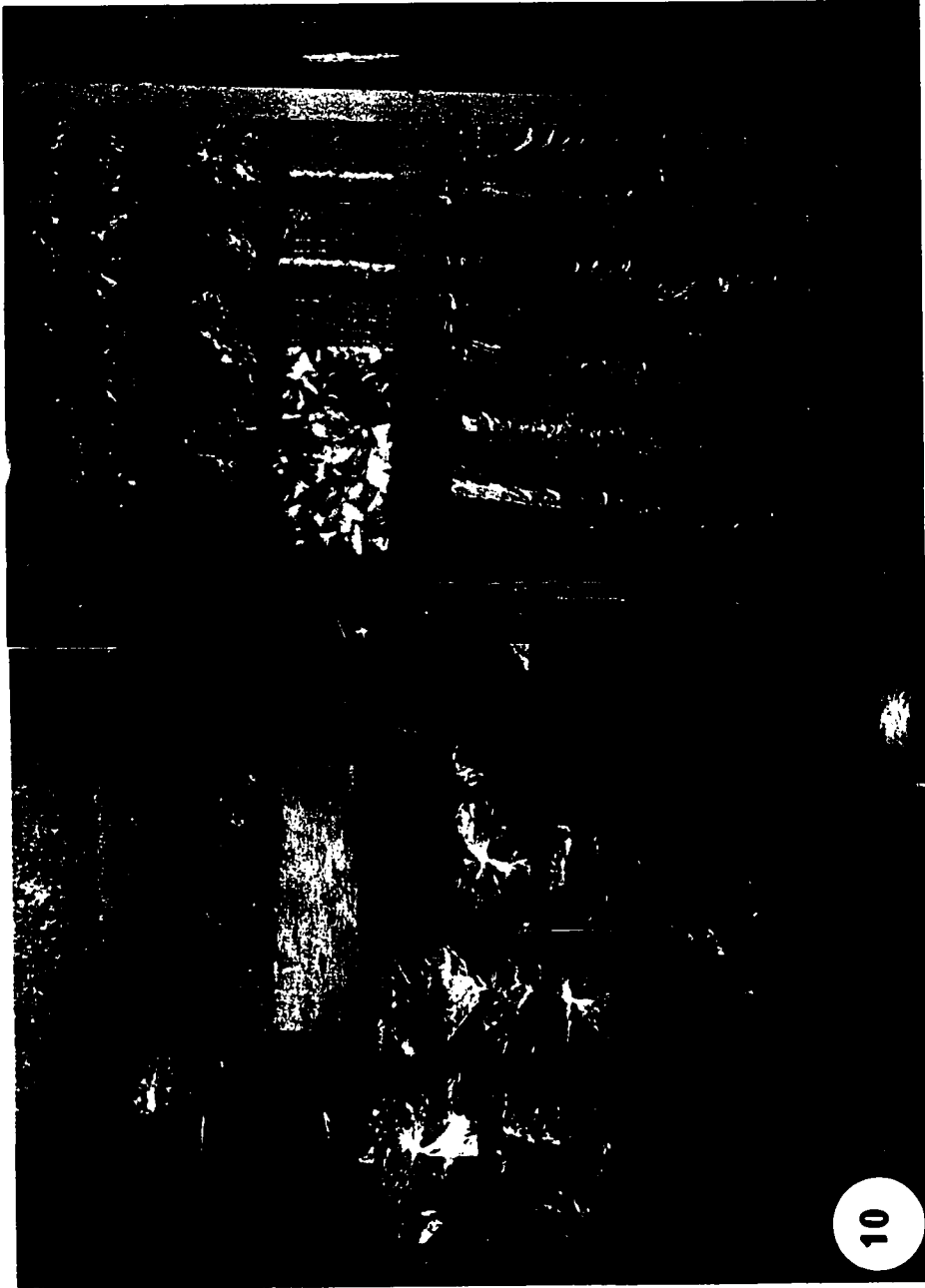


Fig. 10

During a trip to Nepal in 1984, I was offered a bowl of popped amaranth while walking in the Himalayas at an altitude of about 10,000 ft. There was no amaranth growing at the time and the seeds were apparently kept year round for special occasions. In a party of three males and one female, everyone else was offered a drink of fermented maize while I was offered popped amaranth, a seemingly special offering (Fig. 11). The parallel uses of amaranth in the Old World with those uses in the New World is a particularly puzzling occurrence and makes one wonder about the origins of amaranth use. The origins will be discussed further later on. Early studied amaranth in Nepal in 1991 and found it used as a grain and medicine (pers. comm.).

Also noteworthy is the use of amaranth medicinally in parts of Africa and Asia. Amaranth could have an important potential as a pharmaceutical, i.e. as a laxative, and for squalene (a high-priced material found in the seeds of amaranth but normally obtained from shark livers and used in cosmetics, NRC 1984). Its use as a commercial dye may have some interest. In the beginning of this study, I tried to convince the then General Foods (now Philip Morris) to fund some of my work

Fig. 11. A bowl of popped amaranth offered to the author, the Himalayas, Nepal.

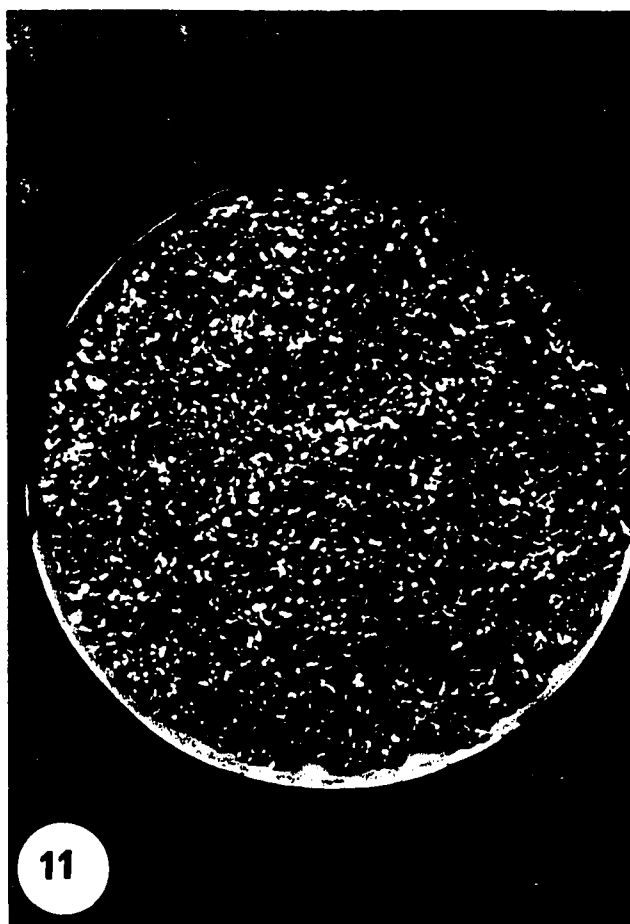


Fig. 11

on the use of amaranth as a dye replacement for the then infamous red dye # 2. I was unsuccessful. The problem seems to be that the dye is not stay fast.

In the book, Medicinal Plants of East and Southeast Asia, Perry and Metzger (1980) list many medicinal uses (see bibliography in Perry and Metzger, 1980, for all references found in the following three paragraphs):

"Various species of Amaranthus are mentioned in the literature, but the ones most used seem to be A. spinosus L., A. tricolor L. (A. gangeticus L.), A. mangostanus L., A. melancholicus L.)".

This reference goes on to say that the root of A. spinosus is used to treat rheumatism (China: Groff et al., 1:79, Cambodia: Menaut, 32: 244, 456, 472, 475). "It acts as an emenagogue (Indonesia: Heyne, p.606; van Steenis-Kruseman, p.11) and as a diuretic in treating gonorrhoea (Indo-China: Pételot, 3:7; Malay Peninsula: Burkill, p.128; Heyne, van Steenis-Kruseman). It is sudorific and febrifuge in eruptive or very high fevers (Menaut) and a constituent in mustard plasters to treat rheumatism and uterine tumors (Menaut). The leaves are

said to be cooling, non-poisonous, and remedial for dysentery and dropsy (How et al. p.144), malnutrition (Thailand: Wichian, coll. no. 312); the plant is used as a diuretic (Forucaud, p.43) and galactagogue (Pételot). Internally, the leaves are used to treat bronchitis (Burkill) cold in the chest (Heyne, van Steenis-Kruseman); they are eaten as depurgative (Kloppenburger-Versteegh), and used in a decoction to treat fever (De Clercq, no. 235). Externally, the crushed leaves and (sometimes) roots are applied as emollient and maturative poultices on skin infections (How et al.), dog bites (Pételot), boils (Burkill), festering wounds (Kloppenburger-Versteegh, recipe nos. 483, 1143, 1373); and the leaves are used locally to treat eczema (Philippines: Parado de Tavera, p.200). The plant contains considerable potassium nitrate (Petelot; van Steenis-Kruseman)."

Perry and Metzger go on to say "Amaranthus tricolor is probably a native of Asia; it is cultivated and also wild in waste places throughout SE Asia." They continue with the following information. In China, a decoction of very old plants is an internal remedy to improve the vision and to strengthen the liver, and ash from old plants mixed with rapeseed oil from a burning

lamp gives an ointment for dressing boils and itch (Hu, p.126). In the Malay Peninsula a decoction is made from roots of A. tricolor and Cucurbita pepo and used to control hemorrhage caused by abortion (Burkill, p.126). Amaranthus blitum L. is eaten in China to remove poison from the system (Tsan; in Lucas, 1977). According to Gershoff (1909: 402; in Lucas, 1977) the seeds of the genus of Amaranthus show a little saponin which probably connects some of the species as an anthelmintic in popular medicine. He suggests A. viridis L. as one of these species. In China A. viridis is used to clear inflammation and to stop dysentery (McClure and Hwang, p.13). In the Phillipines the leaves and shoots eaten fresh are considered to be an excellent source of vitamin B (Hermano & Sepulveda, 54: 65).

Lucas (1977) notes the use of A. hypochondriacus under the name hsien and it is listed as containing active properties as an astringent and nutrient. It is considered to have generous amounts of vitamins and minerals. He says, "for centuries, the Chinese and various other peoples have employed amaranths as a remedy for profuse menstruation. Two ounces of the herb are placed in a container, and one quart of boiling water is poured on. The brew is covered, allowed to stand until

cold, and then strained. The tea is reheated to take the chill off, and one large cup of the lukewarm tea is taken four or five times a day. (In more severe cases, the tea may be taken more often)".

In Mexico, amaranth is popular as a candy called "alegrias" and made of popped amaranth seeds. In many places atole, pinoles, tortas, tamales and licuados are made from the seeds. Amaranth greens are collected from weeds or semi-domesticated areas throughout Mexico and are known as quelites. They are cooked like spinach or used in the making of soups. Grain amaranths are grown in the states of D.F., Morelos, Puebla and Tlaxcala on a large scale presently and have also been mentioned in the literature in Michoacan, Guerrero, Jalisco, Oaxaca, Sinaloa and Chihuahua (Alejandre & Gomez 1986).

Native peoples like the Huichols and the Coras still cultivate amaranth. The Huichols both cultivate amaranth and use it as a grain and vegetable (J. Bauml, who is doing a Ph.D. dissertation in the area, told me that he has seen amaranth there). The Coras are a group of people that have not been influenced by outside peoples until recent times. They are found in the state

of Nayarit. The Mexican army entered their community looking for fields of marijuana and they accidentally destroyed fields of amaranth through misidentification. Ingeniero Eduardo Espitia Rangel from Chapingo went to this village in 1986 which entailed flying into an area that was still a one week walk away from the Coras. He brought seeds of amaranth to replace those that were taken and also collected a small amount of germplasm from some of the elders who had guarded and saved some seed. This was in the hope that these people would continue their use of amaranth which seems to be a staple food for them (pers. comm. 1988). It is my hope to visit this area in the future to study the effects of this unfortunate event and the practices of the Coras with regard to amaranth. This very strange accident seems almost reminiscent of some of the stories found in the literature of the Spanish destroying the fields of amaranth in Aztec times! (Although the stories of burning the fields has not been documented, Early 1992).

On the outskirts of Mexico City, (Xochimilco) amaranth continues to be cultivated in "Atzec type" chinampas or "floating gardens". This has been studied by Early (1977a). This form of agriculture has been practiced in various forms by the Maya, pre-Inca Titicaca

peoples and other South American people as well as some of the hill tribes of Asia (Early 1977a, b, 1988; Armillas 1971; Dahlin 1976; Erikson 1987 and Cole 1979). During my visit in 1986, amaranth was still being cultivated in these "floating gardens" in Xochimilco and transplants were used in Tulyehualco.

In the tropics, Early (1990) notes the cultivation of amaranth in areas where slash and burn agriculture is used. He notes Zongolica, Veracruz, Mexico where the young leaves are used as greens and the grain are harvested later. The plants are then allowed to reseed themselves and they are able to obtain a second crop. Early also notes cultivation of amaranth in the Yanatile region of southeastern Peru where slash and burn agriculture is also used (Early 1988).

In South America, amaranth is used to make similar foods to those found in Mexico. Many authors feel that amaranth was independently developed here (Sauer 1967; Early 1992). Unfortunately Incas written records are not available to us like those of the Aztecs (Early 1992). When amaranth was developed as a grain is not known for sure.

In Peru, mash'ka is similar to the Mexican pinole. Turrone are similar to the Mexican alegrías. Chicha (beer) is also made of amaranth seeds that have been fermented. Ash from the stalks are used to enhance the taste and chemicals of the coca leaves. In the Cusco area flowers of cultivated amaranth are used to treat toothache and fevers. These plants are known as airampo. Red flowers that have been boiled are used to color corn and beer made from amaranth. In Peru, dye from the flowers are used as a rouge to paint cheeks (Early 1992, also I was told that by informants in 1986). Peruvian women also use amaranth as an ornament carried on their backs during Carnival (Early 1992). There is also reference to the use of the flowers as a medicinal to control heavy bleeding during menstruation in Peru, as is noted in Asia.

It is interesting to note that Culpepper (1733) refers to amaranth's virtues as follows: "It is under the dominion of Saturn, and is an excellent qualifier of the unruly actions and passions of Venus, though Mars should also join with her. The flowers dried and beaten into powder, stop terms in women, and so do almost all other red things. And by the icon or image of every herb, the ancients at first found out their virtues. Modern

writers laugh at them for it; but I wonder in my heart how the virtues of herbs came at first to be known, if not by their signatures; the moderns have them from the writings of the ancients; the ancients had no writings to have them from: but to proceed.-The flowers stop all fluxes of blood, whether in man or woman, bleeding either at the nose or wound. There is also a sort of amaranthus that bears a white flower, which stops the whites in women, and the running of the reins in men, and is a most gallant anti-venereal, and a singular remedy for the French pox."

In Mrs. Grieve's Herbal (1931) she lists A. caudatus as being native to Africa and Java and A. spinosa, A. oleraceus and A. polygonoides as native to India. She attributes amaranth as a medicinal for external ulcers of the throat and mouth and as an injection in leucorrhoea. It is used as a wash for ulcers, sores, etc. It is also recommended for diarrhoea, dysentery and hemorrhages from the bowels.

We also find the mention of amaranth in many English works including Spenser's poem "The Faerie Queene", John Milton's "Paradise Lost", and Francis Thompson's, "The Hound of Heaven" (Cole 1979). Their is

documentation of amaranth use in the early colonists' gardens in North America (Cole 1979). In many languages there is the expression, "not worth amaranth" (NRC 1984), but I must admit I have never heard it used.

In the 20th century cultivation of amaranth has been found in Peru, Bolivia and Argentina. In Cochabamba, Bolivia the toasted grain was used especially for children or invalids and the stalks were used in fencing and roof construction (Sauer 1967). Hunziker (1952) described witch-doctors in the Cusco area, carrying bags of amaranth flour to be mixed with chicha and considered excellent food.

Today, in Argentina, several species of amaranth are used as food. These include the leaves for greens, the seeds for popping, milled into flour, the flowers added to apple juice and fermented and as ornamentals. It is interesting to note that many of the seeds that are used are dark seeded (Zardini 1986 manuscript).

In Ecuador, one of the amaranths is known as sangorache (A.hybridus var.sangorache) and is used as a medicinal herb as well as to add color to 'pan de finados' and 'colada morada' during the Día de los

Muertos (Day of the Dead). The origin of this custom is not known. It may be from the Ayamarca of the Incas or even before then (Heiser 1985). Heiser (1985) suggests that amaranth may have replaced maiz negro.

In Bolivia, amaranth is also used on All Saints' Day but is used in a different way (Heiser 1985, from a letter from Timothy John).

In 1979, Lutz (Lutz 1986) visited sites in Latin America to see amaranth use. These included Peru, Ecuador, Guatemala, Bolivia, Argentina and the south of Mexico. He visited a total of 68 sites including 29 sites found in the literature and 39 new sites. Uses included cereal, potherbs, color for food, ornaments, forage for animals and medicine, and ritual uses. In Bolivia, seeds are sold as a remedy for gas. In the Ecuadorian Andes, infusions of the flowers are used for a bad heart, acne and headaches. Principally, amaranth is used as a medicine for menstrual problems and is considered an excellent purifier of the blood.

In Asia, amaranth is used as a vegetable, medicinal herb and grain. Some of these uses have already been discussed above. In Thailand, an amaranth

project has been started thanks to the funding of BOSTID/USAID. Chuckree Senthong and Soonthorn Duriyaprapan have developed projects and amaranth is now being grown in the Chang Mai area of northern Thailand.

Amaranth has also been spread to Africa and this project is under the direction of Dr. V. K. Gupta. It was also originally funded by BOSTID/USAID and they have developed high-yielding and drought resistant lines of amaranth. Development of several recipes have been adopted by local people and it has been very well accepted and enjoyed.

In the United States too, amaranth is being grown in Kansas, Nebraska, Colorado, Wyoming and products with amaranth can be found in most health stores. These include cookies, granola, pasta etc. The research kitchens at Rodale Research Center have developed many amaranth recipes and they can be found in some of their published cookbooks. Rodale even puts out an amaranth newsletter. The first commercial field in the U.S. was established in Kansas with 1.5 hectares in 1979 and in 1984, 25 farmers were growing close to 700 hectares of amaranth (Weber 1986).

In Guatemala, Bressani has been active in working on the development and production of amaranth products. He has developed Amarlac, a powder form of amaranth similar to carnation instant milk (pers. comm. 1986). There are still areas where native people use amaranth and much work has been done to further the commercialization here.

During my visit to Peru (1986), I was introduced to a number of amaranth products developed by those at the Universidad Nacional del Cusco, Centro de Investigacion de Cultivos Andinos (CICA), under the direction of Luis Sumar Kalinowski. These include oil from amaranth, dye from amaranth and starch from amaranth (Fig. 12). Other products include pizza made from 50% amaranth flour, flapjacks from amaranth flour (Fig. 13), amaranth cake, soup with amaranth (Fig. 14), chicha (an alcoholic drink) from amaranth (Fig. 15), amaranth cereal, pellets for animal forage (Fig. 16) and a dried leaf powder from amaranth to use in pastas (Fig. 17).

The Peruvian government sponsored a program supporting native food plants and invited "poor" native people to the then President, Alan Garcia's house. His wife was influential in developing kiwicha as a Peruvian

Fig. 12. Products developed by CICA including oil, dye and starch.

Fig. 13. Pizza and flapjacks made from amaranth.

Fig. 14. Amaranth cake and soup with amaranth.

Fig. 15. Luis Sumar Kalinowski pouring chicha (alcoholic drink) produced from amaranth.

Fig. 16. Amaranth cereal and pellets for animal forage.

Fig. 17. Dried powder from amaranth leaves.

