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Full Length Research Paper

Production, processing and marketing of ginger in Southern Ethiopia

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The cultivation of ginger was started in Ethiopia during 13th century when Arabs introduced it from India to east Africa (Janson, 1981). In Ethiopia it is limited mostly in the wetter regions of Southern Nations, Nationalities and Peoples Regional State (SNNPRS) and some parts of western Oromia. Most of the commercial production is practiced in SNNPRS by farmers within Kambata-Tambaro, Wolaita and Hadiya zones. Despite its uses and contribution to the livelihoods of smallholders and to economy of the country, there has been limited attempt to promote its production and marketing through improvement of pre-and post harvest handling of the crop. This paper highlights the results of a survey and a review of secondary sources of information in sample woredas from ginger belt of country with the objective of identifying ginger value chain problems and potentials in southern Ethiopia. The study identified that there are high potential ginger growing areas in SNNPRS located in Wolaita, Kambata-Tambaro and Hadiya zones that tend to specialize in production and marketing of the crop. However, production and marketing of ginger in these areas is constrained by low quality varieties, poor pre- and post-harvest handling practices, low product market prices and lack of access to markets.

Key words: Ethiopia, ginger, marketing, processing.

INTRODUCTION

Ginger is a commercially produced horticultural crop in SNNPS, Ethiopia. The producing areas in SNNPRS are said to be ginger belts in Ethiopia where much of the country's production and marketing activities are located. Even though these areas were known as major suppliers of ginger in the country, limited attention has been given to expand production for betterment of smallholder farmers engaged in production and marketing activities. Efforts to generate improved technologies were limited to agronomic practices with no concerted effort to improve product quality, which is highly influenced through its value chain from pre-harvest to postharvest management practices including processing of final products. Moreover, no effort has been made to assess farmers' pre and post-harvest management practices that could be used as a benchmark for improvement works targeting product quality and sustainable supply. Factors that determine performance of ginger marketing and reduce benefits to farmers engaged in its production were not adequately understood by policy makers and agricultural extension workers. This survey was carried out in major ginger producing areas of the region with the objectives of identifying pre and post- harvest management practices, processing techniques and marketing actors and practices in ginger value chain. It was found out that farmers practice their long-existed management practices in selecting varieties to be planted, undertaking field management of the crop, processing and marketing. Low market prices due to poor product qualities, cyclical variations in product price, lack of improved processing and storage facilities were found to be major ginger production and marketing constraints.

RESEARCH METHODS

This paper was based on the information obtained through reconnaissance survey undertaken in ginger growing areas of SNNPRS, Ethiopia in February, 2010. Two administrative zones, that is, Wolaita and Kambata-Tambaro, where farmers specialize in

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Table 1. Ginger area, production and productivity in southern Ethiopia.

Administrative zone	Woreda	Area (ha)	Production (qt)	Yield (qt/ha)
Hadiya	West Badawacho	423	67680	160
Wolaita	Boloso Bombe	7000	1120000	160
Kambata-Tambaro	Hadaro-Tunto, Qacha Bira	8223	1308652	159
Dawro	Gena Bosa	1500	225000	150
Kafa	Gimbo	55	8800	160
Shaka		379	60640	160
Bench Maji	Sheko	187	29920	160
Konta		473	75680	160
Total		18240	2896372	

Source: BOARD.

Table 2. Extent of ginger cultivating weredas of SNNPRS.

Woreda	Total area production (ha)	Percentage of ginger producing farmers	Total production (qt)
Hadaro Tunto	3986	80	637760
Boloso Bombe	5000	85	600000

Source: BOARD, 2008.

ginger production were purposely selected for the study. Consecutively, two ginger specializing districts from these zones were selected based on the discussions made with the zonal departments of agriculture. From each district selected, four ginger producing villages were covered by the survey. A qualitative survey method, using semi-structured checklists and informal survey tools such group discussions, personal interviews and filed observations, was administered to collect the required information. Field survey data were supplemented with information obtained through review of published sources. The data collected were summarized and discussed using a descriptive approach which is a qualitative research format.

RESULTS AND DISCUSSION

Overview of ginger production in SNNPRS

In Ethiopia ginger is cultivated under sub-optimal conditions with rain fall often less than 1500 mm per year and at lower temperatures (Jansen, 1981). However, reasonable yields have been recorded under sub-optimal conditions of the country. As indicated in Table 1 in 2006/2007, about 2896372 quintals of fresh ginger was produced from an area of 18,240 ha indicating regional average rhizome yield of 160 qt/ha (BOARD, 2008).

Table 2 shows that about 32% of the total arable lands are allotted to ginger production indicating that ginger was most extensively produced crop of Hadaro Tunto wereda. Same is true with Boloso Bombe woreda with only slight variation in the proportion of land used for ginger production. An estimated total yield of 1237760 quintals of fresh ginger rhizomes in the year 2008 was obtained from the total area of 8986 ha of land from the two major ginger cultivating weredas.

According to farmers of the areas, there had been a higher and more extensive production of ginger in ginger belt of the region before the last 3 to 4 years. However, in the subsequent years, a sudden fall of the price shortly occurred followed by a high production, which resulted in low market demand of the produce. Consequently, farmers could not get benefit from ginger production for the last 3 to 4 years. As a result, a total production and the size of land allotted by farmers to ginger production are declining at alarming rate. Currently, almost all resource poor farmers in Wolaita area are shifting to the production of a high yielding newly released taro variety and maize by abandoning ginger production. Farmers argue that growing ginger commercially is full of uncertainty if there is no market guarantee based on a certain agreement. Once it lacks market demand, the only alternative would be dumping, because no part of it goes to household consumption, unlike food crops.

Pre-harvest management practices

Land preparation

Most ginger growing farmers of the region start plowing the land allocated for ginger production at the end of the rainy season (