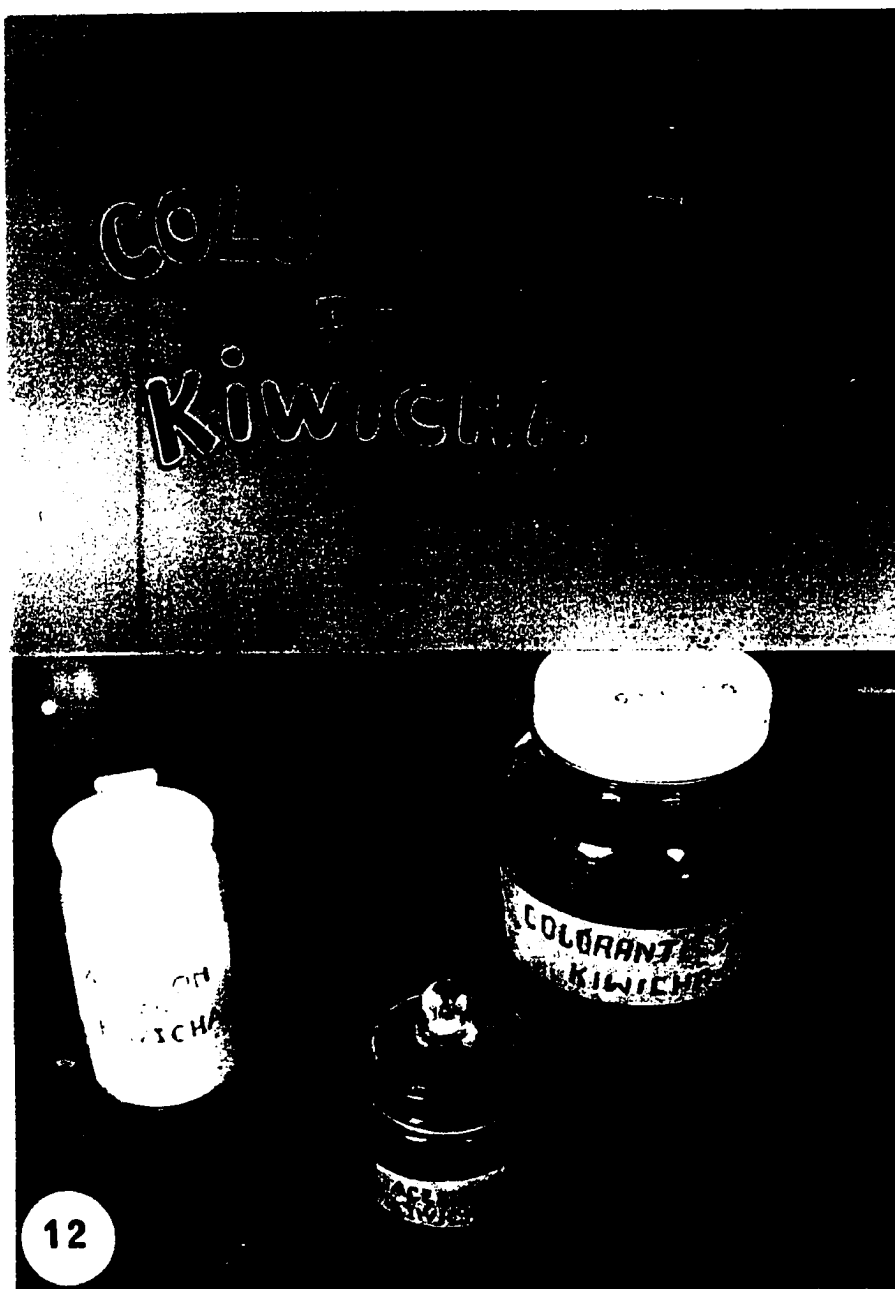


Fig. 12

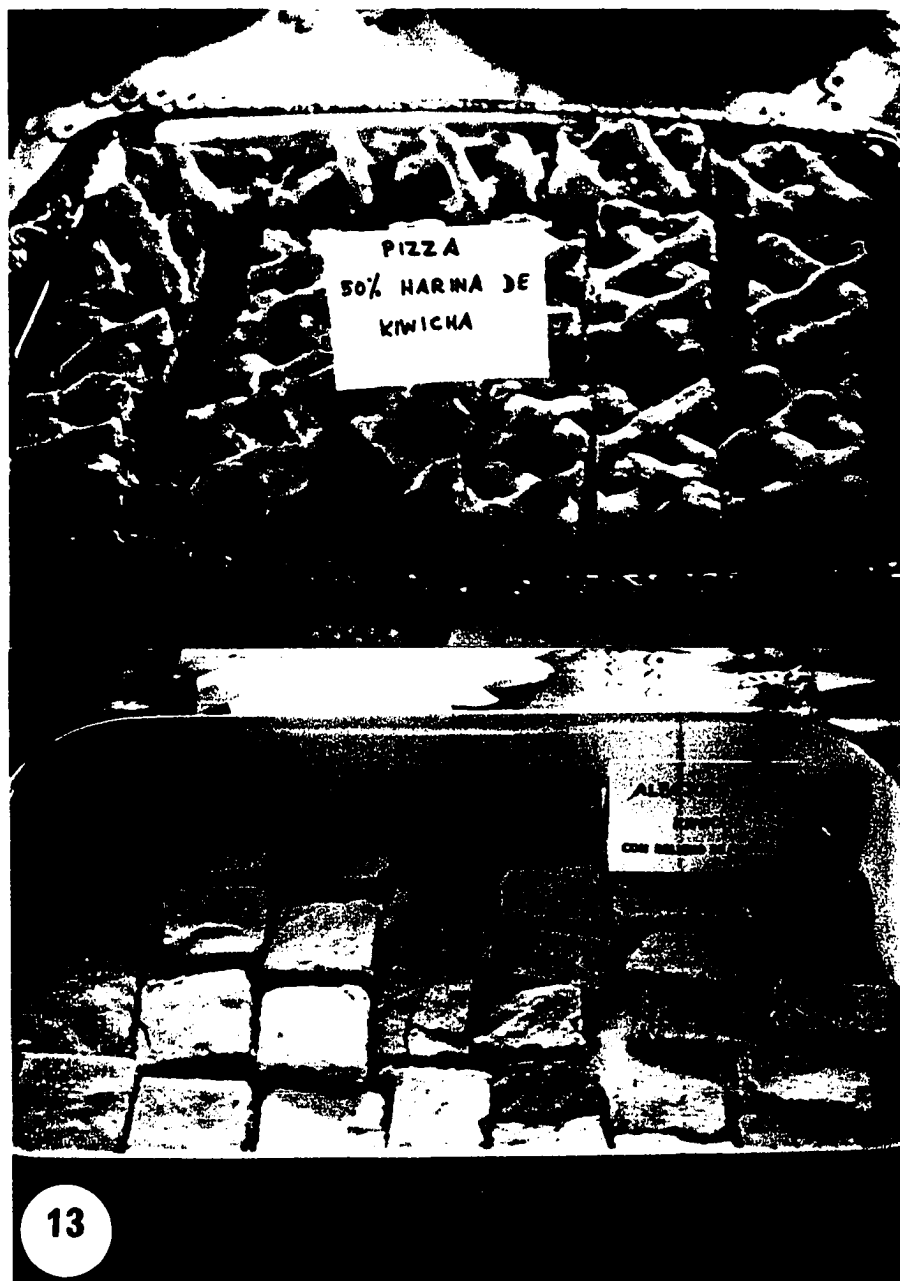


Fig. 13

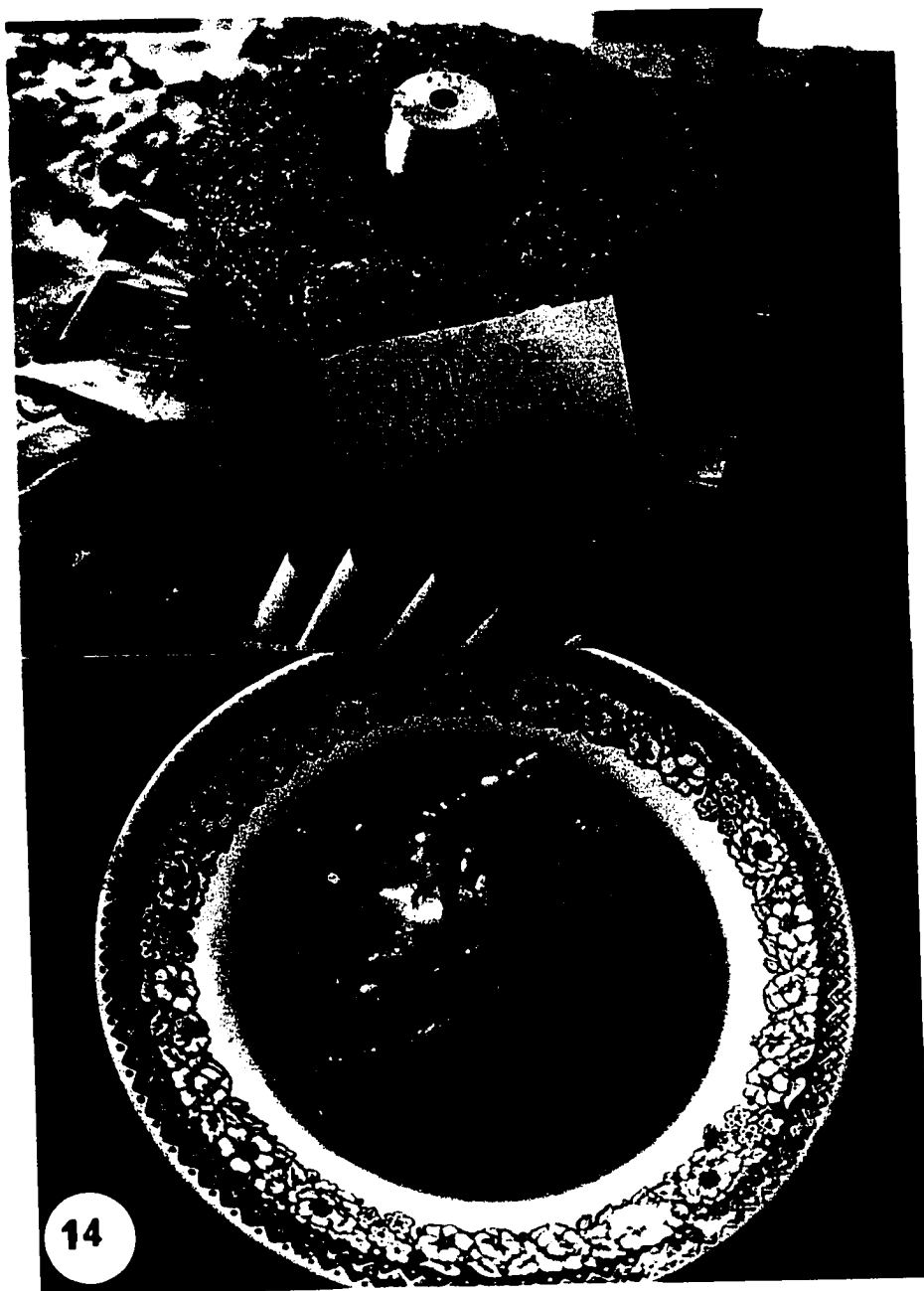


Fig. 14

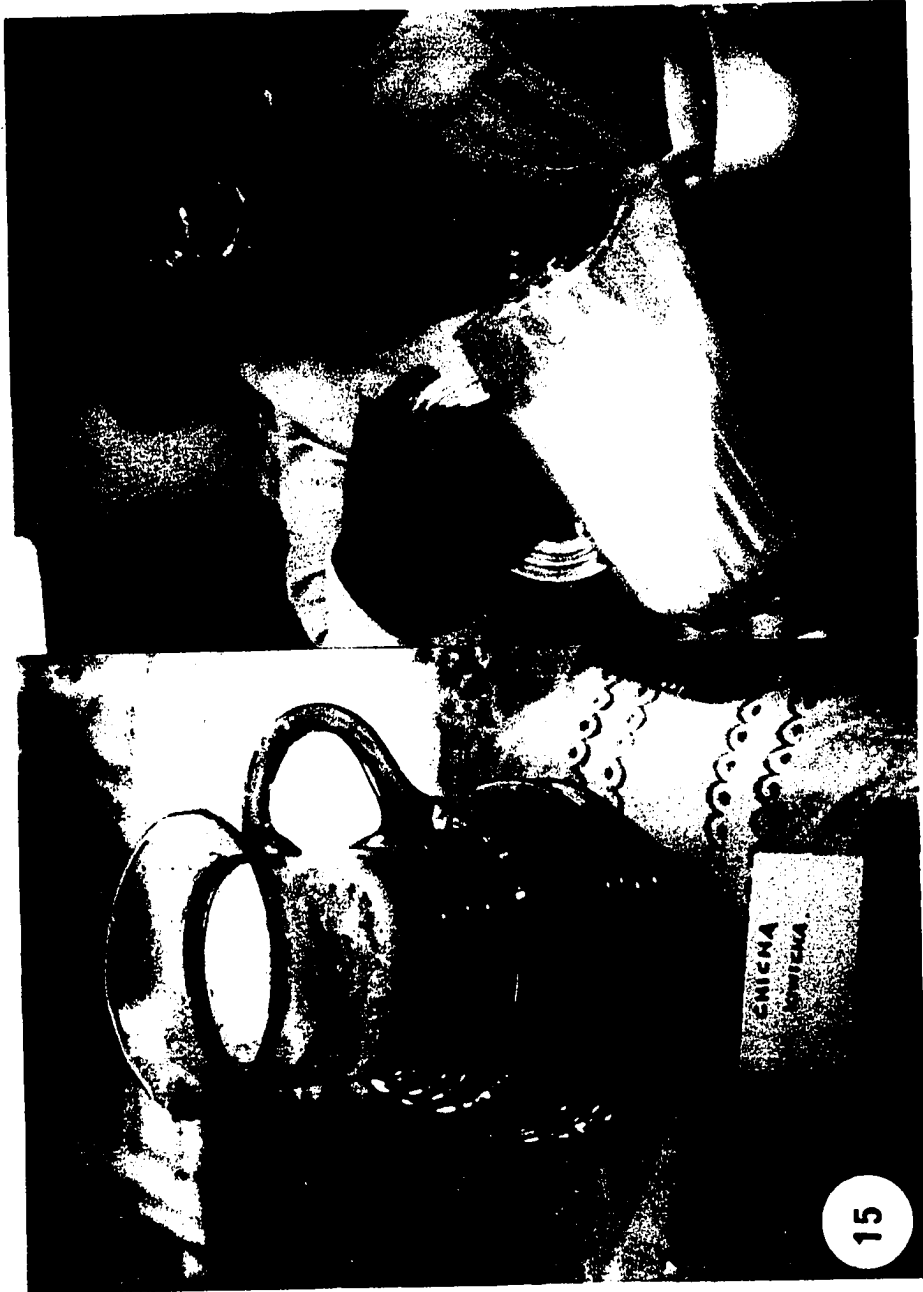


Fig. 15

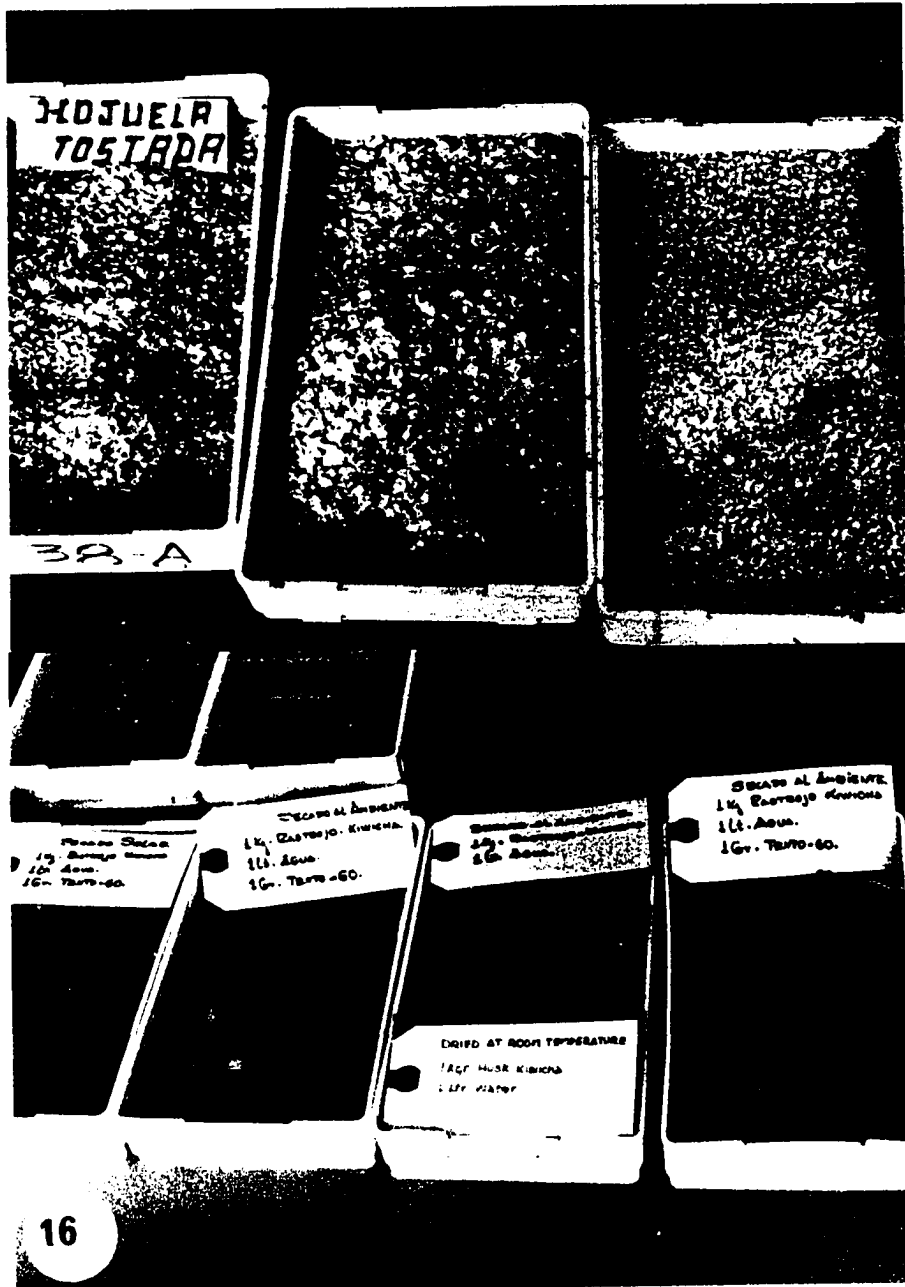


Fig. 16



Fig. 17

native food and everyone seemed interested in eating kiwicha while I was there. Such a marketing strategy, from the President of the country down, caused a real development of Andean crops like amaranth. On the walls of CICA they have a frog that advertises the virtues of kiwicha (Fig. 18). Around 50 farmers in the valley outside the town of Cusco were given seeds to grow of A. caudatus (Fig. 19). One can spot the fields from afar from their red color (Fig. 20). Unfortunately, since this time a guerilla force known as the Sendero Luminoso has taken over the area and the work of Kalinowski and others has been stifled.

During Early and Capistran's Fulbright stay in Peru (1986), they did extension work with local people to promote foods made with amaranth seeds (Fig. 21 & 22). I accompanied them during my visit in Peru and experienced some of this work. In Peru, a wooden stick (palo de tostar) is usually used to pop seeds (Fig. 23). Adaptations of the Peruvian palo para tostar were switched for the Mexican broom and bowl (escoba & cubierto) and the people readily adapted to this method. People, especially children, who had generally only eaten amaranth as quelites enjoyed cereal and cake made from popped amaranth (Fig. 24 & 25).

Fig. 18. Frog logo used to promote amaranth virtues, CICA, Cusco, Peru.

Fig. 19. One of the 50 farmers given A. caudatus seeds to grow, in the valley outside Cusco, Peru.

Fig. 20. Fields of A. caudatus can be spotted from afar, valley outside Cusco, Peru.

Fig. 21. Local people in a village in the valley of Cusco where recipes using popped amaranth were taught.

Fig. 22. Women with a bowl of just popped amaranth.

Fig. 23. Woman learning to pop amaranth with an escoba instead of pal de tostador (on table).

Fig. 24 & 25. Children enjoying amaranth.

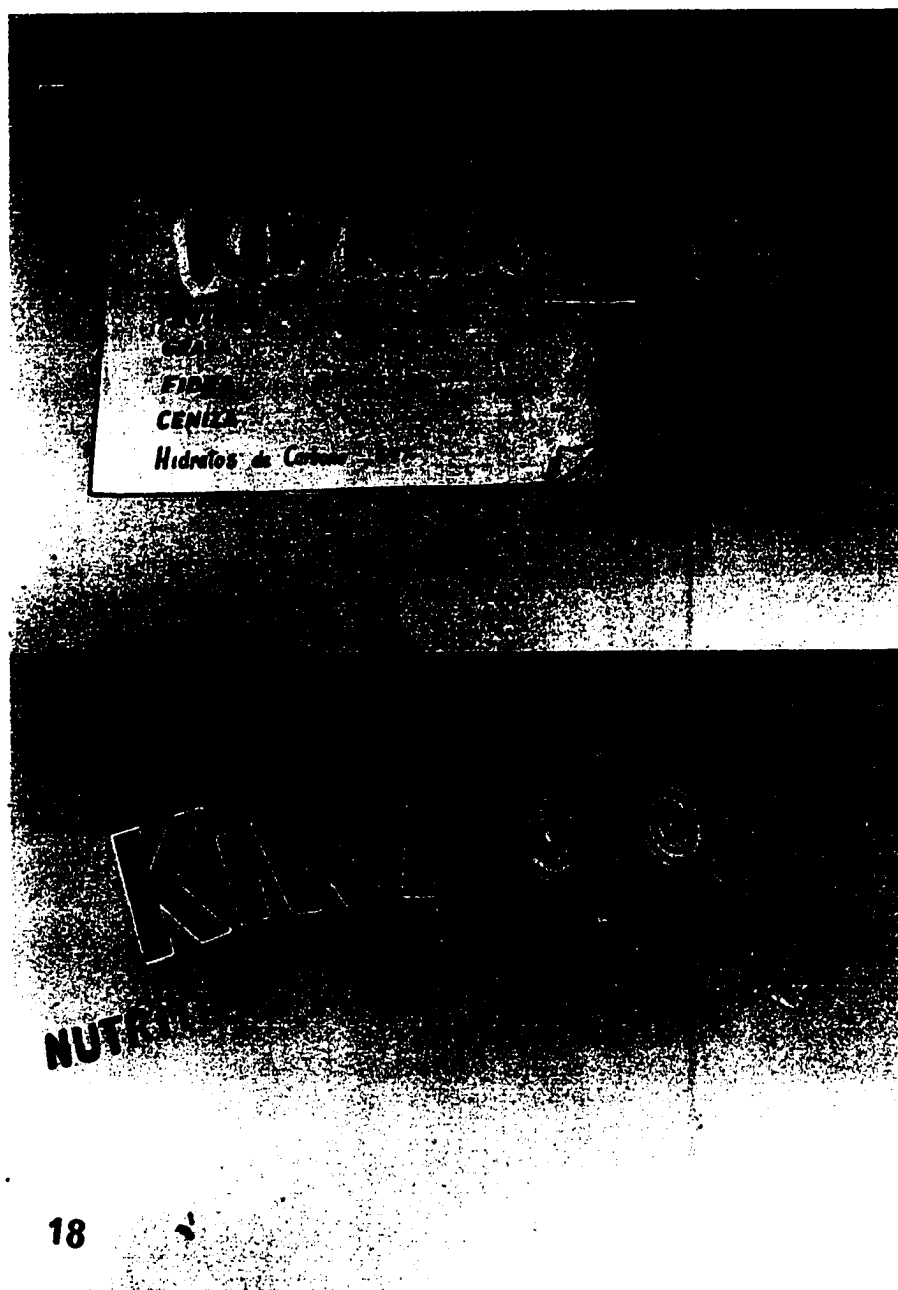


Fig. 18



Fig. 19

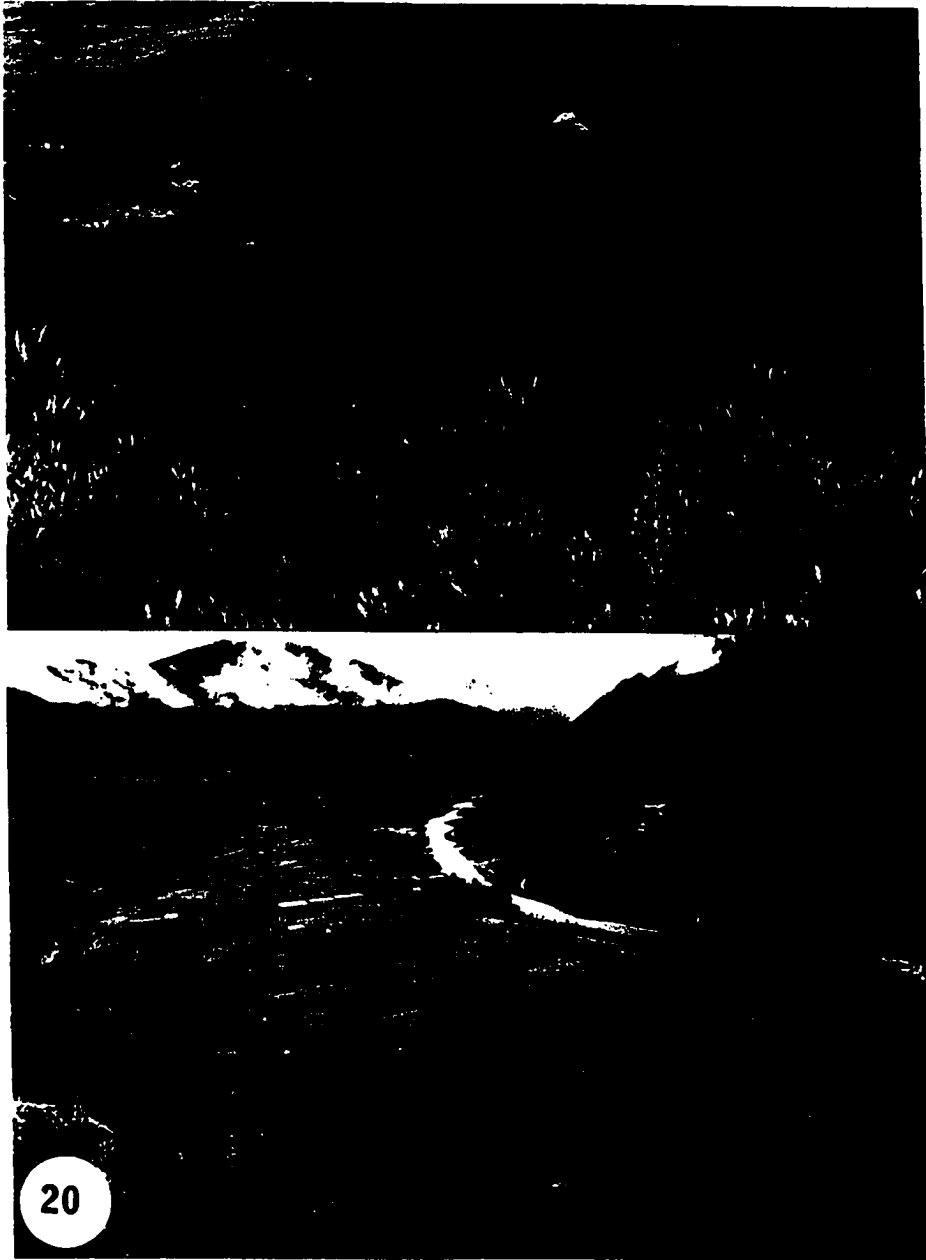


Fig. 20



Figs. 21 and 22



Fig. 24

Fig. 23



25

Fig. 25

Early (1992) notes that in 1982, Dr. Yue Shaoxian of the Institute of Crop Breeding and Cultivation visited Rodale Research Center and brought several pounds of seed back to China. In 1987, 177,000 acres of amaranth were under cultivation. The amaranth is used as a forage, and a dark soy sauce of 15% dark-seeded amaranth mixed with 85% soy beans has been developed.

COMMENTS ON THE ORIGINS OF AMARANTH

Amaranth has been a plant used before even the beginnings of agriculture. It was eaten by hunter-gatherers in both North and South America before the domestication of agriculture (Sauer 1967). It seems to have been gathered as a green and it appears that some of the black seed species were even used as grains. "Our prehistoric ancestors relied on plants for food, medicine, clothing, shelter and survival" (Vietmeyer 1983). According to MacNeish (1970) amaranth was cultivated some 5000 years ago along with some other crops like corn, beans and squash.

Moctezuma received 200,000 bushels a year of amaranth in tribute (Bortz 1975; Coe 1974; Soule 1979). This is nearly the same amount that was offered of corn (280,000 bushels) and beans (230,000 bushels) (Soule 1979; Codex Mendocino; NRC 1938). In Mesoamerica amaranth developed as an important ritual and cash crop. References to amaranth can be found in the important Codices. These include the Florentino Codex of 1550, which describes the ritual uses of the seeds of huautli (Codice Florentino 1968; Casillas 1986; Sauer 1950) and

the Mendocino Codex of 1541, which describes the seeds of huautli as a tribute received by Moctezuma from the Aztecs (Cooper 1938; Casillas 1986; Alejandre and Lorence 1986; Sauer 1950). Alvar Nunez Cabeza de Vaca in 1536 described the use of the seeds by the name of huautli in Sonora and Sinaloa (Casilla 1986) and Ruiz de Alarcon (1629) also described the use of the seeds of alegria in rituals (in Casillas 1986; in Sauer 1950). Jacinto de la Sera (1636) also described alegrias used in rituals (in Casillas 1986).

The Mendocino Codex included a number of foods made with amaranth. They include huauquiltamalli, tamales made from popped amaranth seeds made into flour, cauhquilmolli, a sauce made from amaranth leaves and tzoallaxcalli, special tortillas made from popped amaranth with a syrup made from the sap of the maguey cactus (Early 1992). Many of the Aztec festivals included amaranth foods and these products were offered to their gods. These included huauquitamalli being offered to the fire god, Xiuhtecutli, at the festival known as Huautamalqualiztli, The Amaranth Tamale Feast. This festival was also called Motlaxquain Tota meaning "Our Father the Fire Toasted to Eat" (Early 1992). Images of Aztec Gods were made into tzoali to be eaten.

Tzoali was popped amaranth held together with maguey cactus syrup and human blood. Some of the gods represented included the goddess of crops, Chicomecoatli; the god of fire, Xiuhtecutli; the god of rain, Tlalogue; the flower god, Macuilxochilt; the god of feasts, Omacatl; and the god of war, Huizilopochtli (Sauer 1950, Early 1992). Sauer (1950) provides a table listing the Aztec months and festivals.

The Mendocino Codex lists amaranth as one of the four major crops collected as a tribute to Moctezuma. The page shown (from NRC 1984) shows two wooden bins of maize and amaranth from six towns. On the wooden box the name quahtli (a name for amaranth) can be seen (Fig. 26).

The earliest record of pale-seeded amaranth is from Tehuacan, in the state of Puebla, Mexico. Amaranthus cruentus appeared about 4000 B. C. and A. hypochondriacus in about 500 A. D. (Sauer 1969). The first records of A. caudatus with pale seeds are from 2000 year old tombs from Pampa Grande in the state of Salta, in northwestern Argentina (Hunziker and Planchuelo 1971). By the 14th century A. hypochondriacus was cultivated by Arizona cliff dwellers (Bohrer 1962). This has led to the theory that the grain amaranths were

**Fig. 26. Illustration from the Codice Mendocino showing
guatli as an offering.**

developed in the southwest United States first and then spread to Asia from the Europeans (Sauer 1967, Early 1992).

How and when the grain amaranths arrived in the Old World remains a mystery in my mind and the minds of others. According to Linnaeus, species had been introduced before 1700, possibly from Ceylon (now Sri Lanka). Abyssinians parched seeds and ate them for complaints in the stomach and breast under the name Tsellal Enno Mariamm (parasol of the Virgin Mary) as early as 1815 (Sauer 1967). What seems to me to be the problem with Sauer's works (1950, 1967) is that he seems to overlook all older specimens because of their dark seeds. He makes what I consider a very wrong assumption, if the seeds are black the plant was not used as a grain. On the contrary, many peoples have used the black seeded amaranths for grain even in the New World.

Cole (1979) says, "as I ruminate on the common characteristics assigned the amaranth by the places in this world that were the seats of those ancient cultures - Peru, Mexico, China, India and Africa - I am convinced that there was communication and visitation. For me, the presence of common metaphysical qualities assigned a

plant in places tens of thousands of miles apart is a more convincing argument than the similarities of pyramidal construction or the presence of definite Chinese influences on certain pre-Mayan artifacts."

Cole goes on to say, "given some of the ancient artifacts now being unearthed from the very ruins of Tenochtitlan which Cortez ordered buried beyond recovery, there can be solid cases argued for the truth of the hypothesis that pre-Aztec cultures had calculated the circumference of the earth, that they had long known the planet was round, that they had laid out longitudes and latitudes, and accurately plotted the movements of the sun, moon, and stars across the heavens - knowledge which would have given them every logical reason for attempting the globe's circumnavigation. There is even, in some of the more theoretical interpretations of the artifacts, the basis for believing that there was intercontinental communication of a kind, millennia before Cortez thought he had "discovered" a primitive society in the place he called "New Spain".

According to Cole (1979) we are told by taxonomists that there were five parts of the planet that were the centers of diversity for cultivated plants.

These include Central America and northern South America on the Pacific coast, south-central Europe, central Africa just north of the equator, southern India, and central China. Cole goes on to say, "is it any coincidence that each of these locations turns up whenever researchers begin to trace the amaranth's trail back through the centuries? I don't believe coincidence can explain it; nor do I dismiss the incredibly consistent commonality of the ancient amaranth's metaphysical overtones - a character trait unlike those of any other grain."

Cole goes on further to say that he is not aware of any other foodstuff that is known by its metaphysical as well as its physical dimensions around the world in cultures as diverse as the Hopi Indians and the Szechuan Chinese.

Cole also discusses the archaeological and ethnobotanical evidence to help explain the cultural contacts across the Pacific in pre-Columbian times. He discusses the diffusionists, who feel that there is strong evidence for the early spread of high culture from southeastern Asia across the Pacific to the New World. The inventionists on the other hand feel that there has

been no more than sporadic contact and the cultures of the New World are matters of independent invention.

As Cole discusses (1979) people from the Old World seem to believe the diffusionist's point of view and people from the New World seem to accept the inventionist's point of view. I found the same bias. When discussing the possible origins of grain amaranth use with someone from the Old World, (Dr. G. T. Prance) he seemed quite willing to accept my theory that seeds might have been brought to the New World from Indians of the Old World. In contrast, Dr. Early who is from the New World, disregarded such a notion when I presented it and maintained that the grain amaranths use began in the New World.

The use of amaranth as a grain in Asia remains a mystery and I will suggest another hypothesis to the ones put forth. Although there is no proof that any of the presently used grain species were in the Old World before Columbus (Sauer 1967) this does not preclude the fact that other species were used as grain before Columbus in the Old World. I believe that amaranths were used throughout the world from the beginning of agriculture. As amaranth is a weedy plant and can grow in some of the

most limiting conditions, i.e. heat, dryness and high altitudes, it became established quickly near homes and fields. Uses for it were soon established. In Asia, amaranth has been associated as a vegetable, a grain, a ritual or spiritual plant but I do believe that these ancient plants were black seeded. If Cole (1979) is correct, pre-Columbian communication could have introduced black seeded amaranths to the New World with these spiritual characteristics as well as other uses. From these black seeded amaranth progenitors arose pale-seeded varieties in the the southwestern U.S. and central Mexico. These cultures further developed and domesticated the grain amaranths of the New World as we know them today. When and whether these pale-seeded varieties were reintroduced to Asia I do not know, but it certainly does not make sense to me that the Europeans that were disgusted by the rituals of the Aztecs would bring these seeds back and that they would introduce some of the ritual related customs associated with the grain amaranths into Asia. I feel as Cole does; it is no coincidence that amaranth has such similarities in regard to its metaphysical and spiritual features across the globe. If the uses were the only similarities, I could believe that amaranth was developed as an important plant in these areas independently around the world. The fact

that Pliny wrote of amaranth in the Greco-Roman culture, and that it means immortal or unwithering or seed of god in several languages is no coincidence. In ancient Greece, amaranth was sacred to Ephesian Artemis and was supposed to have special healing properties. It was a symbol of immortality and was used to decorate images of gods and tombs (Grieve 1931). It was eaten both in India and Mexico when other foods were prohibited.

I also feel that it seems unlikely that amaranth could have reached the remote hill tribes of Asia, where it has been found used as a grain, from European introduction as an ornamental. If so, why do we have no records of these visits and what these people did eat.

Only a much more detailed study will help us to solve the many puzzling origins of the grain amaranths. A much greater look into ancient Chinese herbals as well as Sanskrit writings must be done. The study of these works has been neglected by western scientists, no doubt because of language difficulties and the lack of access to China in previous years. As we continue to do ethnobotanical studies in Asia (for example Early in Nepal, 1991) we may uncover a wealth of information. Clearly, more interdisciplinary studies need to be done

using the expertise of the archaeologist, anthropologist, ethnobotanist and taxonomist if we are to unravel this mystery.

SAN MIGUEL DEL MILAGRO

San Miguel del Milagro is a village located in the state of Tlaxcala in the municipality of Nativitas. As noted in the introduction, I chose to focus on this particular village because it provided a unique situation in its intensive association with, and therefore dependence upon amaranth. Nearly all the people of the village seemed to be involved in some way with amaranth. I know of no other village in Mexico or anywhere else where so many people are involved in some way with the production of amaranth. San Miguel del Milagro is located about 80 miles from the capital of Mexico, Mexico City. The village is most noted for its church (Fig. 27) and the nearby archaeological ruins of Cacaxtla. The majority of the inhabitants' houses are located on the hilltop with the streets running up and down on an almost straight incline from the central plaza. The main road (Circuito Perimetral) is paved, but all other streets are made of dirt or cobblestone (Fig. 28 & 29). The village provides a panoramic view of the surrounding countryside (Fig. 31) and on a clear day one can see the volcanoes of La Malinche, Iztaccihuatl and Popocatepetl (Fig. 30).

Fig. 27. Church in the village of San Miguel del Milagro, Tlaxcala, Mexico.

Fig. 28 & 29. Views of the cobblestone streets of San Miguel del Milagro.

Fig. 30. View of an amaranth field in San Miguel del Milagro and the volcanoes of Iztaccihuatl (right) and Popocatepet (left) beyond.

Fig. 31. Panoramic view of the surrounding countryside from San Miguel del Milagro.

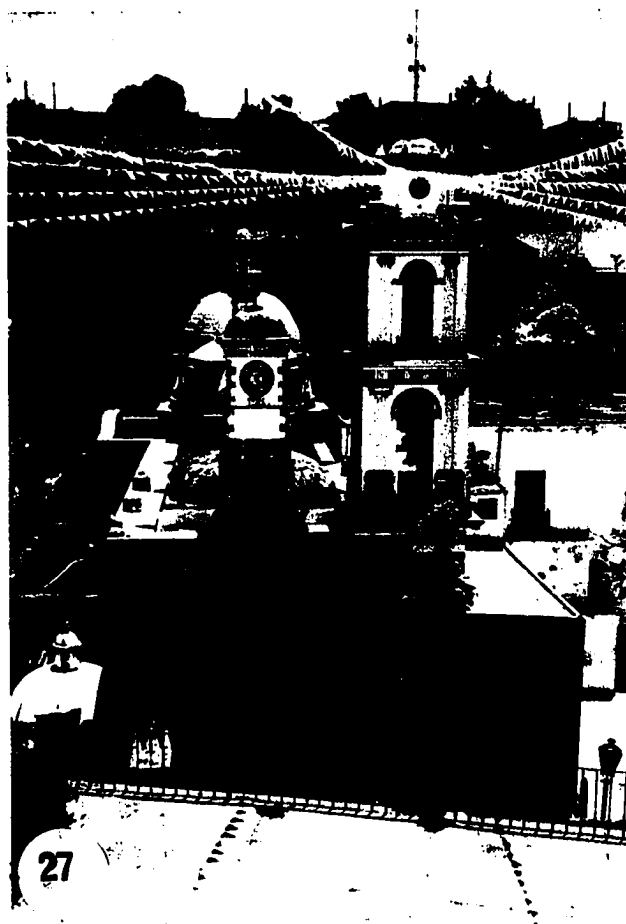
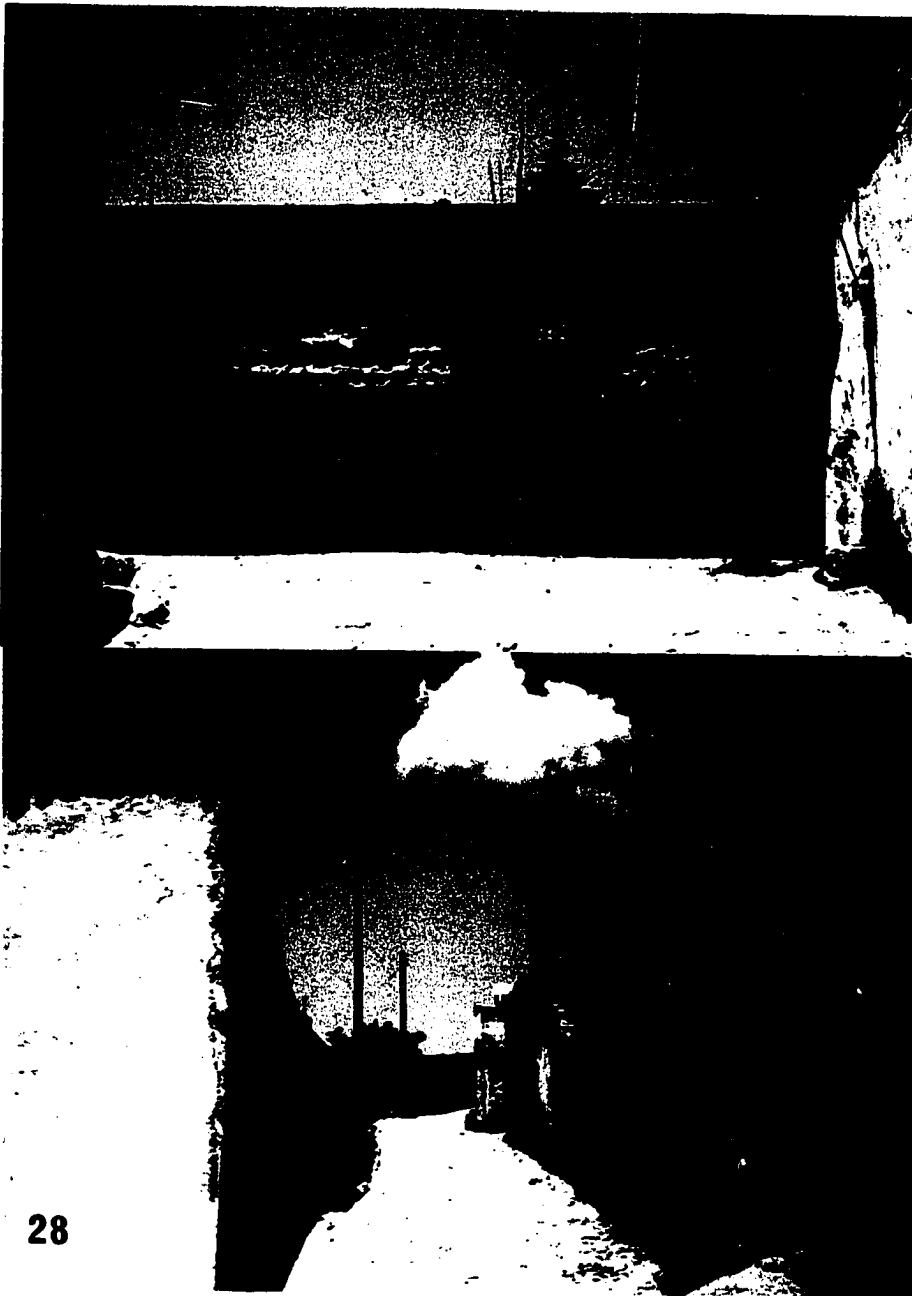


Fig. 27



28

Fig. 28

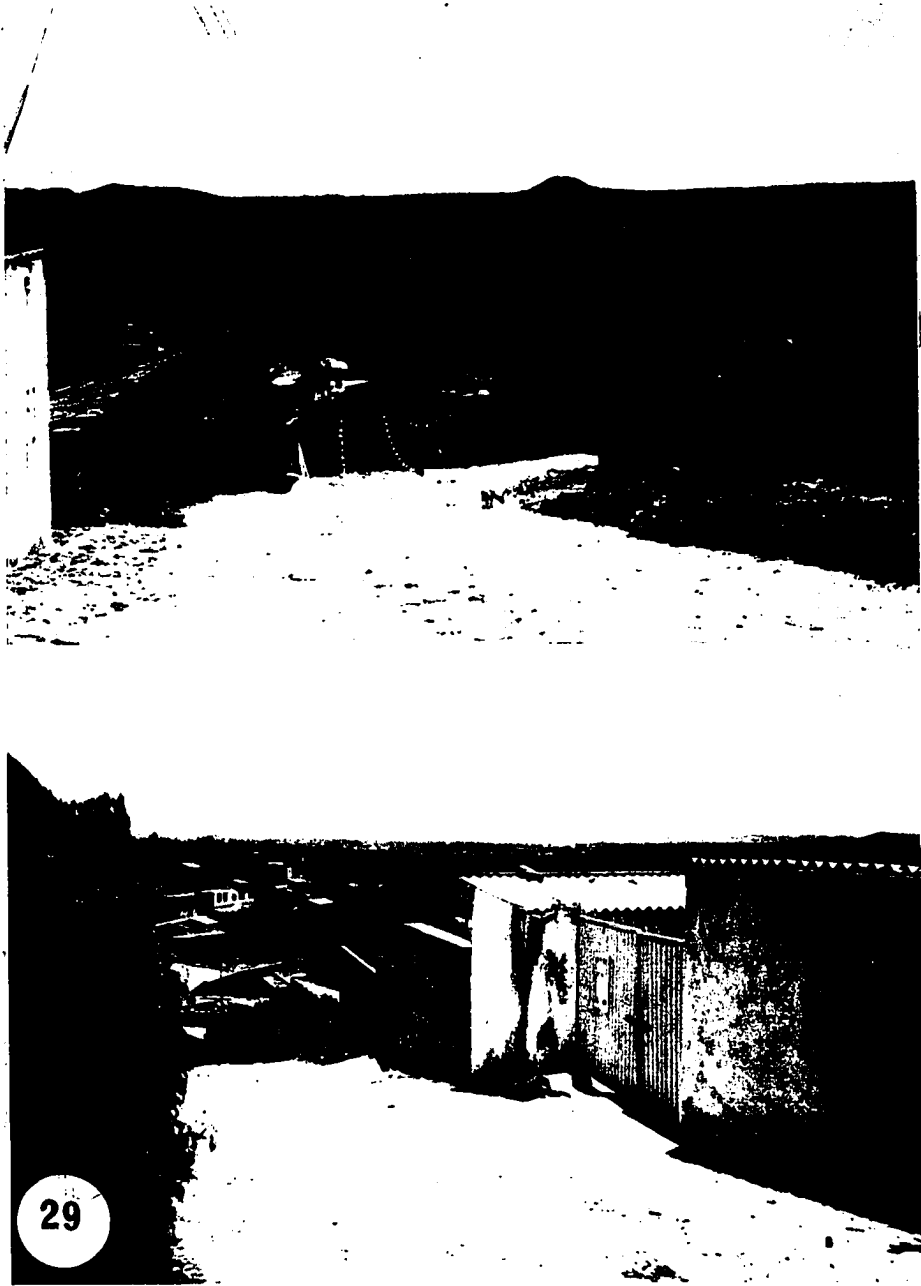


Fig. 29



Figs. 30 and 31

According to INEGI (1990), San Miguel del Milagro has a total population of 908 people, including 443 women and 442 men. Of the total population, 248 people are considered economically active. There are 172 households with an average of 5 people per household.

The village is located in the state of Tlaxcala, which has a total population of 763,683 people (376,242 males, 387,441 females). It lies in the municipality of Nativitas (Population 21,465: 10,530 men and 10,935 females). Geographically it is situated at a latitude of 19°14'05" N and longitude of 98°20'00" W. The altitude of the village of San Miguel del Milagro ranges from about 2260 - 2340 m above sea level. It has an annual average temperature of 12-18°C (Gómez 1986), 16°C (Reyna 1986), and is considered to have a semi-arid climate. Annual total precipitation is between 600mm (Gómez 1986) and 800mm (Reyna 1986). Gómez makes the following observations about soils and other conditions around San Miguel del Milagro. Occasionally crops are affected by frost. The soils are sandy, and a little stoney. The farmed areas are generally in non-sloping areas, in good condition and at times are somewhat terraced to conserve soils. The soil pH is about neutral and has little organic matter. The native vegetation in

the area includes: Opuntia streptacantha, known as nopal in Mexico, O. spp., Agave spp., known as maguey in Mexico, Schinus molle (pirules) and Prosopis spp. (mezquites). San Miguel del Milagro is located in the valley Northwest of the volcano La Malinche. It is north of the city of Tlaxcala, the capital of the state (Fig. 32). On an adjacent hill to San Miguel del Milagro is located Cacaxtla, an archeological site of great importance (Fig. 33). The site of Cacaxtla is really on a low area between two broad, gentle hills that rise from the Puebla valley (Stuart 1992). The hill west of Cacaxtla is named Xochitecatl and on the opposite hill is the town of San Miguel del Milagro. The entrance to the Cacaxtla ruins is in fact in the town of San Miguel del Milagro and is marked by a conspicuous monolith (Fig. 33 & 34).

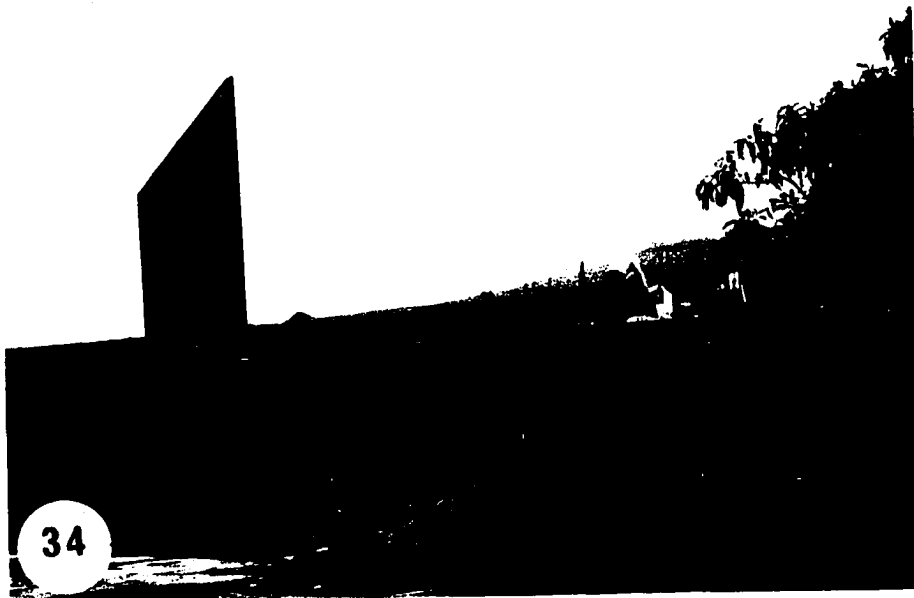
San Miguel del Milagro is considered the site most visited in all of the state of Tlaxcala (2-4,000,000 people per year). This figure seems to me exaggerated, but I have not been there during the festival beginning September 29, and this is the time of year when most people visit San Miguel del Milagro. It has been cited as the village most visited for the past 300 years (Santamaria 1990). The village is also noted for its

Fig. 32. View of the city of Tlaxcala, capital of the state, Tlaxcala.

Fig. 33. Entrance to Cacaxtla with stands selling food and souvenirs.

Fig. 34. Conspicuous monolith marking entrance to Cacaxtla in San Miguel del Milagro.





Figs. 33 and 34

church, for its fields of amaranth and as a center of alegria making. It has been said that the alegrías made here are the most delicious because the crop is grown in the "yellow soil of the mountains" (Santamaria 1990). Starting on September 29th, the town has a special festival to celebrate the archangel, San Miguel and people are said to come from all over Mexico. The square is covered in cars, vans, caravans, buses and bicycles and people everywhere. Pilgrimages which have begun from many places end at the church in the plaza in San Miguel del Milagro.

The people of San Miguel del Milagro can be considered for the most part Mestizos. There are a mixture of people of both Indian and Spanish blood. They may have descended from either Aztec or Mayan origins or Olmecan-Xicalancas (Nahua, Mixtec and Chocho-Popoloca) and this will be discussed under the section on Cacaxtla. Many of the people are campesinos (farmers) making their livelihood from growing amaranth, maize (corn), beans, tomate verde (Physalis), etc. or making alegrías. The town has a kindergarten, a primary school, a municipal building with the mayor's office, the church and the archaeological site of Cacaxtla. Cacaxtla gives us insights into the past of this area. This important

archaeological site will be discussed later. Many of the houses in the village have electricity, television, radio, gas ovens, etc. Some of the people travel to Mexico City on a rather regular basis and a great number of individuals either have relatives working illegally in the United States or they themselves have worked in the U.S. at some point and then returned with the money back to San Miguel del Milagro. Popular states for working included California, Texas, New York, Connecticut and New Jersey. The village has a Mayor that changes every three years. Most of the people grow their own food. San Miguel del Milagro represents a rural Mexican village. Although it is not far from Mexico City (about 80 miles or a 2½ hour drive), the capital city Tlaxcala (about 18 miles or a 35 minute drive) and Puebla (about 30 miles or 1 hours drive), it does not have the wealth, cosmopolitan atmosphere nor the sophistication of Mexico City or even the nearest largest city, the state capital of Tlaxcala. It is a village basically of rural farmers. There are no hotels, restaurants etc. in the village, even though Cacaxtla is a tourist site for Mexicans as well as others. There is, however, a small restaurant in Cacaxtla itself. Also a restaurant has been built in the village, but has not yet opened. In the six years that I have been working in San Miguel del Milagro a series of

new roads have been built and many new houses have been constructed.

There is a market once a week in the plaza near the church and people sell all kinds of food and there is often music for entertainment (Fig. 35). People come for the day from many local villages. Women from the neighboring San Martin (Fig. 36) as well as others (Fig. 37) can be seen selling their alegrías in the plaza. Some of the people who live in San Miguel del Milagro also sell their alegrías here (Fig, 38) and they all seem to be successful.

The people of San Miguel del Milagro seem to get along well with each other for the most part. There is a notable system of community and cooperation that can be seen in the village. All the men are responsible for doing fifteen days of community service in the village per year. This ranges from clearing areas to building roads etc. No matter what the status of the person or their occupation, they are required for these hours equally. The system works on the honor system and it really does seem to work. Besides actual time spent, each family is required to donate money for projects to benefit the community. Exactly how much money and how

Fig. 35. View of the plaza during market day, from a distance (above) and close up (below).

Fig. 36. Women from San Martin can be seen selling alegrías during market day in San Miguel del Milagro.

Fig. 37. People and alegría products from other areas being sold during market day in San Miguel del Milagro.

Fig. 38. Local residents of San Miguel del Milagro selling alegría products.



Fig. 35



Fig. 36

36



Fig. 37



Fig. 38

this is determined I do not know. During my time in San Miguel del Milagro I witnessed a team of men clearing an area above the plaza and preparing a new road (Fig. 39). Many of the inhabitants of the village are related to each other (as can be witnessed by the preponderance of families with the last name Benites).

Origins of San Miguel del Milagro

The following is an account of the origins of San Miguel del Milagro and was taken from INAH 1990. San Miguel del Milagro can be said to have officially come into being on October 31, 1631. The establishment of San Miguel del Milagro is based on a story of an Indian boy about 16 or 17 years old, named Diego Lazaro de San Francisco. The story says that Diego Lazaro joined a procession from his parish of San Bernabe around April 25, 1631. Sometime during this event, a shining winged youth appeared in a private vision to Diego. The vision revealed himself as the archangel, San Miguel. The archangel said that it was his will and the will of God that Diego should tell his neighbors in the village that in a cave amongst the hills, in front of this place, there is a spring of miracle water for all the sick which lies beneath a large rock. The angel told Diego not to doubt what he had told him, neither to delay in carrying

Fig. 39. Group of men in San Miguel del Milagro working on a new road as part of their community service.



Fig. 39

out what he had been told to do. Diego told only the Franciscan fathers of Nativitas. Around May 7 or 8, 1631, the archangel reappeared to Diego Lazaro when he was very sick, curing him and bringing him to the cave where the water was. Again he told him to tell everyone. This time Diego told only friar Hernando Garcia Rendon, the guardian of the convent of Nativitas. Rendon related this to the Governor of the Indians, Gregorio Nacianceno. It was established that the spring was already known and was called Tzopiloatl. This word actually meant "water of the buzzards". Worried, because he had not been believed, Diego with his wife and parents returned to the spring which was further up from the dale of Zopilotl. Some months later, during the religious festival of San Diego de Alcala, on November 13, Diego got very sick again and the archangel appeared to him again, asking him why he had not done what he had been told. The angel chastized him and told him once again to go and tell everyone as he had been ordered. He told him that he could punish him for his disobedience. Diego still did not tell everyone in his village but he told the bishop of Puebla, don Gutierre Benardo de Quiroz. The bishop gave the water he had been brought as proof to the sick people in his house and a hospital. After drinking the water these people were cured. This caused amazement and

various people from Puebla and Tlaxcala visited the ravine of the miracle to drink water from the spring.

Various official investigations relating to the events outlined above were carried out in 1632, 1643, 1644 and 1675. These involved the testimonies of Spanish as well as native witnesses, including the 80 year old grandmother of Diego Lazaro. The outcome of all this was that the interest of the influential bishop, Bernardo de Quiroz, convinced the viceroy, Rodrigo Pacheco, Marquis of Cerralvo, to recognize the miracle cures of the pilgrims and the sick. Pacheco made a decree to officially establish a sanctuary. This decree was dated as of October 31, 1631, and can be recognized as the document which allowed native people to settle near the sanctuary. This was the origin of the town of San Miguel del Milagro (INAH 1990).

San Miguel del Milagro is still the site of an annual pilgrimage to the church. This stems from the story of the archangel of San Miguel. People make the pilgrimage to San Miguel del Milagro each year in September from all of Mexico. The annual festival of San Miguel del Milagro begins in September and lasts for several weeks.

CACAXTLA

An important prehispanic site named Cacaxtla adjoins the village. According to Diego Muñoz Camargo, who is a Tlaxcaltecan historian, Cacaxtla was constructed by the Olmecan-Xicalancas. This group is made up of three ethnic strains. They are Nahuatl, Mixtec and Chocho-Popoloca. They were thought to have come from Xicalanco, which is located in the current state of Campeche, in the gulf coast region (INAH 1990). Archaeological evidence shows that Cacaxtla was occupied for a long time, reached its peak between 650 - 900 A.D. and was abandoned by 1000 A.D. Its rise took place during the same time as the decline of Teotihuacan and during the period, according to Mexican archaeologist, Angel García Cook, when "... the whole land, from the highlands beyond Cacaxtla all the way to Maya country, was in social and economic turmoil" (Stuart 1992).

It is thought that Cacaxtla was the capital of the Olmecan-Xicalancas. The Olmecan-Xicalancas occupied the southwest corner of Tlaxcala and most of the Puebla Valley during this period.

The Cacaxtla site is located at the top of a hill

and provided enhanced cultural contacts with other regions of Meso-America (INAH 1990) (Fig. 40). To protect itself from attack, it was fortified by walling and moating and the natural ravines in the area. Despite this, by 1000 A.D. the site was unoccupied.

The name Cacaxtla is an old name from the Atztec (Nahua) language and means "the place of the cacaxtli, or merchant's backpack". The hill immediately west of Cacaxtla is named Xochitécatl, after a woman who was sacrificed to the mountain gods (Stuart 1992). It is thought that armed warrior merchants, who carried backpacks, left Cacaxtla with obsidian, textiles and pumice and returned with cacao, quetzal feathers and prisoners (Stuart 1992). It is even possible that amaranth was one of the things that were traded.

Cacaxtla occupies an area the size of four football fields and rises more than 80 feet (Stuart 1992) (Fig. 40). Cacaxtla was not really known until 1975 when local people tunneled into the mound in hope of finding treasure. A huge mural was found showing a bird man, plumed and painted black. This painting is considered one of the most recently painted and has been dated at around 790 A. D. (Stuart 1992) (Fig 41).

**Fig. 40. Views of the archaeological site, Cacaxtla.
Aluminum roof has been erected to protect the site
by the state of Tlaxcala.**

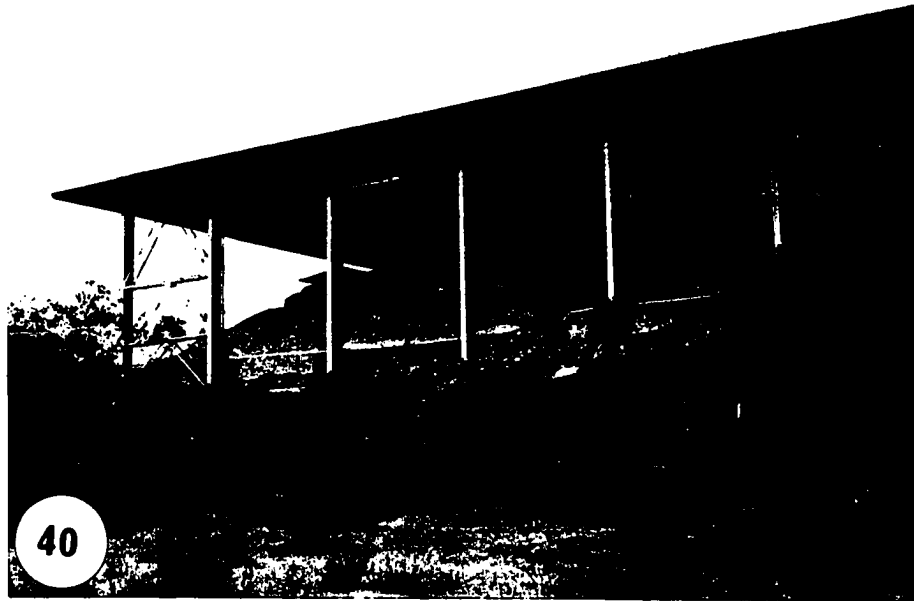
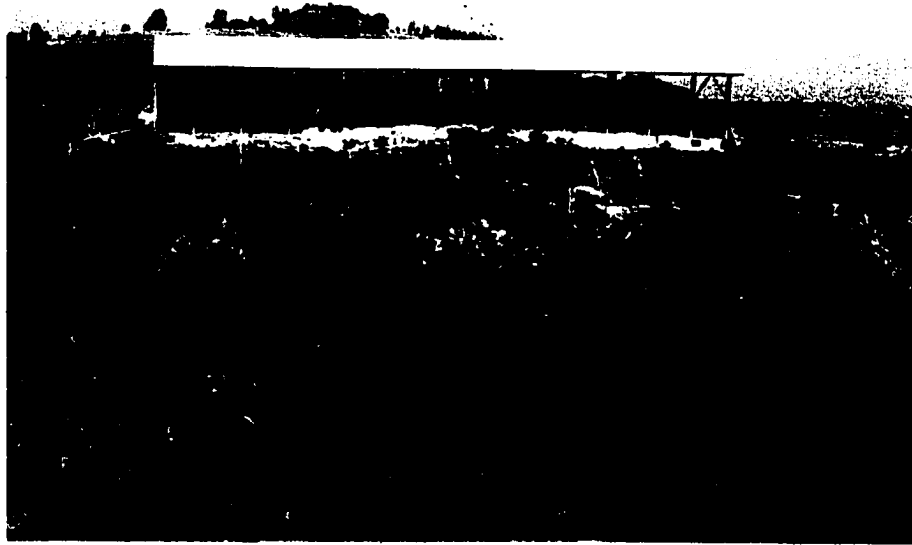


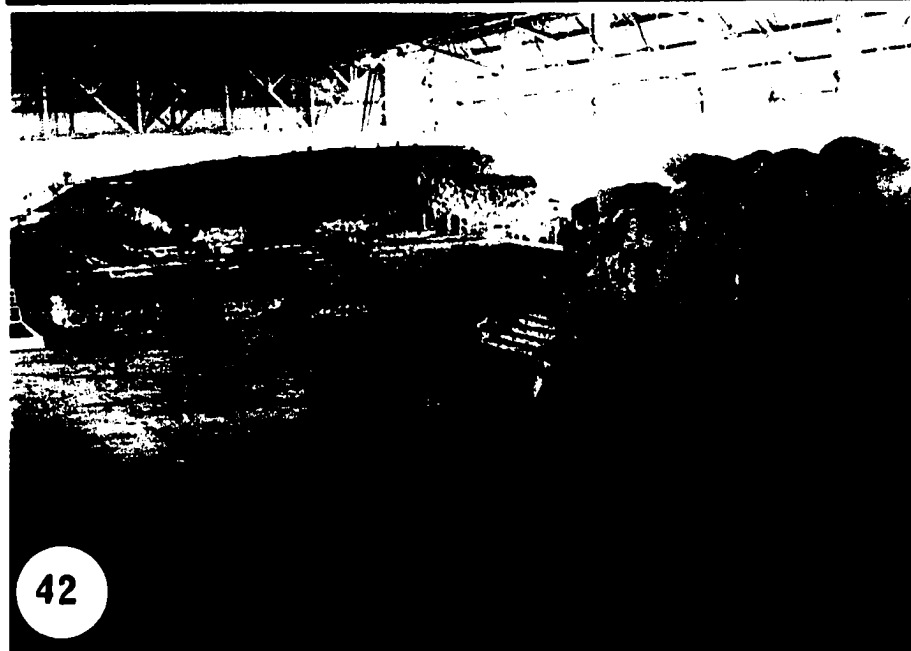
Fig. 40

Experts have found at least eight stages of construction at Cacaxtla. This suggests the possible changes in rulers. Each stage contains its own pattern of adobe buildings. The huge mound is referred to as the Gran Basamento and served as a combination palace and administration center for nobility (Stuart 1992)(Fig. 42).

Since 1975 much study has been done in Cacaxtla. Carlson, an archaeoastronomer, suggests that the paintings are full of Venus symbols. These symbols suggest that wars were regulated by the appearances of Venus (Stuart 1992). Baird, according to Stuart, says that the scenes do not represent a battle but represent the aftermath of traditional sacrificial victims. Blood is seen throughout the murals and it was believed to have held the soul together and was a symbol of water. The remains of burned, dismembered children have been found and add support to the theory that humans were offered in sacrifice at Cacaxtla (Stuart 1992). The colors of the murals have also been analyzed. They were made from colored powders of both minerals and juices of plants. There is no indication that amaranth dye was used here. The blues, reds and yellows provide a most incredible sight as one walks around the ruins. Conservators have

**Fig. 41. One of the most recent painting in Cacaxtla. A
bird man, plumed and painted black.**

Fig. 42. The Gran Basamento at Cacaxtla.



Figs. 41 and 42

of course, repainted many of the murals the same colors that were originally used. Cacaxtla has been described as having the best preserved Mesoamerican paintings yet uncovered (Stuart 1992).

As one visits Cacaxtla, the areas are described with signs in each area. Along the base of the acropolis there is a sign that shows where the cuexcomates once stood. These are circular storage containers for crops that are still used today. According to the signs at Cacaxtla these containers held maize, beans and amaranth. This would, if it is true, date the grain amaranths in this area to the time of 650 - 1000 A.D. The murals depict ears of corn as human heads and cacao plants but nothing that has been thought to be an amaranth plant. I looked carefully myself for something vaguely reminiscent of amaranth but did not find anything. The use of the cuexcomates is really the only evidence that we have that these people grew amaranth.

Murals in Cacaxtla give details of the costumes, hieroglyphs, gods, animals and plants during this period (Stuart 1992). The paintings resemble Mayan paintings but the hieroglyphs point to other Mesoamerican influences (Stuart 1992). To many this site provides

great insight into Mesoamerican cultures not seen previously.

The importance of Cacaxtla to the Mexican people is evident as one approaches the area. A gigantic aluminum roof has been erected by the state of Tlaxcala to protect the ruins (Fig. 40). The main road of San Miguel del Milagro (Circuito Perimetral, see map of the village, Fig. 46) is marked with a monolith (Fig. 34). This marks the entrance to the ruins and can be seen for miles. Across from the entrance, is a parking lot that can accommodate many cars, vans, and buses of tourists. A restaurant and a series of shops have been built inside the entrance of Cacaxtla. This includes a book store, run by the government, an area where tee-shirts and posters can be purchased (also run by the government) and several food concessions (soda, candy, ice cream can be bought). Many of the custodians and watchmen for Cacaxtla are people that live in San Miguel del Milagro. Several people from San Miguel del Milagro and neighboring communities set up temporary souvenir tables and hot food like tortillas just outside the entrance and sell things during the hours that Cacaxtla is open (Fig. 33). In fact, in August 1992 I was able to see an article from September's 1992 National Geographic being

sold just outside Cacaxtla before its actual release date! Young children from San Miguel del Milagro can be found trying to sell packets of alegrías to any visitor on their way into the ruins. Inside the entrance to Cacaxtla, amaranth products can be found in the concessions. Individual packets of alegrías are sold for 500 pesos, as well as packets of 10 (6000 pesos), cereal (6000 pesos) and alegrías made with sunflower seeds, raisins, peanuts etc. (8000 pesos) (Fig. 43). These are all nicely packaged and come from the Amarantell factory.

Cacaxtla is an important site for the economy of San Miguel del Milagro. Some of the men in the community of San Miguel del Milagro work either part-time or full-time in Cacaxtla. Although many Mexicans and some international visitors do come to Cacaxtla, there is a small amount of visitors in comparison to other archaeological sites in Mexico. After the release of the article by Stuart (National Geographic 1992), the village may see an increase in visitors.

Fig. 43. Products from AmaranTell sold at Cacaxtla.

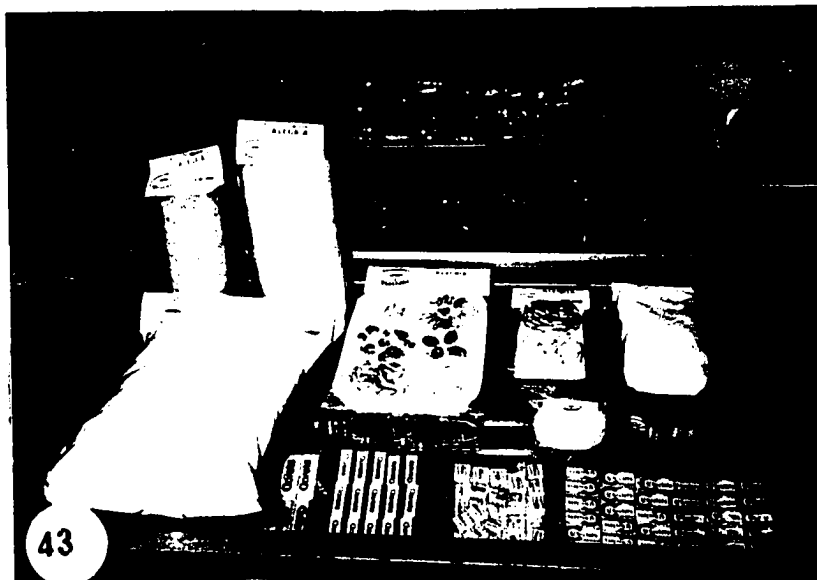


Fig. 43

METHODS

I made 4 visits to San Miguel del Milagro. These were in the summer of 1986, August and November of 1988 and August 1992. The people of San Miguel del Milagro were extremely friendly and helpful during all of these visits. They were patient and helpful and made me feel like a member of the community. This made my work much easier and enjoyable. As this study is based on many informants' information it was very important to feel that the informants were willing to help and did not make up information (Fig. 44a, 44b, 44c). This is always a problem in any ethnobotanical study. Early (1992) states in the beginning of his work, he had a hard time getting information on amaranth use in Peru. When he began to talk about the virtues of kiwicha he found a lot more people that opened up to him.

I tried not to show any bias toward the benefits or disadvantages of amaranth. It was my hope that this would ensure more accuracy and that in this way I would really hear each individual's own thoughts as I talked to the people.

Fig. 44a, 44b, 44c. Informants of San Miguel del Milagro.



44
Fig. 44a



Fig. 44b



Fig. 44c

On my first visit in 1986, I was accompanied by Ing. Eduardo Espitia Rangel, who was known to many of the farmers and this helped in "breaking the ice". When I returned for my second visit, two years had passed. The people remembered me and it took a few days for the people to forgive me for not writing them in between! This reaction to me, allowed me to continue where I had left off and many of my previous informants helped me to meet others and to bring me up to date. I found that my informants were reliable for the most part. In cases that I doubted what I was being told as being the truth, I checked it out with others or noted it in my notes. For example, one informant first told me that they didn't do anything with amaranth and then I saw them cleaning seeds on the roof of their house (Fig. 45). I later found out that the owner was part of the Amarantlax co-op. There were certain people that were afraid to provide me with information and I sensed that they thought that the information would be passed on to the Mexican "IRS" or government. For the most part, people did help out but I always explained that the information was for a doctoral dissertation and only for "science" and would not be going anywhere else. At first, I had hoped to document how much each household actually made in pesos from amaranth, but I decided that this

Fig. 45. People cleaning seeds of amaranth before popping on a roof top in San miguel del Milagro.

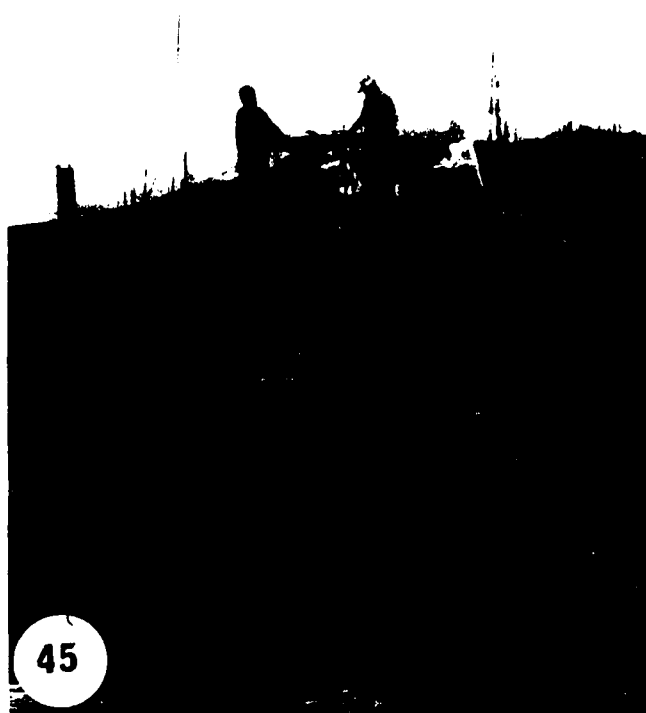


Fig. 45

information would not be easily given to a foreigner and that other less threatening questions were more valuable. Without actually asking how much money each person made, I was able to get information that told me how important amaranth was to the livelihood of the household.

In the beginning of my study mapped out the entire village. The map was made by measuring streets with a tape measure and as well as by pacing and using the kilometer gauge of a car (Fig. 46). Since there were no names posted for any streets I asked people in the village for the names, adding these to the map (Fig.47). Buildings were then carefully entered on the resulting map (Fig. 48). Buildings that were occupied were numbered on the map, while empty buildings (either abandoned or not yet inhabited), were marked on the map but not assigned numbers (Fig. 49). The map, with all the streets and numbered homes entered (Fig. 49), allowed me to systematically survey all the households possible and collect the data in an organized fashion. Without this it would have been impossible to know which houses had been surveyed, or even if some buildings were left out by mistake etc. Once the survey began, the data from each numbered house could be catalogued under that number. It is also for this reason that certain numbers

Fig. 46. Map of streets of San Miguel del Milagro to scale.

Fig. 47. Map of the town of San Miguel dle Milagro with street names.

Fig. 48. Map of streets and buildings, San Miguel del Milagro.

Fig. 49. Map of the streets and buildings numbered, San Miguel del Milagro.

Fig. 46

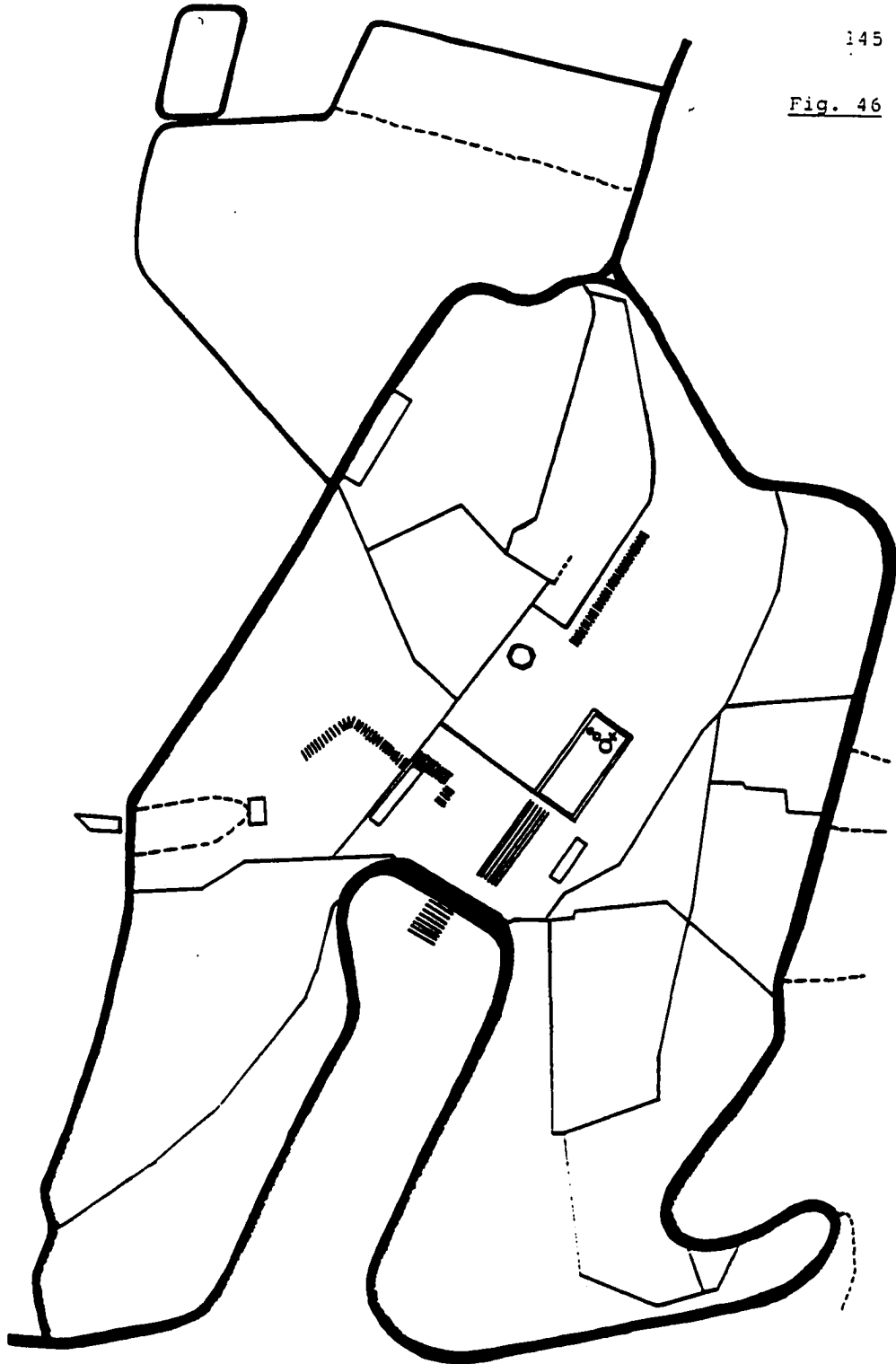


Fig. 47

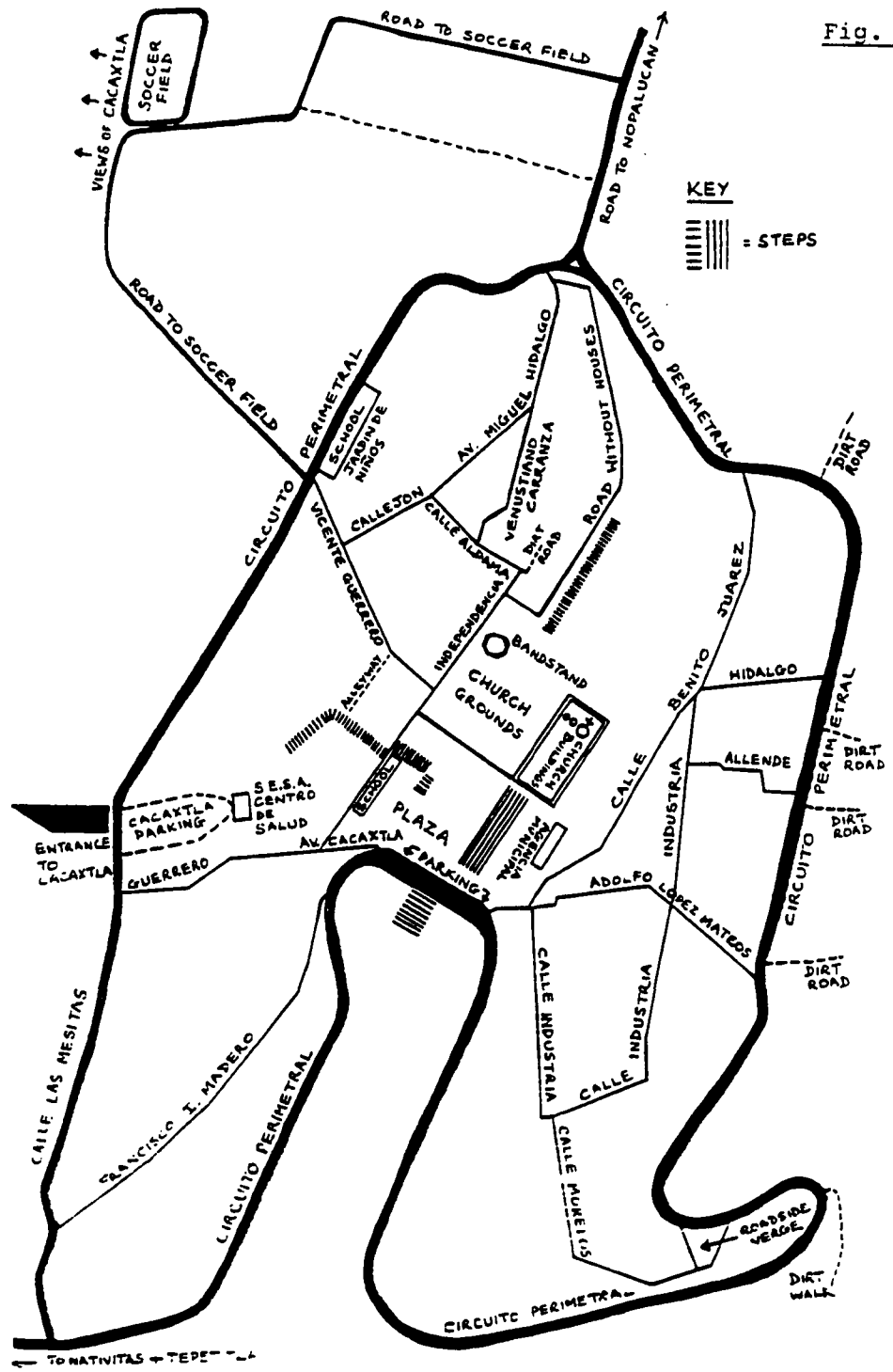
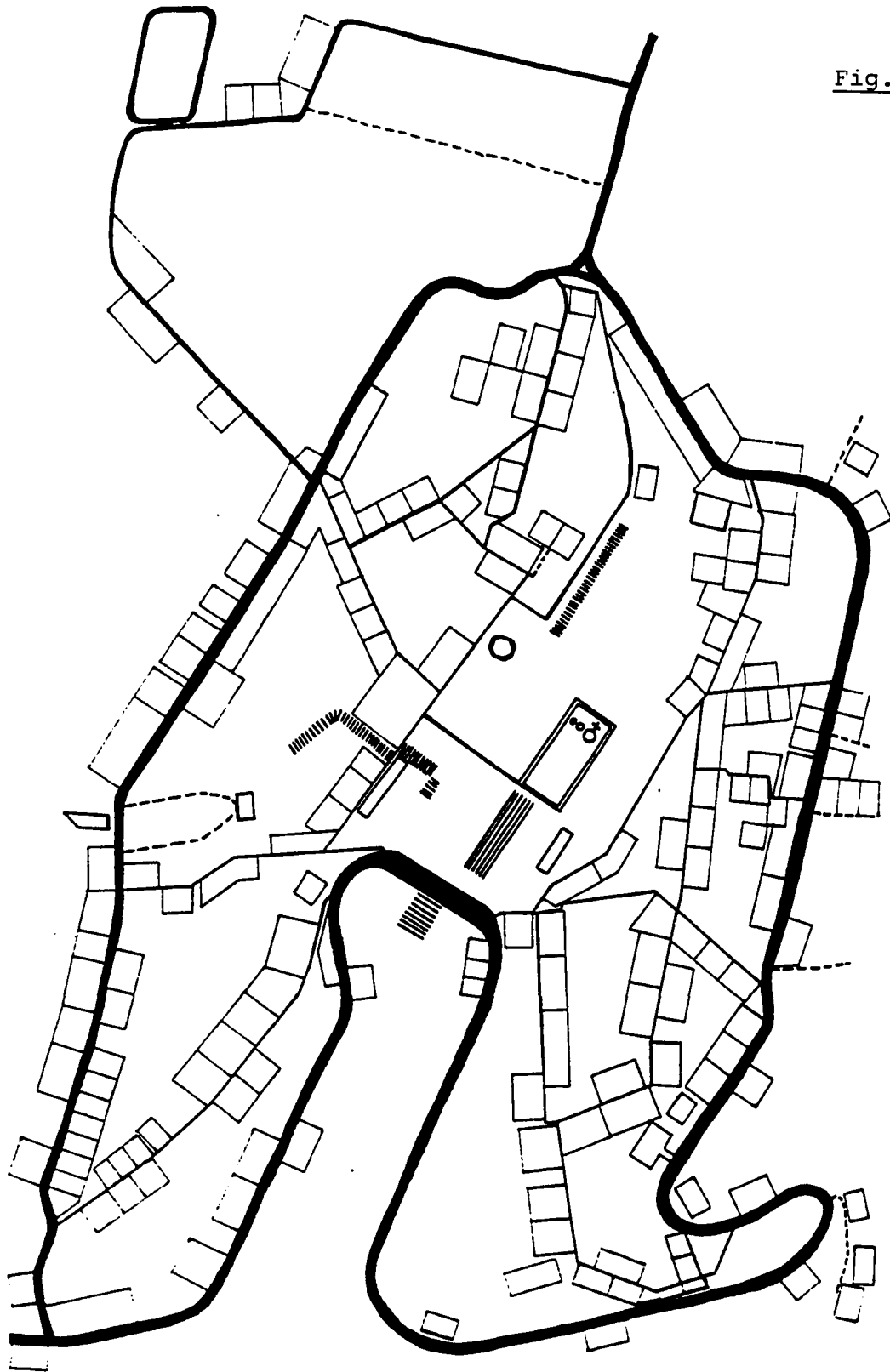


Fig. 48



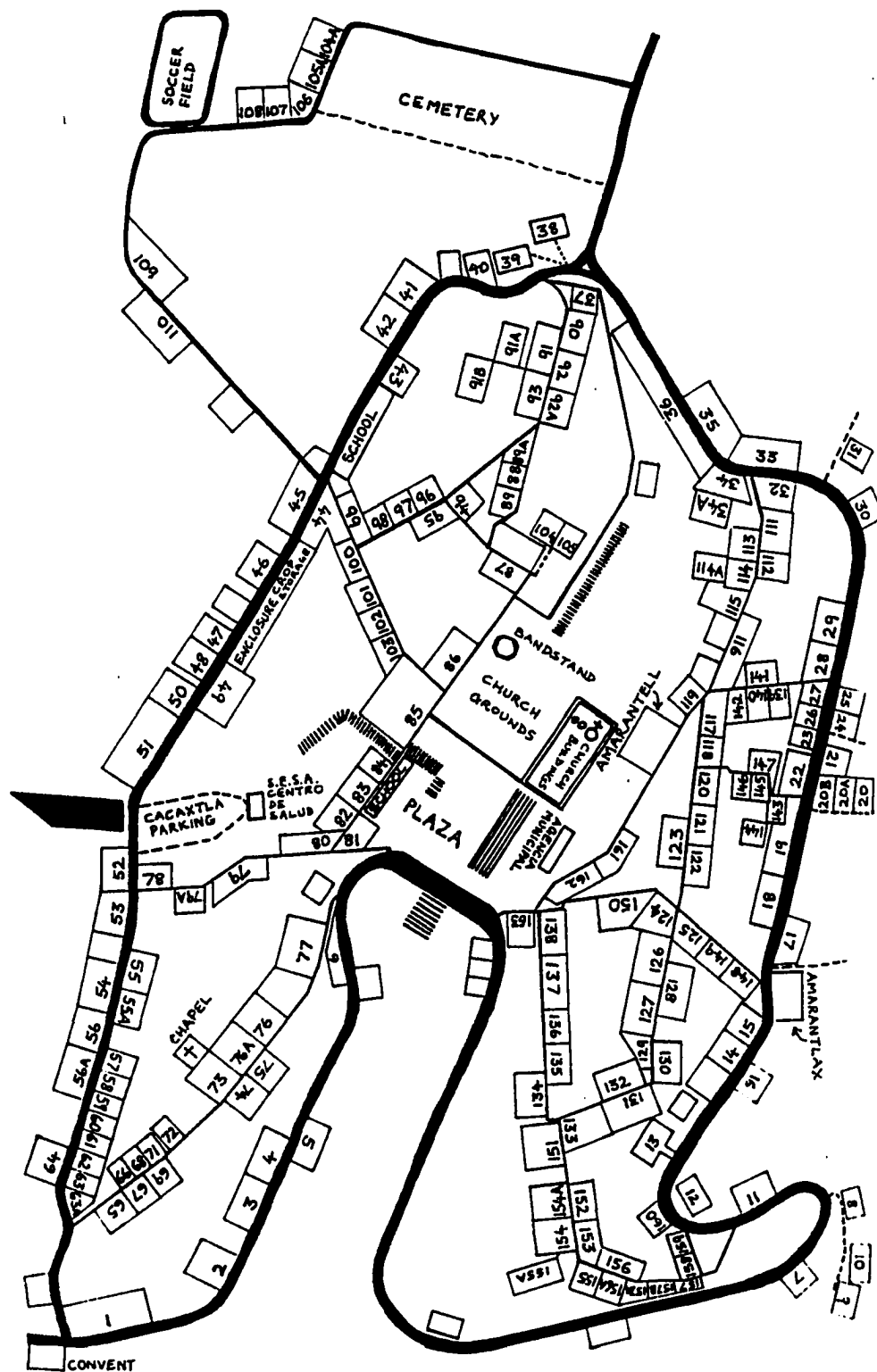


Fig. 49

had to be merged into one domicile, since when surveying the occupants of those numbers, it was established that what appeared to be 2 households from the look of the buildings, was in fact one larger household (for example, houses 69 and 70 were one residence). In some instances these houses would be next to each other, or one in the yard of the other, while on two other occasions, two houses or buildings belonged to the same household when they in fact had an outlet into two different streets, the one behind the other. This was the case with houses No. 2 (= 65) and No. 61 (= 72). In a few other cases, buildings thought to be part of one household, or obscured in the back of a walled building on the street, were found to be 2 distinct households. This led to the use of the letters a or b to distinguish these 'extra' households after the survey of those households was completed (for example, Houses No. 34a and 91b).

The photographs (Fig. 50, 51, 52) give you a feeling of what the village is like. Many of the streets, for example, are extremely inclined. Strangely enough, while making the map, a few men started painting the names of some of the streets on the houses (Fig. 53). After explaining what I was doing, they were happy to have a copy of the village map when it was complete and

**Fig. 50, 51, 52. Views of the domiciles and streets in
San Miguel del Milagro.**

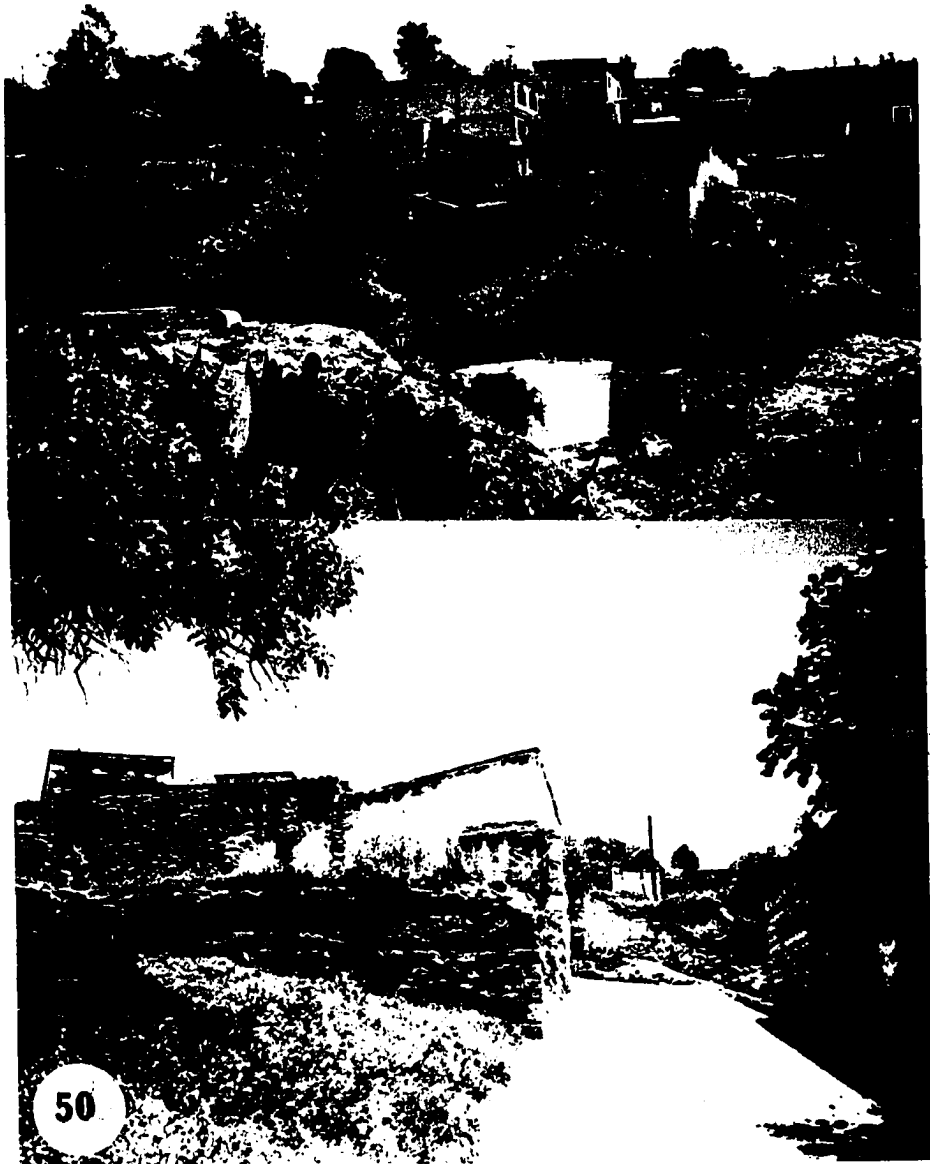


Fig. 50

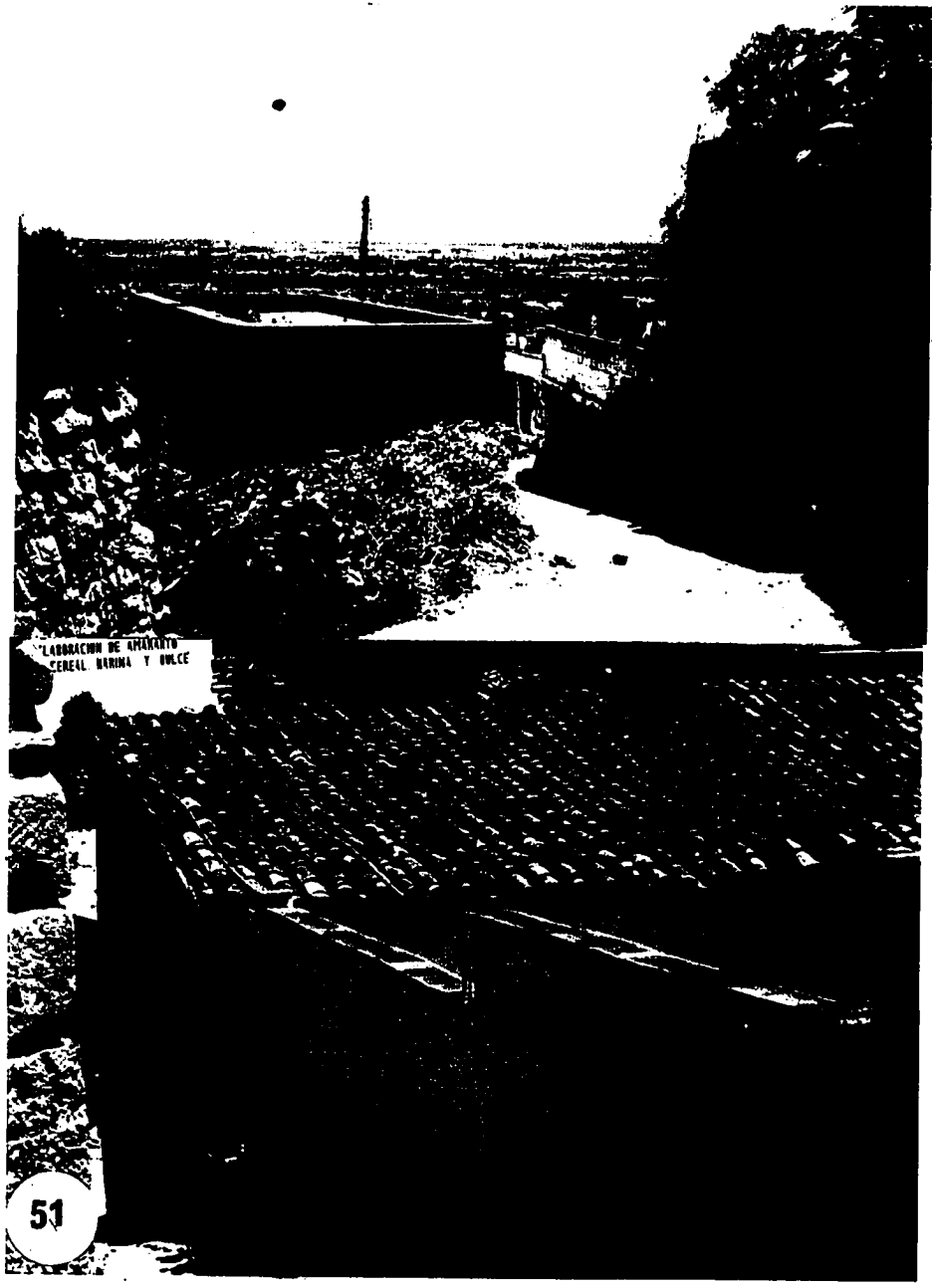


Fig. 51



Fig. 52

Fig. 53. Men painting street names on the sides of the houses in the village.



Fig. 53

after about three street names were painted the painting ceased.

The objectives of this study were to learn as much as possible about amaranth and its importance to San Miguel del Milagro. Questionnaires were designed to provide as much information about the following areas as possible:

- 1) To find out the uses of amaranth in current day Mexico.
- 2) To find out the different types of germplasm which exist in the field and to conserve these for use by Chapingo/RRC. These can then be used in other areas interested in amaranth.
- 3) How can local folk taxonomies be applied to current concepts of biological classification of the genus.
- 4) Trace the cultural/sociological importance of amaranth in present day Mexico where the crop once had a religious and cultural importance.
- 5) To find out as much as possible about the cultural practices of amaranth growing in San Miguel del Milagro and compare it to other known practices so that it can be applied to further amaranth growing in Mexico and elsewhere (other countries) where amaranth has been

introduced.

6) Is amaranth an economically viable industry in Mexico? Who are the people who grow amaranth and how does it affect their standard of living? What are the general lifestyles of those who live in San Miguel del Milagro?

7) How has the re-emergence of amaranth or the "renaissance of amaranth" affected those in San Miguel del Milagro? What impact has Rodale, Chapingo and the Mexican government agencies played on the people of San Miguel?

8) How important is amaranth to San Miguel del Milagro and how many people are actually involved in it in some way?

9) How do present day uses compare with what we know about historical uses.

10) In what way have "scientists'" work on amaranth (i.e. agriculturists, breeders, economists) affected the thinking of the people in San Miguel del Milagro? Has this "knowledge" affected the techniques of local farmers and their cultural practices? Have they adopted any "new" cultural practices, varieties, etc.?

11) How has the introduction of the co-op and large factories influenced the village of San Miguel del Milagro.

12) What kind of future does amaranth have in San Miguel del Milagro? Can it be more than a cottage industry?

Two sets of questionnaires were designed to get as much data as possible from the people of San Miguel del Milagro. One questionnaire was kept as brief as possible, without excluding information that it was desired to get from the people. This was because I had previously used a longer questionnaire and had found that not only was it possible to only survey two or three people a day with this questionnaire, but also I was certain that most of the inhabitants would not have the time to answer it fully, since most people had work to attend to. I felt that much more information could be gathered with a somewhat shortened and more concise questionnaire. This questionnaire concentrated less upon cultivation practices and more on the alegria industry, since I expected more people to have information on this. I translated this questionnaire into Spanish for use in the field. I made the second questionnaire a very comprehensive and it went more deeply into cultivation practices. This questionnaire was used selectively with amaranth farmers, especially those I found to be cultivating more extensive areas of amaranth. All available members of the village were surveyed and the responses are analyzed

and summarized in the Results section.

In order to ensure that no information was missed from informants as they were asked the questions on the different questionnaires, a pocket tape recorder was used to tape all the interviews. For the most part this was kept concealed in a bag or pocket, so as not to alarm those being interviewed. Informant's responses were written as I went through the questionnaire, but the tapes served as a useful security measure backup. For certain situations, such as the trip to the Mercado de Dulces in Mexico City, when I accompanied the informant on one of his regular alegria marketing trips from San Miguel del Milagro, fieldnotes and observations were entirely dictated into the tape recorder since constant movement was involved in this trip.

In addition to the questionnaires, more informal interviews were used where the opportunity arose with certain informants, to get information that was a little different to that which was covered by the questionnaires. Examples of this are where informants had extensive knowledge of subjects such as where amaranth fields were located, inside information on the co-op, history of the village, the alegria industry etc. Other examples were

interviews conducted with family members of the major factory, where the conversation focused upon the family, the business and history. Parts of the interviews have sometimes been included as separate interviews in the results section (for instance in the section on the major factory). In other instances, informants helped to construct sketches or rough maps of where they believed amaranth growing locations of villagers to be around the village and for some distance away.

SUMMARY AND ANALYSIS OF RESULTS

Importance of Amaranth to San Miguel del Milagro

In this section, the numerical importance of different aspects of the amaranth industry to San Miguel del Milagro will be presented. The location and enumeration of domiciles identified through this survey is shown in the map (Fig. 49). The total number of domiciles I located came to 167. Of these 167 houses, data was obtained for 130. In other words, the survey obtained data for 78% of the village. Of the 130 residences surveyed, 123 were found to have actively working occupants (during the course of the fieldwork in the last 5 years). Calculation of the importance of different aspects of the amaranth industry in San Miguel del Milagro was based upon the number of households involved in these different aspects as a proportion of the total number of active residences surveyed, and is expressed both numerically and as a percentage.

Figure 54 shows households that were shown to have any kind of involvement with amaranth, whether it be growing it, making alegrías, working in someone else's alegría business, buying and selling alegrías, etc. Of

the 123 active households, 97 had some involvement with amaranth. As a percentage this represents 79% of the village.

Figure 55 shows households that cultivate amaranth. Of the 123 active households, 83 cultivated amaranth. This represents a percentage of 68% of the village.

Figure 56 shows households that had some involvement with the alegria industry, whether it be a location for making alegrias, people who work in others' alegria businesses, people who buy and sell alegrias or other related occupations. Of the 123 active households, 62 were involved in the alegria industry. Expressed as a percentage this represents 51% of the village.

Cultivation

San Miguel del Milagro is a rural village which is surrounded by fields located on somewhat hilly ground (Fig. 57 & 58). Neighboring villages in some cases are several kilometers away, and if one surveys the surrounding landscapes, all one can see for the most part are miles of small scale fields woven into the patchwork

Fig. 54. Pie diagram showing 79% of village involved with amaranth.

Fig. 55. Pie diagram showing 68% of the village cultivating amaranth.

Fig. 56. Pie diagram showing 50% of village involved in the alegria industry.

79% of San Miguel del Milagro are involved
with Amaranth in some way

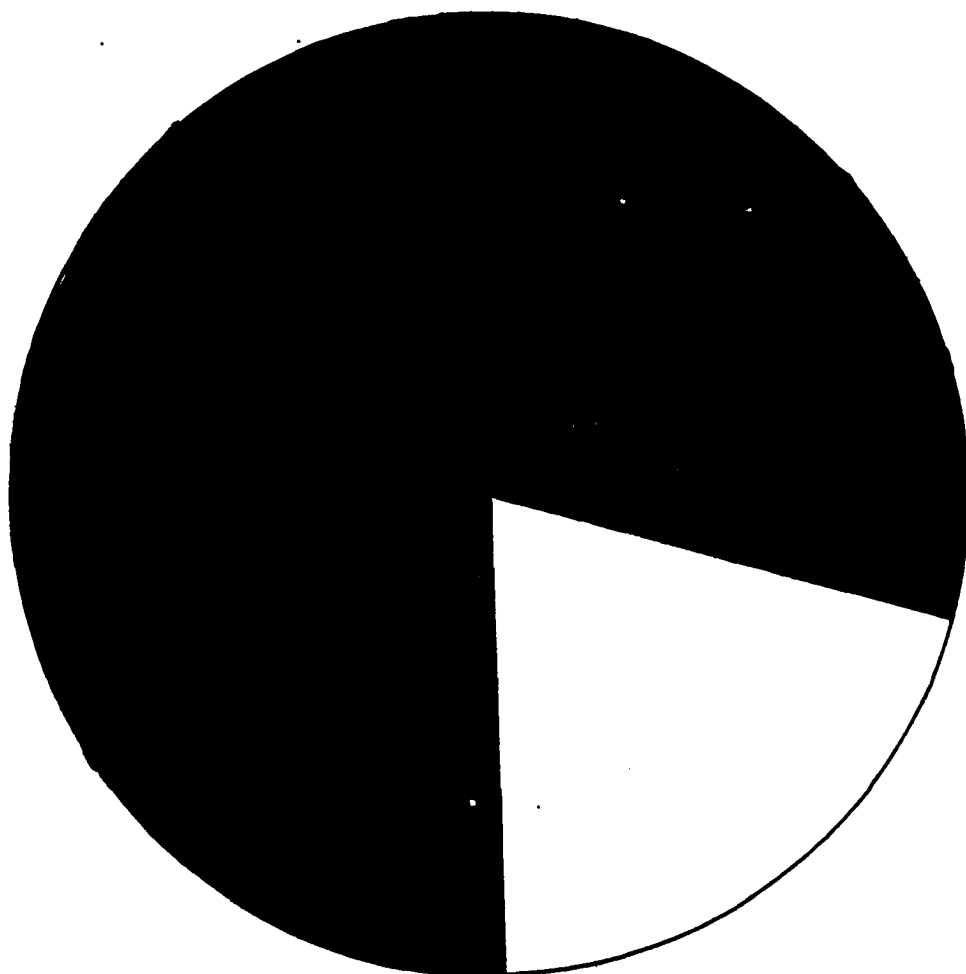


Fig. 54

68% of the Village are Amaranth growers

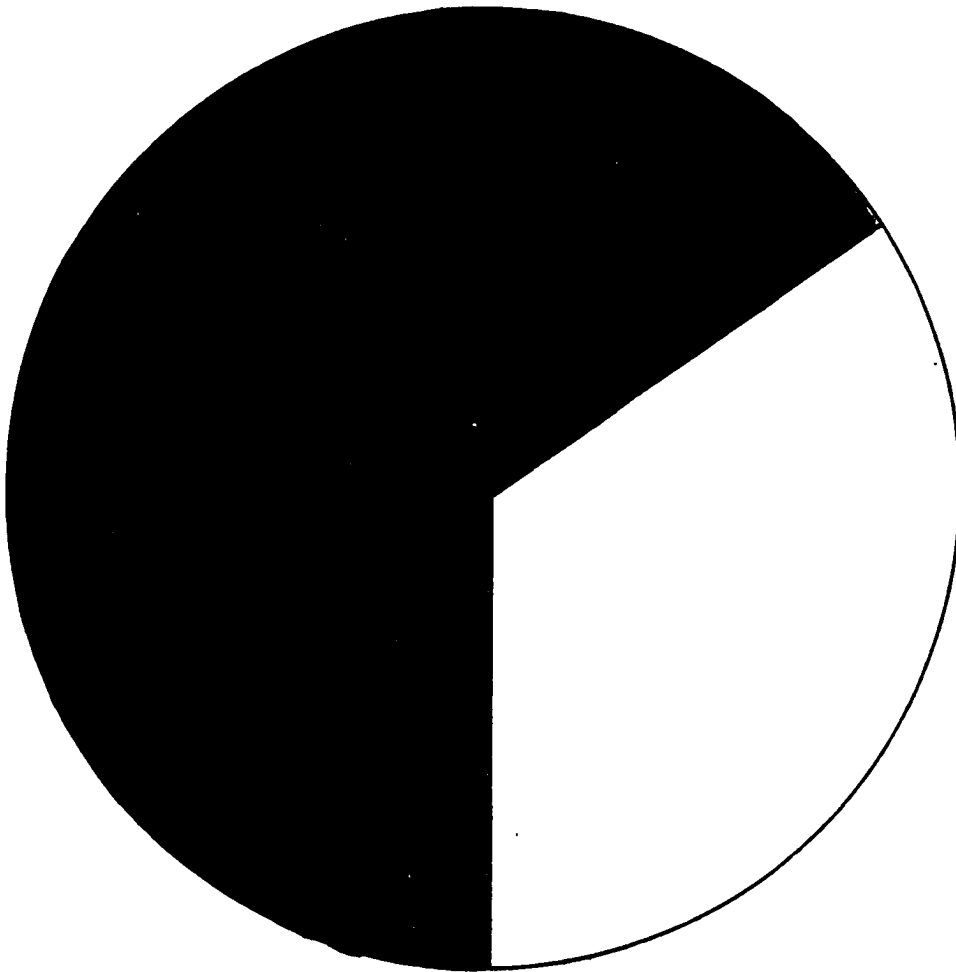


Fig. 55

51% of the Village obtain income from Alegrias

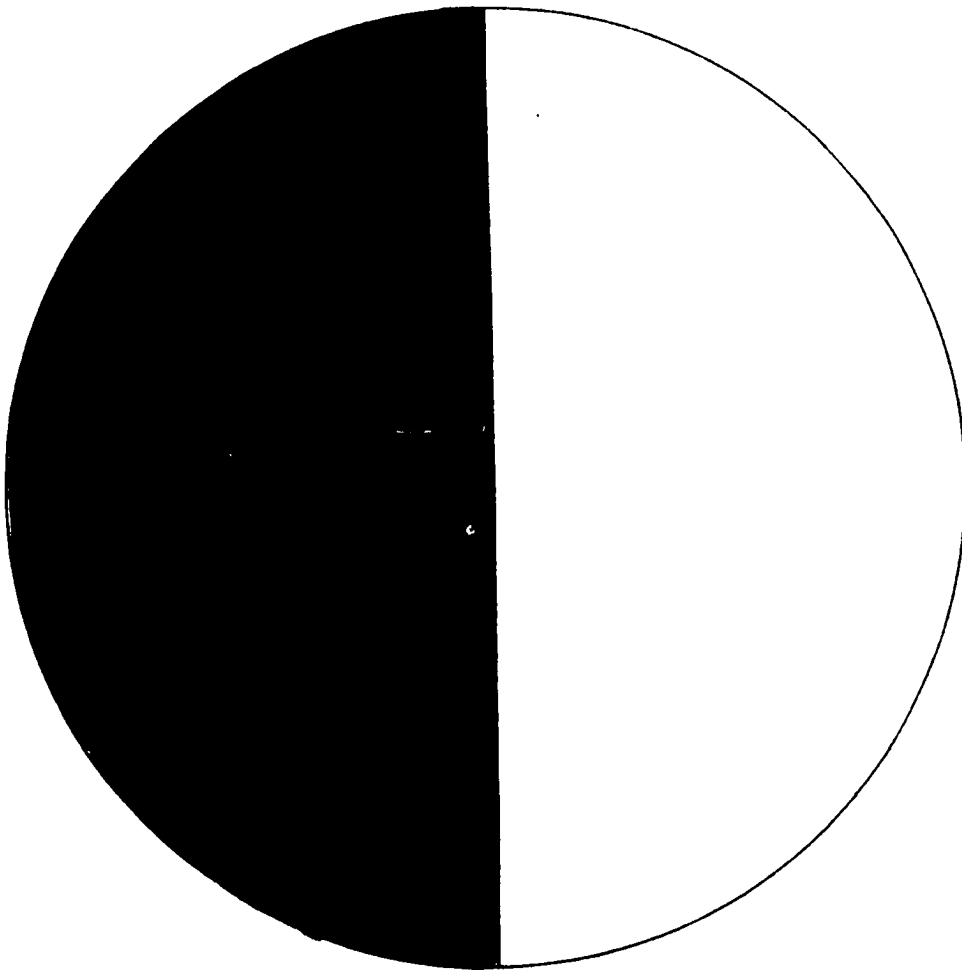


Fig. 56

Fig. 57 and 58. Views from San Miguel del Milagro demonstrating hillside elevation of the village.



Fig. 57



Fig. 58

of the countryside and the natural landscape that includes distant prominent features such as volcanoes. It is natural, therefore, that San Miguel del Milagro is a farming community, with almost everyone having some land that they work, be it their own or not. Given this background it is easy to understand how there would be a high amount of information to be gathered on the subject of farming amaranth or other farming activities.

The purpose of the section on cultivation was to gather as much data as possible from farmers in San Miguel del Milagro in order to both preserve and disseminate their knowledge about amaranth growing. The data gathered may be useful in implementing amaranth growing in other areas, or as a way of identifying ways in which their own methods might be improved at some time. In order to provide the best possible 'picture' of the current state of amaranth cultivation in San Miguel del Milagro I attempted to gather information about all conceivable aspects by the use of my 2 sets of questionnaires as well as other interviews and personal observations. In order to further ensure the scientific value of the data gathered, it was obtained from as many people as possible, and I have not attempted to put more value on one person's statement than another's, merely

reporting here what I found out. Topics considered in assessing the current state of affairs in San Miguel del Milagro range from pests and diseases to location of amaranth fields, and from history of the crop to harvesting.

Amount of amaranth being grown

Table 6 shows the amount of amaranth being grown by all the individual households surveyed. As is shown by the table, the total grown by these households is 41.075 hectares. As can be seen, the area grown by different households varies from .125 hectares to 4 hectares. Fig. 59 shows the number of households growing from 0.125 - 4.0 hectares of amaranth. Some of these fields are divided up into small parcels here and there, while others have larger pieces that they farm. Table 6 also indicates the total number of hectares grown by those surveyed to be 41.075 hectares. One informant estimated the total village cultivation of amaranth to be 80-90 hectares in 1992. The amount grown by the co-op in 1992 was supposed to be 27.5 hectares (see list of members and amounts grown at the end of the section on the co-op). This adds up to over 68 hectares (although there is some overlap between the 2 sets of figures). Given that about 20% of the village was unable to be

surveyed and that several growers who did not specify the amount grown, were not added into the area grown in the survey, it seems quite plausible that there could be somewhere between 80-90 hectares of amaranth grown in the village in 1992.

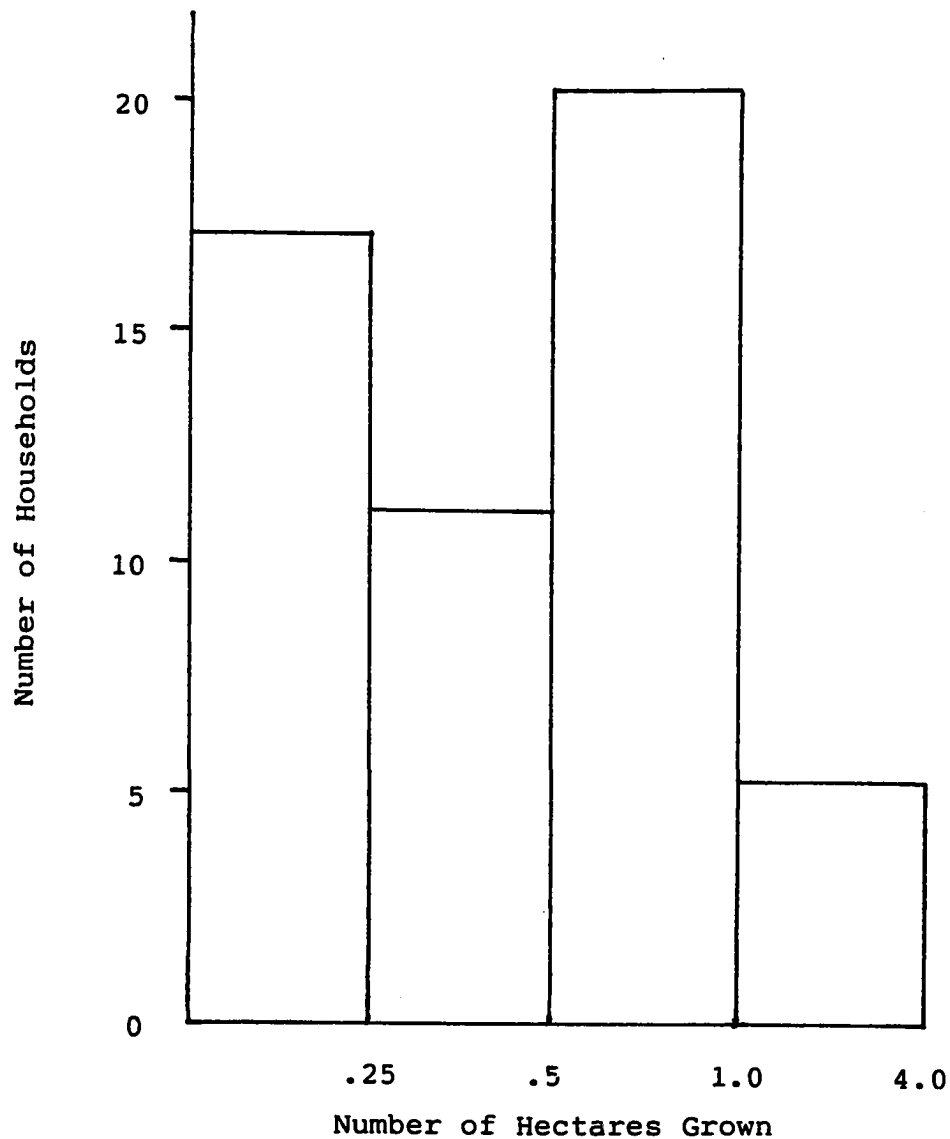


Fig. 59 - Number of households plotted against number of hectares of Amaranth grown

TABLE 6 (1st page)HOUSEHOLDS THAT CULTIVATE AMARANTH AND AMOUNT GROWN
(HECTARES)

<u>1</u> 0.2 EOY	<u>21</u> 0.5	<u>40</u> 0.25
<u>2</u> G	<u>22</u> 1.0	<u>41</u> 0.25
<u>3</u> 0.25	<u>23</u> 1.0	<u>42</u> *1.0
<u>4</u> 0.75	<u>24</u> 0.5	<u>43</u> 0.25
<u>5</u> 1.0	<u>25</u> 0.25	<u>44</u> G
<u>6</u> 1.0	<u>26</u> 0.25	<u>45</u> 0.25 EOY
<u>7</u> 1.0	<u>27</u> 0.5	<u>46</u> G
<u>8</u> 0.25	<u>28</u> last 3 yrs.	<u>47</u> 0.75
<u>9</u> s.a.	<u>29</u> s.a.	<u>48</u> 1.0
<u>10</u> 0.25	<u>30*</u>	<u>49</u> 1.5
<u>11</u> 0.25	<u>31</u> 0.5	<u>50</u> 1 EOY
<u>12</u> 1.0	<u>32</u> 1.0	<u>51</u> G
<u>13</u> 0.5	<u>33</u> 0.5	<u>52</u> 1.0
<u>14</u> 1.0	<u>34</u> 1.0	<u>53</u> G
<u>15</u> 0.5	<u>35</u> s.a.	<u>54</u> G
<u>16</u> G	<u>36</u> 1.0	<u>55</u> 0.5
<u>17</u> 0.25	<u>37</u> 0.5	<u>56</u> 0.25
<u>18</u> 0	<u>38</u> 0.5	<u>57</u> 0.5 EOY
<u>19</u> last 5 yrs.	<u>39</u> 4.0	<u>58</u> 1.0
<u>20</u> 1.0	<u>40</u> 0.25 EOY	<u>59</u> G

TABLE 6 (p.2)60 0.2561 0.7562 1.563 1.564* 3.065 0.12566 0.25the factory = 1.75* = co-op memberEOY = every other year s.a.= small amountG= grow, amount not knownTOTAL GROWN BY HOUSES SURVEYED ABOVE = 41.075 HECTARES

(Note: this does not include anything for the 14 houses listed (G) above where the amount grown was not specified. Houses are numbered but this is not their numbers on the village map).

Percent of people growing amaranth

83 households out of 123 were found to grow amaranth, representing 68% of the village.

Sowing

Width between rows of amaranth when sown can be about 80-85 cm, allowing horses to pass between the rows if needed. Parallel furrows are made to create a ridge between them, running parallel to the furrows (Fig. 60). On top of this ridge is placed a row of seeds. Within the row, seeds can be placed in groups of 8-10 seeds at intervals of 30-35 cm. A piece of manure can be placed on top of each group of seeds after they are sown. Some people hire help (peones) for sowing, the cost being about \$7 U.S. per day. The seedlings can be thinned after about 25 days to leave groups of 3-4 seedlings. At this point a cultivator can be taken along the rows to build soil up around the seedlings to give them a little extra support.

Weeding

Some said amaranth to be very work intensive, harder to weed than maize and harder to pick out weed seedlings in the early stages, for example the weed quintonil, which is not easily distinguished from the

**Fig. 60. Father and son weeding their amaranth field;
showing rows and furrows.**

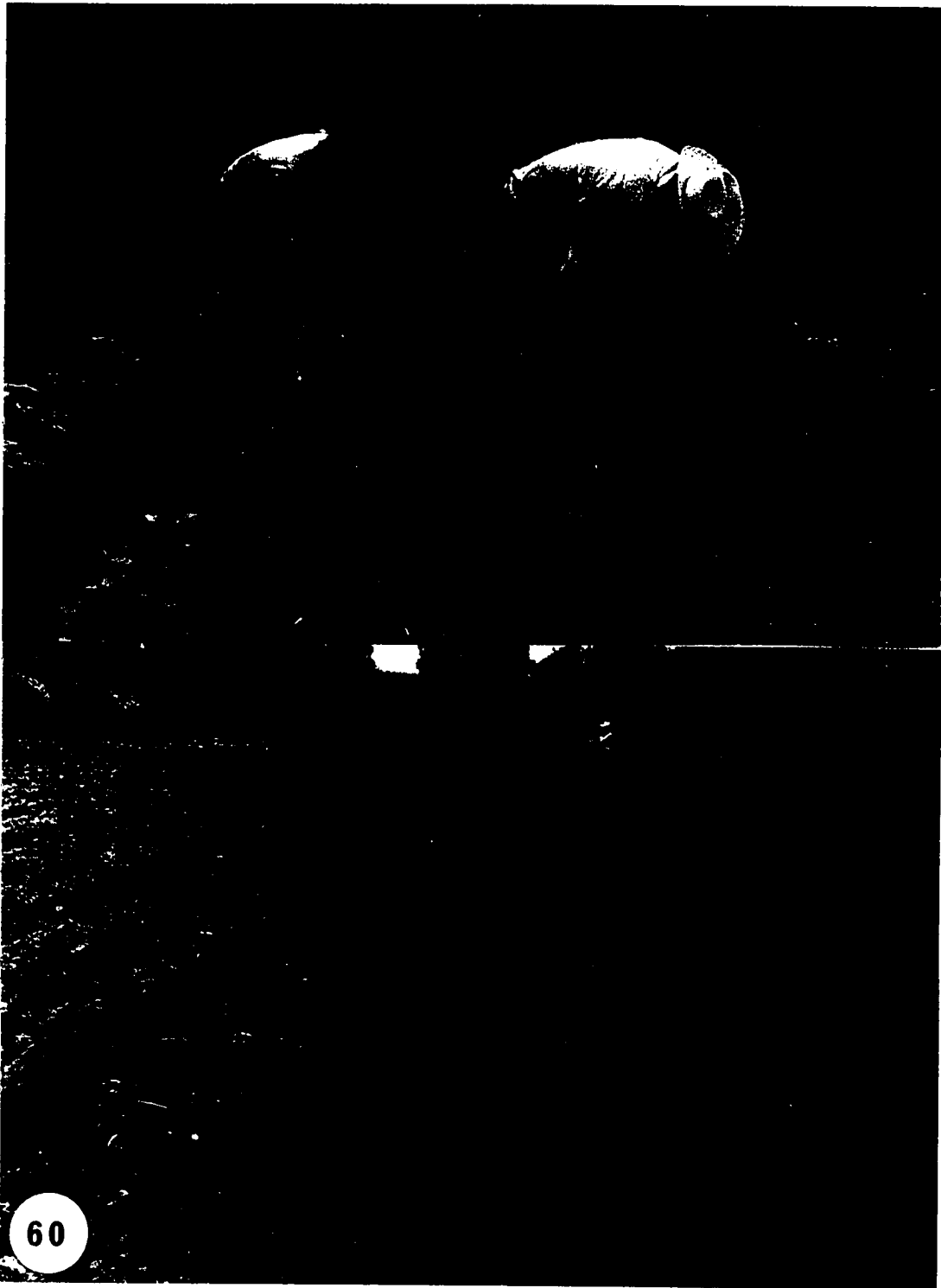


Fig. 60

crop. One informant went as far as to say that amaranth was too much weeding and that there weren't enough peones (day laborers) to weed it, so they stopped growing the crop. Another informant said that at 6 months of age it takes 6 people 1 day to weed $\frac{1}{4}$ hectare. Another hired help for weeding, also for about \$7 U.S., for his three quarters hectare.

Fertilization

Some people use only animal fertilizer, others only chemical fertilizers. Another supplied animal fertilizers after sowing, and later, when the plants were between .5 and 1 meter high, they put on chemical fertilizers. Some noted applying fertilizers twice. The placing of manure pieces on top of the seeds after sowing was mentioned above. One informant was noted to have a much higher estimated yield than another and I wondered whether this could be because of his use of fertilizers. A large number of people appeared to be using chemical fertilizers.

Pests and diseases

Several informants said there were no pests and diseases at present. Others mentioned pests called Chauhuiscle negro. The most mentioned disease was

referred to as Huitlacoche or Cuiclacoche. This appears to be a fungus which enlarges the plant and the inflorescence and rots the head of the amaranth plant, so that a powder comes in place of the seeds. This disease appeared to be the most troublesome to the growers. One informant said he would sow much more of the crop if he could prevent this disease, and that elimination of the disease would be great for the village. He said there was a need for study of the disease and that the agronomists from Chapingo had come to the village but had not helped with this. Another informant, however, said that you can buy something to combat this disease in the 'semillero' (nursery), in the town of San Martin in Puebla. He also said that you can avoid huitlacoche if you change fields for three years. I also found the name of this disease listed as a name for amaranth, suggesting that the name was used to describe the plant, which apparently looks much larger in the inflorescence, when it is infected with this disease. Yet another informant said that this disease is a powder and nothing can stop it.

An unusual pest I heard of was the ardilla, a squirrel. One informant noted that this was a problem for him, since it was burrowing into the ground and

eating his amaranth plants. The animals had eaten most of his crop. He noted that other parts of the village did not have the same problem with the ardilla as he did and he also noted that amaranth does not have many diseases.

Harvests

Plants can be left on the ground to dry for 15 days (Fig. 61-64). After this a machine comes to harvest the seed from plants on the ground. Machines have been coming to the village for the last 5 years for harvesting due to the increased interest in the crop. In some cases large sheets are placed beneath the plants on the ground so that the seeds will fall into it. One informant noted that the machine takes half an hour to clean his $\frac{1}{2}$ hectare of seed. Another said that after leaving the heads of amaranth to dry on the furrows, you throw them into the combine harvester which threshes it and cleans the seed. After this the seed is put in a sheet and then into sugar sacks. The cost of the machine is about \$15 U.S. per half hour. The machine also goes to San Nicholas Pauotla from San Miguel to aid with the harvest. One villager grew 4 hectares of amaranth and said he hired 4 people to harvest for 1 month. Harvesting takes place between October and November.

Fig. 61-64. Various ways of drying amaranth at harvest. All are in San Miguel del Milagro, except 62, which is a method used in Peru.

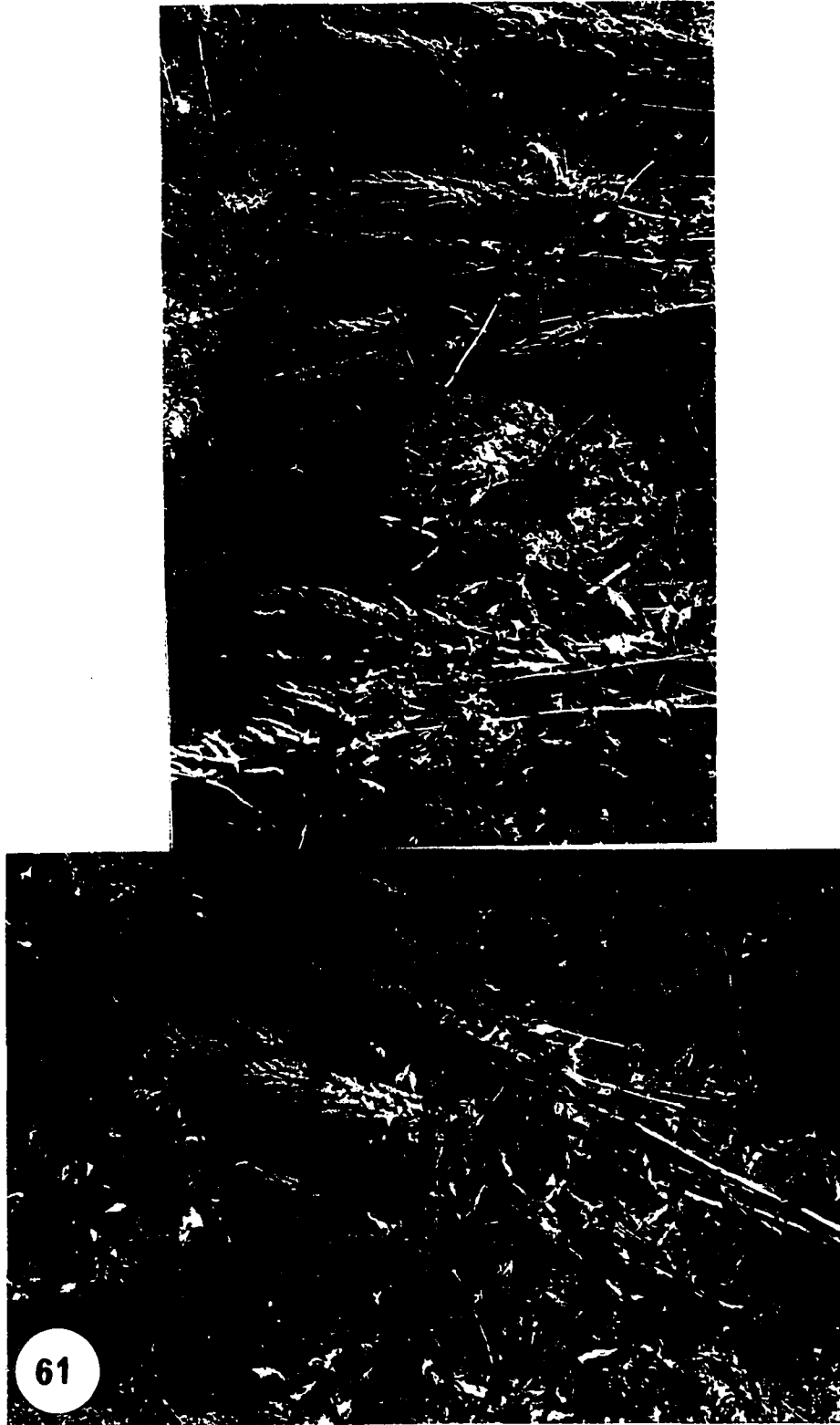


Fig. 61



Fig. 62

Fig. 63



Fig. 64

Time between sowing and harvest

There are 3 month and 5 month varieties of amaranth grown by the villagers. One informant had sown the three month variety on July 24 and expected to harvest it by October/November. The other variety had been sown in May and would also be ready for harvest by October/November. Other villagers sowed in May and expected to harvest by mid-late October. Another sowed in June and expected to harvest in October.

Yields

Different figures were obtained from different people. Variation could be due to many factors, including variety of amaranth grown, type of soil, use of fertilizers, methods of cultivation, etc. or even misinformation in the amount of land or yield. Some estimated yields were as follows: 1 hectare produces $2\frac{1}{2}$ -3 tons (these are metric tons); $\frac{1}{2}$ hectare produces 600 kg, which gives an equivalent yield of 2.4 tons per hectare; 1 hectare produces 21 bags of pure seed, or about 5.5 cargas (1 carga = approx. 150 kg), equivalent to about 825 kg or .825 tons per hectare; 1 hectare produces $1\frac{1}{2}$ tons of seed. One villager was growing 120 costales, equivalent to about one and three quarters hectares. From each costalito he got about 43 kg of

seed, equivalent to about $1\frac{1}{2}$ tons of seed per hectare. This figure was for 'amarilla', the yellow variety. Yields therefore seem to range from about $1\frac{1}{2}$ - $2\frac{1}{2}$ tons per hectare, with the possibility of perhaps 3 tons per hectare and another apparently very low figure of about .825 tons per hectare. An exhaustive study of yields might help to pinpoint farmers in need of help with their growing methods.

Rotation

Rotation appears to be the norm with amaranth growing. This is partly illustrated by the number of growers who only grow amaranth every other year. Others said they occasionally grow amaranth while yet others said some years they grow it and others not. Some specifically said they do not grow it in certain years in order to keep the soil healthy. Some do not return to the same field to grow amaranth for 1 or 2 years, having other fields that they grow it in in the meantime. Some said that 2-3 years maximum, but no longer, in the same field is correct for amaranth, with 2 being the most common number of consecutive years.

Other crops grown

Everybody seemed to be growing other crops in

addition to amaranth. Much of the time it was for their own consumption, while at other times they were growing crops to sell. The majority of informants seemed to be growing maize and beans for their own consumption. Other crops grown included calabazas (gourds) (Fig. 65), alfalfa, runner beans (Fig. 65), fava beans, tomate verde (Physalis), various vegetables, cilantro (coriander), tomatoes, fodder for cattle, huecontle (a vegetable), quelites (young leaves used for spinach-like greens) and barley grown to feed animals. Others keep cows, bulls, turkeys, pigs or other livestock for their own consumption, for eggs or for milk or for meat, but most often to sell. Some examples of some of the various households' involvement with other farming besides or in addition to amaranth are as follows: growing maize, beans or calabazas to eat and sell; corn only; corn and beans for the family's consumption; corn only, because amaranth requires too much work; corn, runner beans, ava, calabazas and tomate verde for their own consumption as well as having 4 cows for selling milk; making their entire earnings from corn; "concentrating more on fattening cows for meat than on amaranth now"; beans only (2 teachers with a very busy lifestyle); campesinos growing maize and beans for their own consumption; campesinos who work for others in their fields but grow

Fig. 65. Other crops grown by villagers. Runner beans (above) and calabaza (below).

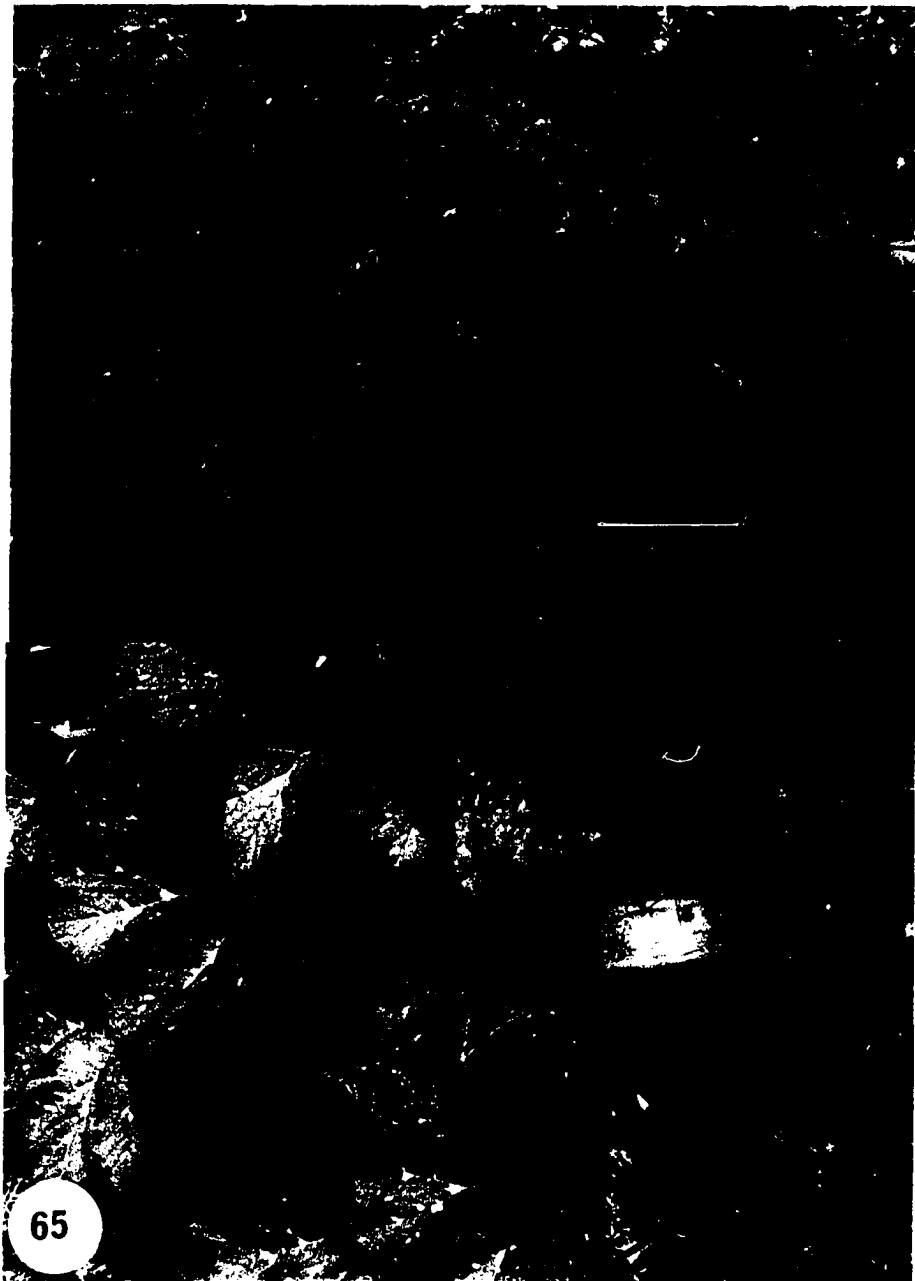


Fig. 65

corn and beans for themselves; large scale farmers using machinery (tractor) and growing 6 hectares of maize and 4 hectares of amaranth; amaranth, maize, beans, tomate verde, barley for their animals, and owninh about 6 bulls to sell for meat. As pointed out earlier, however, most of the people do not grow a great variety of crops, just two or three basics, and usually in addition to amaranth.

Intercropping

In San Miguel del Milagro, amaranth is generally grown in monoculture or pure stands. Early (1985) describes several systems of intercropping in Peru. In San Miguel del Milagro, occassionally, amaranth is grown next to small areas of various vegetables and herbs. No intercropping between alternating rows of amaranth was seen.

People who cultivate

It has already been established that a high percentage of people cultivate amaranth in San Miguel del Milagro. 83 out of 123 active domiciles cultivate amaranth making a percentage of 68% of the village. What has not been addressed is the nature of the people who do the cultivation. Generally it is mostly males who cultivate and who are seen in the fields. However, quite often women are seen in the fields also and children also

work in the fields. It is common for sons to be helping their fathers in the fields since several informants told me that their sons help and I saw this happening several times. Other children work for pay in other peoples' fields. Quite a few adult informants worked mainly as 'campesinos', working for other people in their fields, but most people are farming their own land, whether rented, 'ejidos' or owned. Whether children or adults, the people who work in other peoples' fields often work only at certain times of the year when there is a need for extra help. Many informant growers said that they hire help, often called peones (day laborers), for certain operations only. Mostly this was for harvesting, but also for weeding and sowing.

Labor requirements

As has been noted already, many people feel amaranth to be 'muy trabajoso'- very work-intensive. It is for this reason that several informants said they were no longer growing amaranth. For example, one villager said that he is now growing $\frac{1}{2}$ hectare, when he used to grow $1\frac{1}{2}$ hectares four years ago, but he was now growing less because a lot of work was required for amaranth. Others said that amaranth was a great amount of labor for weeding and sowing etc. Still another said that amaranth

was too much weeding and there weren't enough 'peones' available to weed, so they had stopped growing it about three years ago. Various estimates were given by different informants for the labor requirements for different stages of the crop. One informant said they hired almost no help for their one hectare except on certain occasions. At one month of age, another noted, it took 6 people 1 day to weed one quarter hectare of amaranth (equivalent to 24 days labor for one hectare). Another informant said that for their three quarters hectare of amaranth they hires 'peones' at a rate of 25,000 pesos per day. For harvesting, another informant hired 4 people for 1 month. This villager was cultivating 4 hectares of amaranth and 6 hectares of corn.

Varieties grown and their source

Most of the time the amaranth plant or crop in general was referred to by the same name as that which is used for the candy; "alegria". One informant said that their great grandparents had also called the plant by this name, meaning that perhaps this name goes back for at least 100 years. Some people said they had no special names for varieties they were growing and they just saved their own seed to sow the next year. In fact most

informants would save their own seed for growing the following year. The names and varieties most recognized and used by people in the village were 'blanca' (white) and 'roja' (red), the colors referring to the overall appearance of the inflorescence. There were also two distinctions made with respect to the time taken from sowing to harvesting. On this basis there was a 3 month variety and a 5 month variety, the former sown around July, the latter around May. Both were harvested in October/November. Some informants would sow both blanca and roja and others only blanca, while still others would sow only roja, saving the roja seed from their own harvest to sow in the following year. Roja was said to have more spines and by some to be bad to work with for this reason. The leaves of blanca were said to be greener while the leaves of roja were reddish. Another variety was referred to as 'amarilla' (yellow). Yet another was called 'ginda' due to its deep purple color. One informant said that this was the best variety.

Equipment and Machinery

The vast majority of amaranth growers owned no machinery to help them farm. No doubt this is a contributing factor to why amaranth is so work intensive for them. Only two villagers stated that they owned and

used a tractor. The problem, of course, is having the capital to buy a tractor. One of these informants had raised the money by working in the United States. The tractor enabled his family to farm large areas of land, farming 4 hectares of amaranth and 6 hectares of corn. Another farmer felt the need to use a tractor and it was for this reason that he was not growing amaranth, since it made growing it too expensive. In spite of this lack of machinery to help in the year round tasks, members of the village were using a combine harvester machine to help them harvest and clean the seed. This was a privately owned machine which cost about \$30 U.S. per hour to use and could harvest and clean about 1 hectare of amaranth in 1 hour. It had been coming to the village for the last 5 years, due to the increased interest in amaranth according to one informant. It is not known whether all used this, but it is suspected that the larger growers use it. The heads of amaranth had to first be left on the ground to dry and later thrown into the combine harvester. It took less revolutions of the machine and less air in it's ventilator than it did for the machine to clean wheat. The machine also went to another village nearby, San Nicolas Pautla, to harvest amaranth.

Destiny of amaranth harvest

Since the alegria industry is so popular in San Miguel del Milagro, and the amount of seed produced by the villagers themselves is nowhere near the amount of seed required for the alegrías, there is almost not one farmer who sells their seed outside the village. One villager was an interesting exception, selling also in San Martín and Tlaxcala. In fact, people from Morelos especially, and also other areas of Mexico with warmer climates than San Miguel del Milagro, come on a weekly basis to supply the extra seed needed by the alegría makers. One villager said that there are other villages around the area who grow amaranth and sell their seed in San Miguel del Milagro because nobody in surrounding villages makes alegrías. A village cited as an example of this was Teacalco. Some growers will have specific people or businesses to whom they sell, while others will sell to anyone who will buy it.

There were three scenarios amongst the amaranth growers as to how they disposed of their harvest. Those who do not make any alegrías themselves would sell all their seed to alegría makers. Needless to say, I was informed that the price fetched for the seed varied, as one would expect with any market, according to whether

there was a lot of seed available for sale, or little for sale. Of course, in the first case seed fetches less and in the latter, more. The second scenario applies to those who both grow amaranth and make alegrías themselves. Many of these people use their entire harvest themselves. Still others, but fewer, use some of their seed and sell some also. Amongst those who make alegrías and use their entire harvest, are those who do not make more alegrías once their harvest is used up, and those who use it up and then buy the extra they need from other sources. One household grew $\frac{1}{2}$ hectare of amaranth, which was sufficient to supply their alegría making operation year round. This produced a total of about 20,000 alegrías per year and a gross income of about \$15 U.S. per week. Another maker, who just used his own seed, relied on one eighth hectare per year to produce 10,000 alegrías per year (It's possible that different sizes of alegría account for the different numbers, relatively speaking, produced by these two examples). Those who grow amaranth purely to sell the seed, obviously use the money from it for various purposes. One woman had a large dorado making business and used the money from her amaranth harvests to finance this. Regarding what the members of the coop must do with their seed, they have an obligation to supply a set amount of

seed to the co-op every year from their harvest.

Additional Information

As has been mentioned above, many informants noted that amaranth was a particularly labor-intensive crop. For this reason some were growing less than they used to, while some had stopped growing it. One person had very recently stopped and was now making boxes instead, while others were just growing corn or other crops now. Many informants noted that weeding amaranth was a particular problem, when compared to other crops, especially because of the similarity of certain weed seedlings, such as quintonil (Chenopodium), to amaranth. One of the informants who said that it was too much work had recently lost his wife, which seemed to be having a bad effect on him and could have precipitated his unwillingness to carry on with the work necessary for amaranth. Others who had stopped growing it were older people also, perhaps without the energy required any more. Some amaranth growers said it was an expensive crop to grow since you need a tractor, fertilizers, labor, chemicals for pests and diseases etc. It follows of course, that if it is labor intensive, then it would be expensive because of labor costs, whether in terms of hiring or in one's own days of labor.

The variation in the price fetched by seeds depending on how many are available for sale in San Miguel del Milagro has been mentioned above. Some informants noted that seeds are very expensive to buy at present for alegria making and so they had not been making alegrías for the last 3 years or so. The increased interest in amaranth in recent years, has also been mentioned above, and has apparently lead to a combine harvester coming to help with the harvesting. No doubt, this is related to the stimulation to amaranth growing in the area provided by the input of the government, Chapingo, Rodale and other interested groups.

Unlike the co-op, the large factory, was not growing any of their own amaranth, although the owner's father was. To be sure of a continuous supply of seed, they purchased all their seed from a lowland state with continual production and availability of amaranth seed. Their information that amaranth had survived a freeze in 1932, that corn did not, was interesting. Finally, on the subject of cultivation, one grower said that the productivity of amaranth depended upon the quality of the soils and subsoils.

Products

This section on products which were identified as either being marketed or consumed by the residents of San Miguel del Milagro will be treated in different subsections to include the following: personal consumption by the people of the village; descriptions of individual kinds of products consumed; kinds of alegrías made by different people (this could also be considered under the later sections on alegría businesses and alegría marketing); sources of products obtained by different households; variation in the amount and variety of products consumed by different households; perception and knowledge of nutritional value associated with amaranth, and finally, additional information.

Personal Consumption by the People of San Miguel del Milagro

While these data are not completely exhaustive, since not every household responded to this question, the data are fairly extensive and show a true reflection of the kinds of products consumed by villagers/households, and the relative popularity of each product. Table 7 gives a list of the products named by villagers, followed by the number of households that consumed the product.

In certain cases, products named by villagers in Table are relatively new, since they are made with items that have been introduced in the last 14 years or so, when the recent promotion of amaranth and amaranth products has been in effect. This could be the reason that some items are relatively rarely consumed; not necessarily because the taste or other attributes are unpopular. Other items, such as flour and cereal, for example, are probably more widely consumed than indicated here, because they are used as ingredients in other

TABLE 7**AMARANTH PRODUCTS CONSUMED BY VILLAGERS**

Numbers after categories denote the number of households that consume product.

No products consumed: 5 (This is the case with several households).

Alegrias: 32

Cereal: 5

Licuado: 8

Soup: 1

Torta/Tortitas: 12

Flour (Polvo): 5

Cookies: 3

Atole: 20

Tamales: 1

Postre (some kind of desert): 1

Quelites: 1

Bread: 1

Popped seeds with butter on them: 1

products, and this has not been taken into account. In any case, and not surprisingly, the most widely consumed product in the village is alegria. This, of course, would be expected, because they are making them in many homes, and in several instances informants noted that they or their families would eat some while they were making them. The product is also sweet, like a chewy candy, which also makes it popular. In addition, it has been around for several generations at least, having been made by peoples' great grandparents. It thus has a longstanding popularity and interest in the area. Second in popularity is atole, followed by tortas/tortitas and then licuados. The popularity of the latter is certainly of interest, because according to informants, this product has only been promoted since 1979. It's popularity has thus taken off rather quickly. This may be related to the publicity it received, according to informants, from the Mexican astronaut, Dr. Neri Vela. It is of particular interest to note this example, since one of the major difficulties in getting a 'new' crop off the ground appears to be finding a market for it.

Following is a more descriptive look at these products based upon information from the many informants.

Tortas/Tortitas - According to one dictionary, tortas are loaves or cakes, while tortitas are small loaves or cakes. In fact, tortas that I saw being made from amaranth were like disc shaped fritters, about 3 inches across. Informants noted that they were made from amaranth cereal, which is, in fact, popped or toasted amaranth seed. Various ways of eating them, in terms of their ingredients, were noted. Many informants mentioned 'tortas de camaron', meaning tortas made with shrimp. Others called them 'tortas de alegria' and said they made them from a mixture of amaranth cereal, shrimps, milk and eggs, which they fried. One villager said they only make the tortas de camaron to eat in Semana Santa (prior to Easter). Others eat the tortitas with cheese and/or shrimp. While another told me that she makes tortitas with cheese, eggs and epasote (a vegetable) and they eat them once every week or two weeks. The father of the owner of the large factory, said that up until 1979 they only popped amaranth and didn't use it for making tortas; prior to this, he said, they always made tortillas using only corn and corn flour. One villager gave a recipe for 'tortas de amaranto' and demonstrated how they were cooked, as well as

inviting me to eat them (Fig. 66). The recipe went as follows: mix 3 egg whites and some salt. Beat this into a foam. Put in three egg yolks and beat this in. Stir in about 1-1½ cups of popped amaranth cereal. Heat oil well in a pan. If desired you can also put 'polvo de camaron' (powdered shrimp) in the mixture and stir it in. Put one spoon of the mixture in different parts of the pan. This cooks very quickly. Eat the tortas with salsa and nopalitos (Mexican sauce and prickly pear [Opuntia]).

Cereal - This is popped or toasted amaranth seed. Some eat it with milk. One place it is obtained from is the factory, who sell it packaged, although, of course, since all the alegria makers are popping seed this could be widely available. The wife of the factory said that amaranth flour is made from the cereal ground up, and from this they make atoles and licuados.

Popped seeds - This is really the same as the cereal (above). One person mentioned eating this with butter on it (similar to popcorn). Another mentioned eating the toasted (popped) amaranth in atole. The father of the factory said that popping (for the alegrías), was the only thing they did

Fig. 66. Friendly villager showing how to make tortas de alegrías.



Fig. 66

with amaranth seed up until 1979.

Flour - Flour is made from the popped seed. One informant makes the flour themselves from amaranth seed. Another buys the amaranth flour from the co-op, to make atole. Another said that if you put flour in the licuado (like a milk shake) with cinnamon, it takes away your hunger. He also said that the flour is used in making atole, mixed with wheat flour or corn flour.

Bread - One villager said they eat bread containing amaranth.

Atole - A dictionary definition of atole says it is a gruel made by boiling Indian corn (maize), pounded into flour, in water and also in milk. (In other words, traditionally it is corn flour in milk, a little similar to the sweet English dessert called custard). Obviously, in this case, amaranth flour is partially or completely replacing the traditional flour. Some referred to it just as atole, while others say they eat atole with milk. Others said they occasionally eat toasted amaranth in atole. One household told me they make atole with the amaranth flour that is made from the popped cereal. The father of the factory said that to make atole with amaranth flour some chilling is

involved. You can use either corn flour dough or wheat flour dough, he said, which must be cold. Later put in the amaranth flour and mix it up with cold milk.

Postre - One informant said they make a desert (postre) with amaranth. The kind of desert was not specified and there is a possibility that this could also be atole (above).

Licuadao - This is like a milk shake made with milk, amaranth cereal, banana, chocolate etc. The factory owner made it with the flour from the popped seed, while the owner's father told the story of some American doctors who came to the area in 1979 and after that they started to make licuados.

Cookies - Cookies were not mentioned often, but were consumed by one informant. The factory manufactures cookies, as does the coop and a student of one village teacher was said to be making the cookies now in the city of Guadalajara, a long distance away.

Tamales - These are a kind of small dumpling stuffed with minced meat or other things, and boiled in a corn husk. One villager ate them made with amaranth cereal.

Quelites - While these are well known in Mexico, they were not mentioned frequently in the village. They are greens made from the leaves when the plant is young (like spinach) and were mentioned by one informant.

Kinds of Alegrias Made - There is some variation in the way alegrias are made in terms of ingredients, although this variety is not great. The basic, 'simple' alegrias made by most people, vary little, except in terms of size, shape and the alteration of one of the main ingredients (whatever is used to sweeten them). In terms of size in San Miguel del Milagro, there are two main sizes, either large or small. Nearly all the alegrias made are also round in shape (a disc, symmetrical and perhaps 1 inch thick). For this reason, alegrias from San Miguel del Milagro can mostly be easily recognized, since in other areas, rectangular ones are made. Makers of the large round ones are numerous. Many make both large and small. Some people make only small ones. The basic ingredients of all the alegrias made are toasted/popped amaranth seed and a sweetener which serves to both sweeten and hold the popped seeds together. Sweeteners used are ordinary sugar, piloncillo (blocks of brown cane

sugar), panela (brown sugar) or sometimes, honey. The factory uses piloncillo and honey because they say it tastes better (author agrees). Others use just piloncillo, again because they say the taste is better. Others use mostly sugar and just a little piloncillo, because the piloncillo is expensive. It was said many times that it is more expensive or too expensive to use piloncillo. Others use panela or sugar. Still others use only sugar. Some businesses make only the 'simple' round alegrías without any variation in shape or ingredients, while others add various items to the top of the alegría to decorate them, or make different shapes to sell. Larger businesses seem to have the most variety in these respects. One household, for example, makes most of their alegrías plain, while others are decorated with raisins, peanuts, pinones (pine seeds) and pepitas (gourd seeds). Another business, makes different figures and shapes with raisins, ajonjolí (sesame seeds) and peanuts. These shapes include stars and hearts. Since this household is making them for the festive ferias, perhaps this is why they make these shapes (stars were unheard of elsewhere). Most of the businesses wrap their alegrías up in

simple plastic to sell. Most businesses seem to make packages of 10 individuals for sale, while others put lesser amounts in. Other sizes encountered included packages of 9 and of 4. All these packages could be either large or small alegrías, of course. The most sophisticated and largest businesses in the village (the coop and the large factory), make the largest variety of products. Table 8 gives a list of some of the large factory's products with the prices that they sell for at the factory, as well as at the store at Cacaxtla. From the data in Table 8, it can be noted that the prices these products sold for at Cacaxtla were in general about double the price that I was quoted for them at the factory itself. It can be reasoned that products the nicely packaged products would fetch a higher price at Cacaxtla because the market there would be tourists, Mexican and non-Mexican, who in general would be wealthier. Many of the products from the factory and the co-op are packaged with modern marketing packages, with writing, designs, color etc. to make the product look better.

(Fig. 67-69 show some of the basic steps followed in alegría making).

Fig. 67-69. Basic steps in alegria making. Fig. 67- popping the seeds using a 'comal' (Peru). Fig. 68- sieving the popped seeds. Fig. 69- after mixing with melted sugar or other sweetner, the alegrias are banged into molds to give the round shape characteristic of San Miguel del Milagro.



Fig. 67



Fig. 68



Fig. 69

Sources of Products Among the Villagers - Many of the villagers provided their own ingredients for the different amaranth-related foods they eat. Some noted, however, that they obtained ingredients and items from other places in the village. Of course, this would be true for items such as cookies, which are a relatively specialized and recently introduced product. One informant noted that they bought cookies from the co-op and cereal from the large factory. Others bought ingredients for atole from the co-op. Another bought cereal from the large factory. All those who make alegrías theoretically have their own supply of the cereal.

Amount and Variety of Consumption of Amaranth Products by Villagers - This varied greatly, from those who ate no amaranth products whatsoever, to those who consumed a large variety. Some houses consuming the greatest variety of products listed the following varieties of products: atole, cereal, licuado, torta de camaron and alegrías; licuado, cereal, atole, alegrías and quelites; licuado, soup, torta, flour, cookies and cereal; and torta, atole, bread and flour made from amaranth seed.

TABLE 8 - LARGE CAPITALIST FACTORY'S PRODUCTS AND PRICES

<u>Product</u>	<u>Price (pesos)</u>	
	Factory	Cacaxtla
Package of 5 heart shaped alegrias	3000	6000
(seeds, nuts and raisins)		
250 gram bag of cereal	3000	6000
Pkg. 6 round alegrias	4000	8000
(seeds, nuts and raisins)		
Pkg. 10 large round alegrias	3000	5000
Pkg. 10 small round alegrias	1500	3000
250 gram bag of flour	4000	5000
1 small round alegria	500	500
Pkg. 2 round alegrias with nuts etc.	3000	

(3400 pesos = \$1.00 in 1992)

Perception and Knowledge of Nutritional Value of Amaranth Products by Villagers - One villager noted amaranth products to be very nutritious (I note that he was a teacher and therefore more educated than most villagers). Others said that alegrías were too sweet. I also attest to their sweetness. Another said that the licuado made from amaranth cereal mixed with banana and milk was very nutritious and contained protein, iron etc. They also noted the information about Dr. Neri Vela, the Mexican Astronaut who had promoted amaranth cereal (note the illustration on the amaranth cereal box of the young 'astronaut'. The wife of the owner of the factory also said that about 13 years ago (around 1979), when their child was 6 months old, they found out that amaranth was a good aliment for their child (an agronomist from Chapingo told them), which lead her husband into making the co-op. Another informant said that licuados got rid of hunger (using 2 heaping teaspoons of amaranth flour in the licuado along with other ingredients), as did eating 10 small alegrías for lunch with other items when working all day in the fields. He also said that after 9 months of eating these products it appeared to clear the cholesterol from the veins in his legs.

Additional Information - It is noted that there was a

special display of the large factory products at the shop in Cacaxtla, as well as the fact that the factory sells it's products from a store on it's premise. The co-op also sells products from a store within it's factory building.

THE CO-OP

The co-op in San Miguel del Milagro that was initiated officially on March 1, 1986, as a society of amaranth growers from the village with 10 members. It came about through a proposal that the growers of San Miguel del Milagro made to the state government. Since it came after the co-op in Tulyehualco, it is possible that it was somewhat inspired by this. The government of the state of Tlaxcala and the growers of amaranth in San Miguel del Milagro got together to work on aspects of cultivation and making different products from amaranth. The government was interested in the rescue of a traditional crop, which had a long history of cultivation and popularly was said to have been lost during the time of the conquistadors. It was planned that when the co-op grew, they would enroll more people. Each paid something toward the establishment of a factory, such as land, and credit was obtained from the bank to build the factory (Fig. 70). The federal government helped by giving a long-term low interest loan from the bank. In 1989 the society of amaranth growers became the co-op under the name it is known today. As part of their agreement with the government, each grower in the co-op had to visit 4-5 towns to demonstrate how to grow amaranth. Charts were

Fig. 70. The co-op factory building.



Fig. 70

prepared by state agencies that showed the potential areas and number of hectares suitable for amaranth cultivation in the state of Tlaxcala, and it is apparent that state agencies were trying to promote a much wider cultivation of amaranth in the state. The purpose was to get more villages to grow amaranth every year. They (the farmers) would be guaranteed a minimum price and that the co-op would purchase the seed from them. The idea was that with amaranth the farmers could be more sure of the price than with the more widely grown maize, as well as having less diseases to contend with etc. One co-op member said in 1989 that he did not expect the co-op to affect the other alegria makers in the village adversely, and that besides having to give seed to the co-op, the co-op members would be allowed to keep seed also for their own alegria businesses.

The factory was scheduled (in summer 1986), to start in November 1988. When I was there at this time, the factory had been completed and some machinery brought in so that they were apparently very close to production. As planned, the factory/co-op makes alegrias, cookies, flour and cereal, which it has an agreement to sell first to the D.I.F.

This organization, D.I.F., in Spanish, is called the 'sistema para el Desarrollo Integral de la Familia', meaning 'integrated system for the development of the family'. It's goal is to 'apply social programs to help families, to help in community development, to further education for social integration, to stimulate sound physical and mental growth in childhood and to protect the rights of minors, youth, the elderly and handicapped without resources' (translated from D.I.F. explanatory booklet obtained from D.I.F., Tlaxcala, State of Tlaxcala). The D.I.F. is interested in introducing amaranth cookies and amaranth pasta (for putting in soup, pers. comm. Guadalupe Pedraza) for their school programs. However, there is not yet enough to supply the state of Taxcala (pers. comm. Lic. Adelea O. Luis de Salas, D.I.F., Tlaxcala, Tlaxcala, 1992). Because of this, as of 1992 the program had not really got under way.

According to a former co-op president, the plan was for all the children of the state to eat cookies of amaranth for school breakfasts. The flour and cereal was to be sold in Mexico City markets, where people already sought amaranth flour. The aim was to make 80,000 cookies per 8 hour shift with the machinery of the factory. The factory also had a gas popping oven that

could pop more amaranth much more rapidly than by the traditional hand methods. While San Miguel del Milagro could not provide enough seed, from the surrounding communities, as well as Morelos etc., they planned to be able to purchase enough seed to keep these rapid levels of production going. The intention and capacity had been for 45 people to work per shift in the factory, which would be permanent work, unlike the spasmodic employment some people have as seasonal farm-help etc. They planned to design packaging for the products in 1986, and register the product etc. By my 1992 visit their products were sold in such packaging.

By 1992, one of the original members, who had claimed to be the originator of the co-op, had split off from the co-op, making his own factory. A reason given was that the co-op was not working regularly enough or hard enough, so he had split off from it about 1½ years ago. Now, his business, was said to be producing more than the co-op.

It was evident from my last trip in 1992, that the co-op was not working full time, in fact there was little evidence of them working much at all. No activity was noted there, such as personal coming and going,

machinery noise, etc. What was particularly strange was that on previous visits they had been particularly forthcoming about products, recipes and other information, apparently because they felt that all the exposure they could get might help to create a larger market for amaranth products. Now, however, things were very different. They were very guarded and would not even let me go inside the factory. Several times appointments were set up for interviews as to the current state of affairs, but it became evident after trying several times that it was not going to be possible. I do not know if this was because they were wary about their industrial methods being documented, or it was fear of possibly seeing that they were not producing as expected. I can only speculate upon the reasons. Needless to say, it was interesting that both the major ventures in the village, this and the factory, were apparently going out of their way to prevent interviews or pictures.

Informants in the village told me, in fact, that the co-op had had no effect on others' businesses, since everyone had their own markets. One did say, however, that the co-op was bad for the village because they did not pay enough for amaranth seed. Others bought some products from the co-op, such as cookies, while one

bought all their seed already popped from the co-op to make their alegrías and another would buy alegrías from the co-op to sell when they did not have enough of their own to sell. Other co-op members are both members of the co-op and run their own businesses. One co-op member noted that as part of his agreement with the co-op he must produce 3-4 tons of seed per year, which is all to be used by the co-op. He said he was growing about 1 hectare, which he expected to produce 2½-3 tons. He also said that the co-op owed 250 million pesos to the government for the factory they had built and also noted that part of the co-op's agreement with the government was to sell the cereal they make from the seeds to the people of San Miguel del Milagro.

Table 9 shows the amount of amaranth grown by co-op members in 1992, which each had agreed to supply the co-op. As shown in Table 9, the total to be supplied by members to the co-op in 1992 was 27.5 hectares.

TABLE 9

**Co-op members and amounts said to be grown of amaranth,
1992**

<u>Name</u>	<u>Hectares to be supplied to co-op</u>
A	3
B	3
C	1.5
D	3
E	2
F	2
G	2.5
H	2.5
I	3
J	3
K	2
<u>Total</u>	<u>27.5 hectares</u>

Members are listed as A-K for purposes of anonymity.

The Large Capitalist Factory

On the last of 4 field trips to San Miguel del Milagro, in August 1992, there was an immediately visible addition to the village. Looming large, above and just beyond the principal architectural buildings in the village, (namely the picturesque and ornate church in the plaza), was now a large and conspicuous kind of billboard, painted in huge blue and red, the name of the capitalist factory (Fig. 71). On more careful inspection this was in fact the back of a fairly large white-painted building. It stood out so much because of the village's situation in a mini-valley on a steep downward slope, so that the street behind the church buildings was greatly elevated above the church, giving full visibility to the building. Upon climbing this street once more and talking to inhabitants of the village, it became clear that this was, in fact, a house where a relatively sophisticated alegria and other amaranth-products capitalist business/factory had sprung up. On other occasions soon afterwards, while walking around San Miguel del Milagro, I noticed various amaranth products, again, in somewhat sophisticated packaging compared to the way most of the alegrías of the village are sold. What was most striking was the fact that they were

Fig. 71. The large privately owned factory building.



Fig. 71

bearing the name of this business. The biggest impression was left when I visited the small candy store among the various official buildings as you go down the short entrance road on the site of Cacaxtla. Here for sale were numerous items bearing their logo.

What was striking about this proliferation of fancily packaged products from this factory, was that previously the co-op had been the largest and most organized factory in the village. I had seen their products developed in this way and presumed them to be the biggest possible influence on the village. Of course, I had been curious to find out what effect the Amarantlax co-op would have on the village. Would it lead to an improvement or deterioration in the lives of the people of San Miguel del Milagro. Now, suddenly, here was another enterprise of major visibility in the village, and I was curious to find out more about it. I wondered how it had come about and how it would affect the village. How too would it affect the co-op, which had seemed such a major and co-operative venture in the village. What I had liked about the co-op, and been interested in, was the fact that rather than being a situation where one private enterprise 'took over' the village, here was an effort for village members to

apparently pool together for their mutual benefit and achieve something together, that perhaps none of them could have achieved as individuals. Now, here was an apparently completely private enterprise which appeared to be vigorously growing. How would this affect the village and it's people? Already it was rather brashly visible, dominating the only substantial and classical piece of architecture in the village. In fact, because of it's brightness, it was dominating the whole view of the village.

In a detailed interview with the family that owns the factory I learned the following. They do not sow any amaranth, concentrating on making amaranth products. They referred to their business as a microindustry and said that their products were registered. Besides the husband, the family spends all their time in the house and in buying things in Tlaxcala. For their own consumption from amaranth they make tortitas with cheese, eggs and epasote (a vegetable) about once a week or two weeks. From the flour that is made from the cereal they make atoles and licuados.

The husband has an accountant who helps him with the business. The seed that they use is ventilated by machine in order to get rid of the dirt in it. They make

alegrias with piloncillo and honey because it tastes better that way (author agrees!). All the people they employ come from another village.

The factory vs. the co-op

The owner was a native of San Miguel del Milagro. According to his wife he was the initiator of the the co-op 6 years ago (1986). He grew a lot of amaranth for the co-op and put a lot of money into it. The factory didn't want to go ahead too fast so he decided to go out on his own. Now the factory had been in business for 1½ years (as of August 1992). The had bought a machine for the factory and now it was necessary to get more machinery since they wanted to export. According to his wife, their factory sells more than the co-op and is always working; the co-op only works for limited periods only, 2 months at a time etc.

How they began

The husband's grandmother worked for 70 years with alegrias. They said she was the first to be doing this. After this his father continued working with alegrias. Thirteen years ago, when their child was half a year old, they found out amaranth was a good aliment for the child. An agronomist from Chapingo told them

that amaranth was a very good nutritious substance. After this the husband was said to have gotten the idea to make the co-operative, which was discussed above.

The father of the factory owner was born in 1923. The family used to make alegrías when he was younger in a nearby house where another family member now lives. At that time that residence was the owner's grandmother's house (the one who had started making alegrías in the village 70 years ago). Back in 1932 the family was growing both corn and amaranth. There was a freeze and the amaranth survived while the corn did not. From this point on they decided to grow amaranth every year. At this point in time 3 other people were growing amaranth and making alegrías. Their family used to make alegrías for Easter week (Semana Santa). In 1942 the owner's grandfather died, leaving his mother with 7 children. The oldest of the children went to the market in Mexico City to sell the alegrías every Sunday. They saw that it was making money so they kept on making it. Up until 1979 they had only popped the amaranth; they always made tortillas with corn/corn flour. In 1979 some 'doctors' came to the region and after that they started to make licuados. At a colloquium in Tlaxcala licuado was given to some Americans who had come. They liked it and it

"got rid of their hunger", they were not hungry later. The licuado was made with milk, chocolate milk, banana and amaranth flour. After this a lot of tests were made in these aspects of amaranth. The informant also said how when he put 2 heaping tablespoons of amaranth flour with a little cinnamon in a licuado he was not hungry afterwards. When he would go to work all day and take with him a packet of 10 small alegrías, a banana and a bottle of milk, he would not be hungry afterwards. He did this for one month. He would take 2 tortillas with amaranth flour in them and he would not be hungry afterwards. His kept repeating his theme of not being hungry after eating amaranth products. After 9 months of eating like this he said he went for a cholesterol analysis in Mexico City. His veins had previously been black in the back of his calves, but now they were cleared of cholesterol. Clearly he was attributing to amaranth the properties of taking away hunger and helping to clear cholesterol.

The father of the factory owner had worked extensively in agriculture in many parts of the U. S. Now he had a store in Tlaxcala and has 8 children, all who had attained good professions in life, such as psychologist and teacher.

The family gave several recipes for foods made with amaranth. One recipe involved the following. A little red wine, 1 litre of cold milk, 1 litre of atole, 2 eggs (organic), 1 banana, 2 heaping tablespoons of amaranth flour and a little cinnamon. For another take popped amaranth cereal and fruits such as banana, pears, papaya and strawberries, put in honey and milk and eat with a spoon as you would any cereal. To make atole use corn flour dough or wheat flour dough, which must be cold. Later put in amaranth flour. Mix with cold milk.

Marketing

They have a candy store attached to their house where they sell their products. As mentioned above they also sell their products in the store at Cacaxtla. The factory has its own clients in Hidalgo and small parts of the states of Puebla and Mexico and the husband delivers his products to them. He goes to Jalapa in Veracruz and all over, selling their products and bringing them to stores. He takes a small truck bearing the factory's logo, leaving at 9 a.m. and returning at 12 midnight. They don't sell their products at ferias. They want to export the cereal abroad.

Source of Supplies

Supply of amaranth seed for their operation has to be reliable so they buy it from outside sources, even though this is a little more expensive. They buy it from campesinos from the states of Morelos and Puebla. The husband brings piloncillo, sugar etc. to the house.

Products, Production and Economics

Daily production of the factory varies. The average is 500-600 packets of the small alegrías, 300 packets of the large ones and between 80-100 packets of 6 small alegrías with decorations. The amaranth cereal is made from toasted amaranth and is made when they have orders for it. It's made into 250 gram bags and they can make 200-300 bags a day.

They sell a variety of shapes of alegrías with different decorations. Table 8 lists many of the various products they make and compares the prices charged at the factory store and Cacaxtla.

Types of Businesses Involved with Alegrias

This section will focus upon the different occupations and scale of operations of the many people involved in different ways in the alegria industry of San Miguel del Milagro. I will attempt to identify the different scales and magnitudes of operation of the many alegria-makers, as well as the variety of ways that people make their livings from alegrias. Aspects of alegria-making businesses considered will include output of alegrias on a daily, weekly and yearly basis, frequency of making alegrias and employment of workers. Other aspects considered will include the different types of alegria businesses, such as makers, marketers, buyers and sellers, as well as those who work in others' alegria businesses.

Table 10 gives a list of various occupations identified through my survey in San Miguel del Milagro. In addition, the number of domiciles involved in each activity is listed.

As can be seen from the data in Table 10, the alegria industry is of great importance to San Miguel del Milagro, providing jobs and income for many people.

As has been stated earlier, 62 out of 123 active

TABLE 10

Ways in which Residents of San Miguel del Milagro Earn Money through the Alegria Industry (Numbers in brackets indicate how many domiciles were involved in each activity)

Farming amaranth - (see section on cultivation).

Major factory - Both the co-op and the largest factory belong in this category.

Member of the Co-op - (11)

Children work in others' fields of amaranth - probably several

Children work with Amarantlax - (2)

Children help in parents' fields - (2)

Housewife - probably several

Children (mostly) or other family members work in others' alegria factories - (14)

Children working in parents' alegria business - (6 plus)

Buy alegrias from others and sell them - (5, two of them also make alegrias)

Run store to sell products needed for alegria making - (1)

Adults who work in another family member's business - (2)

Used to have alegria business - (8)

TABLE 10- PAGE 2

Businesses that make alegrias and hire people (note: this category does not account for the many businesses where children and other members of the household are involved in the production of alegrias. Some families are very large and therefore 'employ' many of their children - (10 plus)

Travel to sell alegrias as well as making them - (27)

Make alegrias every week, once per week - (6-9)

Make alegrias every week and more than one day per week - (6)

Make alegrias every week from 4-6 days each week - (7-8)

Make for ferias only or occasionally - (8)

Make less than once per week - (3, including one domicile that makes alegrias both occasionally for ferias, as well as on a more regular basis for other purposes - therefore, this house has been included in the preceding category also)

residences surveyed are involved directly in the industry, whether it be making alegrías in the residence, having children who work in others' businesses, or buying and selling alegrías etc. This represented 51% of all households surveyed in the village. The data shown in Table 10 also shows which occupations involve the greatest number of households. Clearly, there are numerous households that make alegrías, and these fall into several categories, depending upon the frequency and regularity with which they make alegrías. As outlined in Table 10, the number of businesses which fall into the different categories are as follows:

Make alegrías every week, once per week: 6-9 households.

Make alegrías every week and more than one day per week:
6 households.

Make alegrías every week from 4-6 days each week: 8
households.

Make for ferias only or occasionally: 8 households.

Make less than once per week: 3 households (includes 1
from previous category also).

A total of 36 households actively make alegrías, representing 30% of all active households surveyed. 9 additional households made alegrías during the last 5 years, bringing the total up to 45 or 37%.

While the above data shows which households make alegrías with the greatest frequency, it does not indicate which ones have the highest productivity. It is feasible that a household making alegrías once per week could produce more in that one day than a household making alegrías three days per week. To establish which businesses have the greatest output it is necessary to compare the figures for the number of alegrías produced per day, per week or per year for each business. In order to make the most meaningful comparison, the figures for annual production must be compared, since weekly figures would be meaningless when comparing a business that works only 3 months of the year to one which works every month of the year. Before doing this, however, I will briefly enlarge upon the various activities associated with the alegría industry that have been listed in Table 10.

Numerous households travel to sell alegrías that their business produces. There are 27 such households, representing 27 out of the 33 households that make alegrías. In other words, nearly all the households that make alegrías also travel (meaning away from San Miguel del Milagro, and usually a considerable distance, some hours away) to sell them. The per cent of households

that make alegrías who also travel to sell them is 82%. This category of travelling to sell alegrías will be covered in more depth in the section on marketing below. Needless to say, it is common for someone involved in a major way in making alegrías, such as the father of the household, to also travel frequently to sell the product.

A lesser number of households only buy alegrías from others in order to sell them (3 households), while 2 others make alegrías and at certain times buy from others in order to sell. One domicile interesting and unusual because here they buy the amaranth seed pre-popped from the co-op, since this avoids toasting, and the time, heat and discomfort associated with this. They make the alegrías from this pre-popped seed, unlike almost every other alegría making business, which pop their own seeds.

At least 10 alegría businesses that hire employees were identified by the survey and I believe this figure to be somewhat higher probably, since not everyone shared data on this. These businesses, of course, represent a very valuable community resource, since they are providing income to other households. The numbers would be far greater if all the businesses that

'employ' their own children, often quite a few children in one business, were included.

14 households were identified where children worked in other houses' alegria businesses. In some cases these were adults rather than children, but it is believed the majority were children, perhaps of secondary school age, although data on exact ages was mostly not available. Needless to say, a large portion of the labor force in the village's alegria industry includes children of some age.

6 additional households were identified where the children were working in their parents own alegria business, but I do believe the actual figure to be considerably higher than this.

All the households that produce alegrias to sell, using traditional methods and without the aid of machinery can be classified as artisan producers. Under this category there are those who produce large amounts of alegrias that they sell on a regular basis to considerably improve their standard of living. Also in this category, are those who make alegrias in smaller quantities and less frequently to provide for themselves

on a subsistence level. The only 2 businesses known to have machines were the large factory and the co-op. These have been treated in separate sections and can be classified as capitalists.

One business provides many of the alegria makers with much of their sugar, piloncillo supplies etc. This building is a rented owned by a villager but run by people from a nearby village.

Table 11 summarizes the productivity of the different alegria makers which allows a meaningful comparison of the amounts produced by different households.

The information from Table 11 has also been summarized in a graph (Fig.71a) in order to compare the annual output of all the alegria- makers identified by the survey. Since some makers did not specify whether their alegrias were large or small, the total annual count has been used for the graph. As can be seen from the analysis shown in Table 11 and Fig. 71a, there is a wide range of scales of production, from as low as 2,500 alegrias per year, to perhaps as high as 2.25 million alegrias per year. The lowest end of this scale can be

TABLE 11**Analysis of Alegria Production by Different Producers**

(Data is included for all categories for which informants gave information. Estimates of annual production are based upon an estimate of 50 work weeks per year).

KEY

Where possible, information is included under the following letters, representing the following categories: a) days per week of alegria making; b) = output per day of individual alegrias; c) = output per year of individual alegrias; d) = amount of seed used. L = large alegrias made. S = small alegrias made. S/L - denotes large or small, size not specified. For the last 2 categories (ferias/ occasional, less than once per week), the following letters have been used in place of a) and b): e) = frequency of making alegrias; f) = number of alegrias produced each time they make them. Households have been labelled A-FF to maintain anonymity.

Households that make alegrias about once per week

A	B	C
a) 1	a) 1	a) 1
b) 5,500 S	b) 653 S/L	b) 1,000 L
c) <u>275,000 S</u>	c) <u>32,625 S/L</u>	c) <u>50,000 L</u>
	d) 15 kg per day	

TABLE 11- page 2

D	E	F
a) 1	a) 1	a) 1
b) 400 S/L	b) 200 S/L	b)
c) <u>20,000 S/L</u>	c) <u>10,000 S/L</u>	c)

Households that make alegrías more than 1 day per week

G	H	I
a) 2	a) 1-2	a) 1-2
b) 20-40,000 L	b) 5,000 L	b) 5,000 L
c) <u>1-2 million L</u> (probably 1)	c) <u>375,000 L</u>	c) <u>375,000 L</u>

J	K	L
a) 2	a) 2-3	a) 2-3
b) 500 L	b)	b) 750 L/S
c) <u>50,000 L</u>	c) <u>1.1 million L</u>	c) <u>93,750 L/S</u>

approx.

M
a) 2
b) 625 L
c) 62,500

TABLE 11- page 3

Households that make alegrías 4-6 days per week

N	O	P
a) Frequent	a) 4	a) 2-6 (Avg. 2.5)
b)	b)	b) 8,750 L
c)	c) <u>1.1 million</u> approx.	c) <u>1.1 million</u> approx.
Q	R	S
a) 6	a) 6	a) 6
b) 1,200 S/L	b) 2,500 S/L	b) 7,500 L
c) <u>360,000 S/L</u>	c) <u>750,000 S/L</u>	c) <u>2.25 million L</u>
d) ca. 160 kg/wk.	d) ca. 300 kg/wk.	d) 30 sugar bags/wk.
T	U	V
a) Frequent	a) 6	a) 6
b)	b) ca. 1,250 L	b) 1,000 S/L
c)	c) <u>ca. 375,000 L</u>	c) <u>300,000 S/L</u>

Households that make alegrías occasionally or for ferias only

W	X	Y
e) ca. 2 x yr.	e) small amt.	e) occasional
f) ca. 9,000 S/L	f)	f)
c) <u>ca. 18,000 S/L</u>	c) small amt.	c) Earns 60,000

TABLE p.4

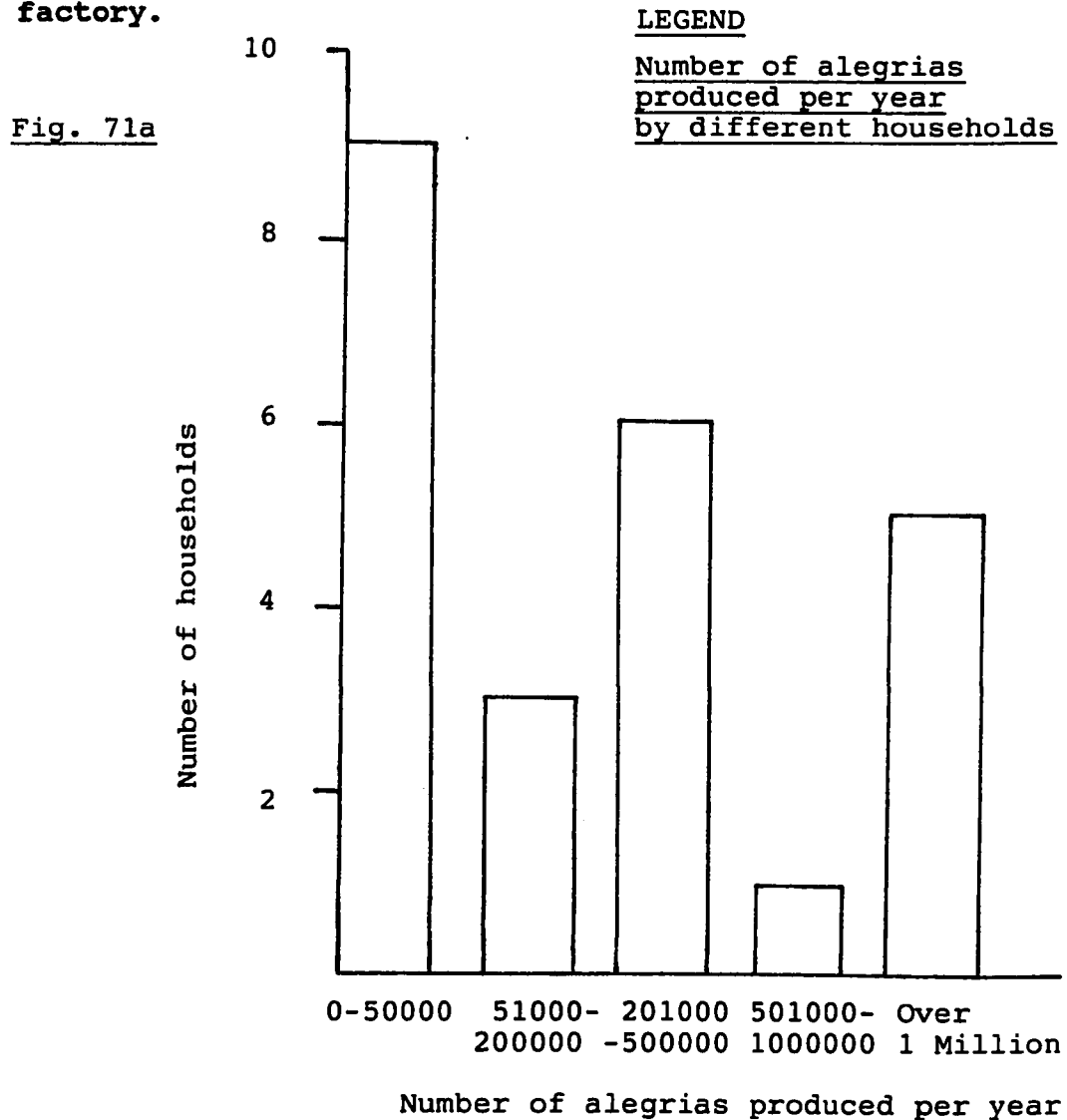
pesos/feria

Z	AA	BB
e) few x yr	e) occasional	e) 15 ferias/20 days
f) 500 S/L	f)	f) 7,000/feria + estimate/day
c) <u>ca. 2.5-5,000</u>	c)	c) <u>125,000 S/L (est)</u>
CC	DD	
e) occasional, fiestas/vac- ations	e) 3 mth/yr	

Households that make alegrías less than once per week

EE	FF
e) ca. 36 x yr	e) Occasional, when orders
f) ca. 1,250 L	f)
c) <u>ca. 45,000 L</u>	c) Prob. lg. amt.

seen to be villagers at the subsistence level. While as one moves up the scale the level of existence moves to artisan producers. 12 houses were calculated to make 275,000 alegrias or more per year, with quite a few around the million mark. Perhaps these 12 businesses deserve the title of major factories or major producers. Not included are figures for the co-op or the capitalist factory.



Marketing Methods for Alegrias

Methods of marketing vary greatly for alegria makers in San Miguel del Milagro and will be discussed at length. As a synopsis, some people sell in the village, particularly in the plaza on market days. Other small scale selling is done by young children who hang around near the entrance to Cacaxtla. On a much more major scale, selling of alegrias is done by producers at ferias. Because of the nature of ferias, i.e. the fact that they are celebrations held on particular dates or weeks of the year, this form of marketing is by necessity less regular in nature than the next form of marketing. Many people make regular trips, either daily or several times, or once per week, to bring their alegrias to their own particular marketing outlet, be it Mexico City, Puebla or elsewhere. Various states are visited for marketing. Some people go and return the same day, others make trips of perhaps 3 days each time, depending on where they are going and on their marketing strategies or methods. Of those who go regularly to Mexico City, the Mercado de Dulces is a common place for them to sell. This is a major candy market of Mexico City. Other people are purely involved in marketing, buying from someone in San Miguel del Milagro and selling the

alegrías elsewhere. This is relatively rare. In the last 7 years or so in Mexico, some of the most organized businesses or co-operatives have put sophisticated packaging on their products in order to promote sales to a wider market. Into this category fall the co-op in the village, as well as the capitalist factory, a large, privately-owned operation in the village. Marketing methods used by these two major organizations have been discussed separately under their respective names in separate sections. The various aspects of marketing, including a section on the ferias visited for marketing, as well as a special trip to the Mercado de Dulces with one of the village's major producers, will be elaborated on in more detail. Marketing of amaranth seed produced by the growers in San Miguel del Milagro has been discussed in the section on cultivation.

The marketing methods of the different producers and sellers of San Miguel del Milagro are various. They could be described under the different destinations that they travel to sell (San Miguel del Milagro itself, Puebla, various other states, the Mercado de Dulces in Mexico City, many different ferias in different states etc.), or the different durations of their trips, their methods of selling (carry boxes around, use a push cart,

sell to other vendors, sell to candy stores, sell to restaurants etc.) or their methods of travel (owning a van - rare; take a bus - common), or probably even in other ways. The problem with describing them in any of these fashions is that many of them fall into more than one of these categories. I have therefore decided to describe them under a different 'classification' for purposes of convenience, based upon how often or regularly they travel to sell alegrias. The categories I am using are as follows: weekends; travel every day; more than once a week, not daily; frequency not specified; local; infrequent, occasional or otherwise irregularly; once a week. These categories are still not entirely mutually exclusive, since someone selling on weekends can also be included in the categories of once a week, or more than once a week if they sell on both Saturday and Sunday, and someone selling locally only could similarly fall in a different category also. However, selling locally or on weekends seemed to present natural categories of their own, as opposed to someone who sold during the week etc., and so I have maintained these otherwise overlapping categories.

It may have been possible to exclude mentioning data obtained from all the known sellers had their

methods of selling duplicated those of other sellers. However, nearly all the sellers varied from each other in some respect, whether it be their frequency of travelling, their destination, their method of transport, duration of trips or other factors. For this reason I have mentioned nearly all the sellers below (referred to as informants or villagers), listing their different methods of selling in order to provide the most complete picture possible of the marketing of alegrías from San Miguel del Milagro. To help summarize this information I am including a table with all the different locations, cities and states where people go to sell (Table 12) from San Miguel del Milagro. I am also including a section describing what I was told about all the different ferias that they go to sell at, since this is their major form of marketing second to their regular trips to set destinations and secondary vendors.

Marketing activities of individual alegría sellers from San Miguel del Milagro based upon their frequency and time of selling

Weekends

After making alegrías on 2 days of the week one villager used to sell in Veracruz on weekends, leaving on Fridays and returning on Sunday afternoons. Another made

alegrias once a week, also travelling to sell them every week. They said Saturdays and Sundays were the best time to sell. They went to many ferias, not only on the weekends. Places they travelled to included Jalacingo (Veracruz), Pachuca and Tulancingo (Hidalgo), as well as ferias such as in San Miguel del Milagro (September 29) and Cholula in the state of Puebla, a 1½ hour trip from the village. An example of one of their regular weekend trips was to Jalacingo in Veracruz. This trip would take about 4 hours, leaving San Miguel del Milagro at 10 a.m. on Saturday and arriving in Jalacingo at 2 p.m. Occasionally they would make this trip on a Sunday. Another villager would go twice a week, on Saturdays and Sundays, to Mexico City, where he would sell from a basket in the streets. This supplied their entire earnings, less than \$15 U.S. per week. One informant would make alegrias on Fridays and Saturdays to sell on the next day (Saturday and Sunday) in the Plaza Tianges in Mexico City. Another made a small quantity of alegrias once a week, selling them in the plaza in San Miguel del Milagro on Sundays. One villager bought alegrias from another villager and went to sell them in Puebla on Saturdays and Sundays.

Travels every day to sell alegrias

In one domicile the wife makes the alegrias with hired help on 2 days of the week, while the husband travels to sell them for 6 days of the week. In this case the husband makes 2 trips per week on his own to either Tehuacan in the state of Puebla, Cordoba in Veracruz, or Orizaba, also in Veracruz. Each trip lasts 3 days, the informant staying in hotels and selling all his alegrias. To help him get around with the amount of alegrias he brings with him, he uses a hand-cart (diabolito) as he sells to people on the street. In this way he sells at least 20,000 large alegrias per week. Another travels every day to sell in the Mercado de Dulces in La Merced in Mexico City, to where people come from all over to buy the alegrias. He leaves early in his pick up truck for San Martin in Puebla and then takes the bus to Mexico City. This informant produces perhaps 22,000 alegrias per week. One informant, who produces about 7,200 per week, making them every day, also travels daily to the 'Mercado de Dulces' Ampudia (candy market) in Mexico City where he sells to various clients. Another produces 6 days a week with an output of about 15,000 alegrias per week. The brother of the owner of the alegria factory would leave at 4 a.m. every day by bus for the Mercado de Dulces in Mexico City, taking 5

boxes with him, each containing 50 packets of 10 alegrías. Another informant, would buy alegrías from his cousin in San Miguel del Milagro, taking 10-15 boxes a day to sell in the Mercado de Dulces in Mexico City. He would leave at 7 in the morning, travelling by bus and arriving at the candy market by 12 noon. One household ran a major alegría operation, producing perhaps the largest amount of alegrías, outside of Amarantlax and Amarantell, in San Miguel del Milagro. Production has been estimated at as much as 45,000 large alegrías per week and up to 2½ million per year. 12 people were working full-time in this alegría business, 5 of them family and 7 employed for 6 days a week. Like some other producers they would buy seed regularly from people who came from Morelos on a weekly basis. This business had a unique marketing arrangement not encountered otherwise. Like quite a few major producers, their alegrías were sold in the Mercado de Dulces. However, unlike others, the owner's brother sells from a stand that they own in the candy market. He would leave daily in a van for Mexico City at 4 a.m., returning in the evening.

More than once a week but not daily

One informant takes her own car or a truck to Puebla twice a week, taking 500 alegrías that she makes

each time to sell. 155 had been making 100 packets of 10 alegrías daily and travelling to sell them in Puebla every other day.

Frequency not specified

One household produced about 5-10,000 large alegrías per week. To sell they travelled to the candy markets of Mexico City, Puebla and Veracruz. Another informant makes 1,000 large alegrías per week and sold them to a restaurant in San Martín (Puebla), walking around the plaza there selling them also. Another villager made alegrías once a week and would sell their alegrías at various markets in Mexico City on Sundays and in Puebla on Saturdays, as well as at ferias about 12 times a year in Jalacingo (Veracruz), and the states of Morelos and Hidalgo. Travelling by bus, each of these 12 trips lasts about 3 days. They would take more to sell to the ferias. They also sold alegrías at the September 29 festival in San Miguel del Milagro. One informant made about 2-3 boxes a day of alegrías and would go to Mexico City every week to sell them to the vendors in the Mercado de Dulces. In August he stopped making the trips to Mexico City, so that he could have plenty of alegrías to sell when the feria in San Miguel del Milagro began in September.

Local

On a small scale, locally, one villager buys alegrías from Amarantlax and sells them at the church in San Miguel del Milagro, along with candles and flower garlands for church visitors. They also sell in San Martin in Puebla.

Since this vendor had a unique 'niche' in San Miguel del Milagro they have been listed here. Other informants also sold in San Miguel del Milagro, but since they also sold elsewhere, they have been included in the other sections here.

Infrequent, occasional or otherwise irregularly

One person only made alegrías for Semana Santa (Passion week), travelling to sell them in the Puebla feria that takes place that week. Occasionally they would also make them for the September 29 festival in San Miguel del Milagro. Another used to make small amounts to sell in plazas. Still another made alegrías occasionally and would sell them in San Martin, Tepeaca (Puebla), Atlixco (Puebla) and when there were ferias or fiestas. One house made alegrías only a few times a year, selling them in ferias in Puebla and Mexico. Another sold their alegrías at about 15 different ferias during the year, as well as making about 20 trips to

Puebla to sell them on Sundays. Three of the ferias were in San Miguel del Milagro, while others were in Puebla, Hidalgo and the town of Tlaxcala. Another made alegrías about three times a month, selling them to a candy store in Puebla. Sometimes they would buy alegrías to sell from another villager in San Miguel del Milagro. One person would make alegrías whenever he had orders from different candy stores in Mexico City. As a member of Amarantlax, the co-op, it was said that he had one set of clients for his own business, separate to the clients of the co-op. One couple, who were teachers, just sold alegrías at fiestas and in vacation times. Another household made alegrías for three months of the year and sold them at the Volkswagen factory in Puebla.

Once a week

One villager would make alegrías when they had seed but still buy alegrías from the co-op to sell when they weren't making them themselves. They would sell in ferias and markets as well as in the plaza here. Once a week they would sell, going by mini-bus to places like Mexico, Puebla, Huamantla (state of Tlaxcala) and Veracruz. Another villager made alegrías once a week and went to sell them once a week in Tehuacan (state of Puebla).

Additional information

One interesting piece of information was that a student of a teacher in the village was now said to be making the recently developed cookies in Guadalajara, perhaps an indication of how different amaranth products can spread to relatively far flung areas.

Ferias described by the people of San Miguel del Milagro, where they go to sell alegrias

As has been mentioned above, there are many ferias in Mexico, with the region surrounding the state of Tlaxcala being no exception. These are fairs, or celebrations which fall at fixed times of the year in different towns, often connected to the time of a religious holiday. These ferias are a favorite venue for the people who sell alegrias from San Miguel del Milagro to go and sell. Sometimes these trips can be quite far and involve several days at a time. Others could be closer and there are at least 3 in San Miguel del Milagro itself. Following is the information I was given by different vendors about the different ferias they go to sell at.

Quite a few villagers make a lot of alegrias for selling at the September 29 feria in San Miguel del

Milagro. I was given various durations for the period of activity that goes with this feria. Dates ranged from one estimate of from September 29 to November 20, while another informant said it ran from September 1 to October 24. Many people are said to come from all over for the festival, including pilgrimages from all over the place. The pilgrimages were said to end with one from Texcoco in Mexico State. Other ferias in San Miguel del Milagro were dated on April 25, May 8 and October 15. The latter date was said by one informant to be a better time to visit since people were better behaved then than for the September 29 feria. In the past, although I am not sure for how many years it was held, there was a 'Feria del Alegria' from November 13-20. However, I went down to Mexico from the U.S. especially for this feria in 1988 and it did not take place. It appears to have been discontinued now. The feria was apparently started in about 1983 and called the feria del dulce de alegria. It came about after the renewed interest in amaranth of the late 1970's, and was designed to be an exposition of amaranth products in the plaza to show what each person does with the product. It's aim was to further the market for amaranth. I was told by a prominent member the co-op in 1988, that 10,000 people came to this feria and at nights there were artistic events, folkloric

dances done by schools as well as visits from the University of Mexico. Another feria in the state of Tlaxcala was the October 12 feria in the capital town of Tlaxcala.

Ferias mentioned in other states included in the city of Jalacingo in Veracruz, and others in the states of Morelos and Hidalgo. In the state of Puebla there was a feria from November 8-15 in the town of Cholula, a few hours from San Miguel del Milagro. The informants who went to this feria spent the entire week at the feria. In Semana Santa, before Easter week, another feria takes place in the town of Puebla, which is not too far from San Miguel del Milagro. Table has been included to summarize all the different ferias where informants go to sell alegrías.

Some informants would go many times each year to these and other ferias. One informant went to about 12 each year, each trip lasting for about 3 days. Another went to about 15 ferias in a year. They would have a calendar of such events which they would go to each year. One informant noted that their year began with ferias in Puebla and Hidalgo where they would stay during the days of the ferias.

While ferias do not provide as regular a market as some other outlets, such as the Mercado de Dulces in Mexico City where there are people who require a constant supply of alegrías, they do provide a market which can last for several days at a time, depending on the festival. Moreover, larger quantities can be sold at ferias than, for instance, in a smaller market or in the streets, because of the festive nature of the occasions. They provide a significant source of income for many sellers, particularly for those who go frequently, such

TABLE 12

Geographical locations and venues where people from San Miguel del Milagro sell alegrías (one way travel time in brackets where informed)

State of Tlaxcala**San Miguel del Milagro**

plaza

store in Cacaxtla

store at Amarantlax

outside entrance to Cacaxtla

Church

other locations

3 different ferias, including Sept. 29

Tlaxcala (town)

includes various ferias

Huamantla**State of Hidalgo**

various ferias

Pachuca

Tulancingo

State of Morelos

various ferias

Mexico City

Plaza Tianges (Mex. Cty.)

Table 12 p.2

Mercado de Dulces, La Merced

a) sell to vendors b) run own stand (71)

**Mercado de Dulces, Ampudia (poss. same as La
Merced)**

various markets

various candy stores

other activities

State of Puebla

Cholula (1½ hours)

Tehuacan

Tepeaca

Atlixco

various ferias

Puebla (city)

candy market

candy store

feria of Semana Santa

Volkswagen factory

other activities

San Martin

restaurant

plaza

other activities

Table 12 p.3**State of Veracruz****Veracruz (town)****candy market****Jalacingo (4 hours)****feria****other activities****Cordoba****Orizaba****other desinations**

as those mentioned above who are going from 12-15 times a year. They also provide a good source of income to people who do not wish to, or who are not set up to, make alegrías on the daily basis and often in the large quantities, that may be required if one is to be successful in acquiring the market of regular buyers, such as the vendors in the Mercado de Dulces.

The 'Mercado de Dulces' in La Merced, Mexico City

It is evident from the presentation of data above on the major vendors of alegrías in San Miguel del Milagro and their marketing outlets, that the place most frequently visited by these vendors is the Mercado de Dulces in Mexico City. Six artesan producer households were noted to sell to or at the Mercado de Dulces. While one of these had ceased going to the Mercado de Dulces in August in order to stock up for the feria in San Miguel del Milagro, nevertheless, they went otherwise every week and possibly more than once each week. All the other vendors went every day (6 days a week). They are all major vendors and all but one are major producers of alegrías in San Miguel del Milagro. It is thus clear that the Mercado de Dulces provides the biggest outlet for alegrías for San Miguel del Milagro. One of these businesses (apparently the largest producer also) even

has their own stand in the Mercado de Dulces. These vendors sell 1.1 million, 360,000, 750,000, 1,875,000, 2.25 million and 375,000 alegrias per year respectively. This adds up to about 6.71 million alegrias being brought from San Miguel del Milagro to the Mercado de Dulces each year for sale!

To illustrate further what this market is and what is involved for some of those who travel there from San Miguel del Milagro to sell alegrias, I accompanied one of these people there on one of their trips. The informant who was followed on this trip runs a major alegria business with his wife and was the former mayor of the village. They are helped by 7 of their children and employ 5 people for 6 the days a week that they run their business. On the day I accompanied the informant, he was bringing 8 boxes of alegrias to Mexico, each containing 50 packets of 10 large alegrias (Fig.72). At 4.30 in the morning he was securing the alegrias in their boxes ready for their journey to Mexico (Fig.72). His oldest son (of those living at home) is very active in helping with the business and helped to load the boxes of alegrias into his father's pick-up truck. By 5 a.m. the informant was leaving for Mexico City with his son and another helper on the first stage of his journey. He

Fig. 72. Packing alegrías for the journey to the Mercado de Dulces at dawn.

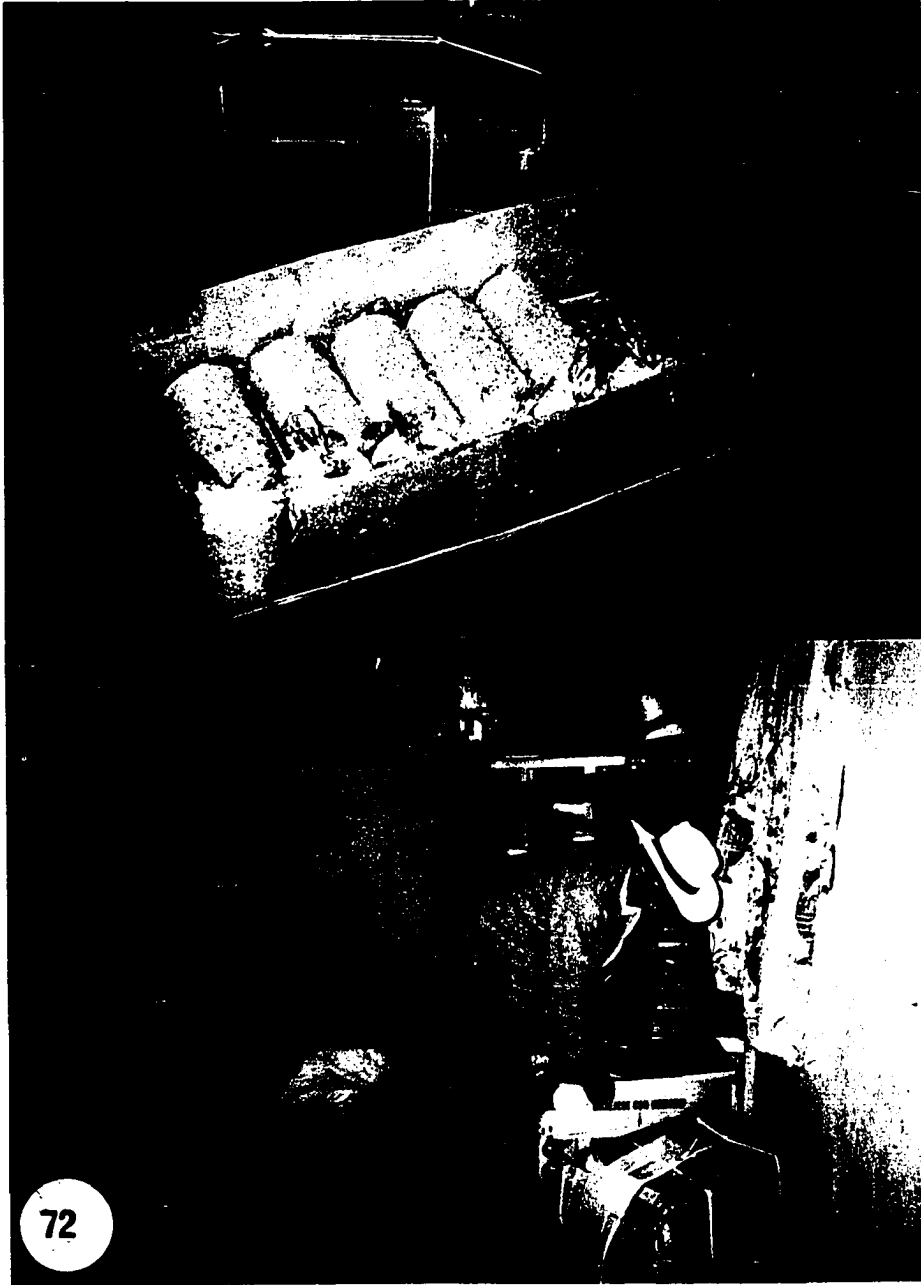


Fig. 72

takes the truck to the town of San Martin, a major market town about a half hour's drive from San Miguel del Milagro, and a principal transportation junction on the route to Mexico City. In San Martin he drives to the bus station where buses are leaving frequently for Mexico City. His help assisted him in loading his boxes underneath the bus (Fig.73) and then drove off with the pick-up truck, leaving the informant to get on the bus for Mexico City. By the time he had loaded the boxes and waited for the bus to leave it was about 6 a.m.

The informant knew the bus driver well from his regular trips and had an arrangement for the driver to drop him where there wasn't even a proper bus stop, as close to the Mercado de Dulces as possible, since the bus route did not go directly to the market. By this time it was about 10 a.m. Waiting for him here was a man who regularly helped him, who assisted him in getting the boxes from beneath the bus. The man had a 'diabolito' with him (a hand-cart), onto which he loaded the 8 large boxes (Fig. 74). The man then started off on foot with the cart on the 1-2 km trip to the Mercado de Dulces from here (Fig. 74). About 20-30 minutes later, by 10.30 a.m., the man arrived with the informant and the produce at the Mercado de Dulces. This market is housed in a

Fig. 73. Moving the alegrías boxes from his pick-up truck to the bus.

Fig. 74. Helper moving alegría boxes on 'diabolito' from the bus to the candy market.



Fig. 73



Fig. 74

large building and is similar in some respects to the Hunts Point market, for example, in New York City. It is a major center where people come from all over to sell their produce to vendors who have space in the market. Besides all the people bringing merchandise in, there are, of course, many more people who are coming in to buy the produce, mostly for sale elsewhere. Thus, the market is full, out the back, of vehicles that bring both people and produce to the market, as well as bustling with people who come to buy and sell. Besides the candy market, there are other adjacent markets of fruits, vegetables and other products, so the market is both a very busy as well as very colorful place.

The helper wheeled the boxes through a barrier that lead to the walkway that passes by the outer stalls in the candy market. The informant then walked around the market, negotiating with his regular customers and making arrangements to sell his alegrías (Fig. 75). Alegrias sold by the informant and other vendors from San Miguel del Milagro were easily recognized at the many candy stands by their round shape, since alegrías from other areas are rectangular. At all these candy stalls there were many other candies, nuts and other sweet items for sale. By 12 noon he had completed all his business

Fig. 75. Candy stands at the market. The informant (with hat) doing business with a vendor.



75

Fig. 75

and could think about his trip back to San Miguel del Milagro.

Other Occupations of People of San Miguel del Milagro

Although the majority of people in San Miguel del Milagro are involved in some way in the alegria industry, whether it be growing amaranth, making alegrías or otherwise, there are still a variety of other occupations that can be found amongst the people of the village. Many residents not only farm some amaranth, but also do something else. Many of the trades found involve working with the hands or making things (especially a variety of foods) to sell. Cacaxtla provides federal employment to quite a few also. Several people, whether parents or their offspring, teach, usually outside San Miguel del Milagro in other parts. Many describe themselves as campesinos, often meaning that farming, whether growing their own food or working for others, is their single or main occupation. The majority of the villagers are probably campesinos in some respect. Some of them farm animals and sell their cows' milk or sell the meat, or even the whole animal. There are quite a few stores, even though inconspicuous, that people in the village own and run. Others have left to go and work in Mexico City,

whether fathers, children or whole families. Still others are employed in large cities, from $\frac{1}{2}$ hour to 1 hour away, such as Puebla and Tlaxcala, several working in the textiles and weavings industry in Puebla. It is fairly common that a member of a family has worked in the U.S. at some point, illegally. Some are there at present while others have recently returned. School aged children of some families are currently in the U.S. Table 13 gives a breakdown of the various occupations and numbers of people who were said to be involved in the different activities listed. While the majority of the village work with alegrías or amaranth, Table shows those who have other occupations. Sometimes, they are involved in some way with amaranth in addition to these occupations (for instance, farming some amaranth or occasionally making alegrías or making alegrías and working shifts at Cacaxtla).

TABLE 13**Occupations of people in San Miguel del Milagro besides
amaranth related activities****1. Work outside San Miguel del Milagro**

- A Buys peanut brittle in Puebla and sells in Santo Toribio.**
- B Teachers (8 people): in Nativitas, 2 daughters in Tlaxcala, husband and wife in Aguas Calientes and Santiago Michoacan, husband and wife in the state of Puebla.**
- C Makes tortillas and goes to sell in Mexico and Tlaxcala.**
- D Works 5 days a week in San Martin.**
- E Night watchman in Tlaxcala.**
- F Work in textile and weavings industry in Puebla (3 people).**
- G Work in Mexico City (a father, 2 other children and a son).**
- H Bought a microbus with which they work in Mexico City.**
- I 2 parents work 5 days a week for the Social Security in Tlaxcala.**
- J Factory worker in Tlaxcala.**
- K Works in ILSA steel factory in Puebla.**
- L Sells dorados in Puebla.**
- M Drives large truck.**

TABLE 13 p.2

N Father runs a book business near Acapulco in the state of Guerrero, along way away.

2. People in the U.S.

A Was in U.S. in 1990 working as a busboy in Chicago.

B Had worked in a nursery in Connecticut.

C Husband currently away working in the U.S., sends m money.

D Brother has been in New York for a year.

E Child currently in U.S.

F Daughter now in Queens, N.Y.

3. Own/run store in San Miguel del Milagro

A 6 different informants were running different stores around the village, selling various provisions. Only one of these stores was said to be rented, and this was the Sugar dispensary, which was run by people from another village.

4. Cacaxtla employment (total of 14 people from the village, either full-time or part-time; providing almost 50 total days employment per week).

A Conservation of ruins 5 days a week.

B Watchman every other day.

C Cleans 5 days a week.

D Guard 2 days a week.

E Guard at night.

TABLE 13 p.3

F Cleans 1 day a week.

G Guard 5 days a week.

H Husband (6 days a week) and wife.

I Occasional work at Cacaxtla.

J 5 days a week at the anthropology institute at
Cacaxtla.

K 2 work as federal employees of Cacaxtla in Tlaxcala.

L Daughter works in candy store in Cacaxtla.

5. Making things to sell or selling

A Tostadas from corn.

B Tortillas from corn.

C Dorados de trigo (3 people).

D Make clothes.

E Artesania (different handcrafts).

F Foods such as quesadillas, gorditas, atole, which they
sell here in the plaza (4 people).

G Sells soft drinks in the plaza.

H Sells candles and flower garlands for Church visitors.

I Sells green ceramics on Sundays at the market in the
plaza and at the entrance to Cacaxtla, which he
buys in Oaxaca.

J Sells jams etc. at Cacaxtla entrance.

TABLE 13 p.46. Other occupations

Mayor, many schoolchildren or students, several retired, some housewives (probably quite a few), campesinos (many), keeping animals to sell for meat, whole, or for milk etc., carpentry (1 Person), painting and putting in mosaics (1), making boxes/construction (1), running business such as selling animals, buying and selling etc. (1 or 2 people).

DISCUSSION AND CONCLUSIONS

The study of amaranth in San Miguel del Milagro, Tlaxcala, Mexico provided a wealth of information, so much in fact, that I have not been able to include it all in this thesis. By way of summary, discussion and conclusions I will address each of the areas I set out to explore in this study. These objectives were outlined in the introduction and methods section of this thesis.

To find out the uses of amaranth in current day Mexico two approaches were taken. The first of these approaches was a literature search, the results of which have been presented in the sections on history of amaranth use and uses of amaranth today. Besides current day uses in Mexico, worldwide uses were also reviewed. Clearly, amaranth has many uses; as a ornamental, a wide variety of medicinal uses (particularly in Asia), a coloring agent, a vegetable, grain and animal forage, among others. In Mexico, it is of particular importance as a grain and there are a multitude of products which are being, and have recently been developed, particularly since the late 1970s when international experts were becoming interested in the crop and there began to be an interchange in knowledge between Mexico and foreign

scientists.

The second approach to studying current uses of amaranth in Mexico was the extensive use of questionnaires and other interviews to survey the uses known by the people in San Miguel del Milagro as well as other areas I visited in Mexico such as towns in the state of D.F., Morales, Puebla and Tlaxcala. In Mexico, the most important use of amaranth is as a grain. It is also used as a vegetable (quelites), ornamental, animal forage and medicinal uses have been seen but these are all minor importance. I have not seen the plant used as a colorant in Mexico. Numerous products made from the grain such as licuados, atole, pinoles, tamales, soups, flour and cookies have been listed and discussed in the results section. Still the most accepted product is the candy known as alegria. However, should the DIF project to introduce cookies and flour for pasta into the public schools really take off then this can change.

Regarding the different types of germplasm in San Miguel del Milagro, it was apparent that most of the farmers surveyed were not interested in any new germplasm introduced to them. They were growing Amaranthus hypochondriacus var. Azteca and distinguished only

between different color forms of this variety. The color forms recognized were named 'Roja' (red) and 'Blanca' (white) and 'Amarillo' (yellow) for the most part. These names were descriptive of the overall inflorescence color in particular. Another form named was 'Ginda' (a deep purple color). There was also a 3 month variety and 5 month variety grown and recognized. Eduardo Espitia Rangel has characterized and collected germplasm in San Miguel del Milagro and Chapingo has good germplasm collections from this area as well as the rest of Mexico. As far as local folk taxonomies relating to biological species concepts there doesn't seem to be a correlation. Although Ing. Rangel pointed out that San Miguel del Milagro was a good place for a further study of land races.

Amaranth is an ancient, important and historical crop of Mexico. Its significance to some of the native peoples has been discussed in this thesis. The codices that still exist have shown its importance as a ritual and spiritual plant. At present, amaranth does not seem to this cultural significance. This can be attributed to the abolition of native Nahua religions customs which have been replaced with Catholicism. However, it is still a food consumed at the many festivals associated

with religious holidays. In San Miguel del Milagro, many types of amaranth products are sold during the yearly pilgrimages associated with the September 29 festival. In fact, some people even call this festival an amaranth festival. However, there is no evidence to show that there is any religious significance to amaranth at present.

Cultivation techniques (cultural practices) have been outlined at length in the results section. These practices may stand as a guide or reference point for other areas interested in cultivating amaranth. Some noteworthy comparisons to its cultivation in other areas include the fact that amaranth is always sown directly in San Miguel del Milagro and never transplanted as it is in Tulyehualco, D.F. There are only a three month and five month variety both harvested once a year in October-November, whereas in other states such as Morales and Puebla amaranth can be grown year round. This accounts for why major producers buy seed from people who come to San Miguel del Milagro from Morales, since they can guarantee a continual and steady supply.

Clearly, amaranth is an economically viable industry in Mexico. There are a large amount of growers

as well as producers of alegrías. However, many informants in San Miguel del Milagro say it is a work-intensive crop and for this reason have given up growing it. Although it is labor-intensive it does guarantee a higher price per hectare than corn or wheat (Ramos Lopez 1992). It is not a staple food in Mexico but clearly as a cottage industry it provides many people in various states with their entire income. There is a concerted effort to make it into a bigger industry in Mexico and to export this crop. The development of the two cooperatives (San Miguel del Milagro, Tlax. and Tuelyehualco, D. F.), was linked to the foreseen economic growth and development of the amaranth industry in Mexico.

The people who grow amaranth are for the most part campesinos, farmers who live in a rural setting and grow their own food. In San Miguel del Milagro there are farmers who grow only amaranth and there are also farmers who grow amaranth as well as corn, beans and other vegetables. This has been discussed in the results section and it is no doubt that people grow other crops too because of the rotation requirements for amaranth. Many people interviewed told me that they grew amaranth every other year. The standard of living for many of

the people of San Miguel del Milagro is based entirely on the market for amaranth and its products. This can be seen by the results section which deals with marketing and shows how far people go to sell their products as well as how much they produce. It is no doubt that the market for alegrías provides a majority of the people of San Miguel del Milagro with a better standard of living than they would have if they only grew and sold corn, beans and other vegetables. The standard of living for those that have large factories, including Amarantell and Amarantlax is obviously better than the rest of the village. Due to the alegría industry, many of the people of San Miguel del Milagro travel throughout many of the states of Mexico on a regular or irregular basis to sell their products.

The recent interest in amaranth or the 'renaissance' of amaranth has clearly affected the people of San Miguel del Milagro. This can be seen in several ways: the reintroduction of native names for amaranth such as huatli, which no doubt was told to them by a visitor; the references one hears to the nutritional merits of amaranth, which have arrived through scientists and technicians and other publicity, including the use of amaranth by a Mexican astronaut; and lastly, the native

pride the people of San Miguel del Milagro have about their role in the amaranth industry, which has included them going to health fairs to teach about the uses of amaranth, to name just a few. Extension work has provided information on fertilization and actual growing trials of germplasm have been done by Chapingo in San Miguel del Milagro. However, this doesn't seem to have changed the people of San Miguel del Milagros way of doing things. The introduction of machinery for harvesting has helped those that grow large amounts of amaranth and have the money for them. Also the government funds have allowed the co-op to come into being and allowed the building to be built and machinery for popping the seeds to be bought. In general, the people of San Miguel del Milagro continue to use traditional methods for cultivation and production of alegrias. In the cases of the large capitalist factory and the co-op where a 'big business' mentality exists, I noted a real change in the personalities and attitudes of the people. In the beginning of my study, the people of Amarantlax were extremely helpful, and six years later they had developed a corporate, secretive attitude. It seemed that they thought I might give away trade secrets to competitors. Nevertheless, the life-style of the people of San Miguel del Milagro has not changed

dramatically.

While Rodale and Chapingo do not seem to have had too much effect on the amaranth industry in San Miguel del Milagro, the people of San Miguel del Milagro have furthered their projects by allowing the collection of germplasm, allowing them to have test plot and offering them information. Most farmers do not seem to feel that they have benefitted from this association but are open to their help particularly in solving some pest and disease problems. None of the farmers seemed interested in growing new varieties of amaranth and were satisfied with growing the same material that they have used for years. Government agencies, however, have had a dramatic effect by facilitating funding for the construction of the co-op and its machinery. However, in this arrangement the government also guaranteed to buy products from the co-op and many members believe that they could be selling their products elsewhere for a higher price. The D.I.F.'s plan to supply amaranth products from the co-op to all the schools in Tlaxcala was a great incentive for the co-op members. This plan has yet to have taken off and the results seems to be that the co-op is not in full production yet. There seemed to be little activity at the co-op on my last

visit in August 1992. This was a dramatic contrast to the 45 people employed full time per shift for a fully functional factory that the co-op's president had anticipated in 1988. This capacity was predicted if the co-op was running at its full potential. Hopefully, the co-op will be fully functional in the near future and the D.I.F.'s program will be successful. This school-meals program seems a terrific idea and is certainly a very innovative idea, which really seems to have the potential to not only guarantee a much broader market for amaranth but also stands to instill a taste for new amaranth products in children, who represent the future for Mexico.

As has been shown in the results section, San Miguel del Milagro is certainly a town where amaranth affects a great deal of the population. As I suspected, it did provide an interesting phenomenon. Of the 78% of the total population I was able to surveyed, 79% were involved with amaranth in some way. 68% of those surveyed were growing amaranth. 51% were involved with alegria production and marketing. I believe that these figures are if anything, low and if I had been able to survey 100% of the people I might have found that 90% of the people are involved with amaranth as one of the

informants suggested. Without doubt, amaranth is of amazing importance to the village, and is the center of its existence. Competition among villagers is not keen, even though one might expect this. The people seem to have found their own markets. I had wondered how Amarantlax in particular, and later the large factory, would affect smaller businesses. To my surprise, several informants said that they have no effect since everyone has their own market and even the co-op does provides other businesses popped seeds when they run out on occasion. Whether this scenario will continue should the co-op reach full production will be an interesting thing to watch.

Many studies have been done on the introduction of new crops. People tend to not be adventurous when it comes to changing their diets. Slowly, however, cultures do readopt their diets when marketing is well done and information on health issues becomes important. The United States has seen a remarkable change in diet in the past twenty years. People are concerned among other things, with cholesterol, fiber and fat, and have adapted their diets accordingly.

Amaranth, like tofu, will not become the food

served in every U.S. kitchen, in my opinion. It does have a future as a 'health' food and is known and eaten by some in the form of cookies and cereal (granola) in the United States. In Mexico, it certainly is important and may gain further importance if it is marketed properly. Introduction of a new food plant is often dependent on the palates of the people and their cultural bias in the area it is being marketed. Foods that people eat from different cultures differ greatly; for example: kiwi fruits, pine nuts, frog's legs, chocolate covered ants, caviar, calamari, gefilte fish, durians, sushi, or corn smut. Amaranth is able to be used in a variety of ways, making it adaptable to potential markets. Many of the products I have sampled were quite pleasant and may have potential as a gourmet food.

The real future for amaranth in my opinion, is in countries where a good protein source is not readily available. Where there is a need for food, it can be introduced and will flourish. This can be seen in Africa, where Dr. Gupta has introduced many products and locals have readily adapted to the taste of them. Amaranth is a wonderful plant due to its high protein content, and also to its ability to grow in varied

habitats and conditions, if given moisture in its early stages. It certainly could help to improve the nutrition of many hungry people worldwide. Its uses as a colorant, oil and medicinal should be further explored and may provide even more useful products.

It is my hope that this ethnobotanical study will be useful to the development of amaranth as a crop in areas that are in need of food sources and will help to lessen the burden of the hungry.

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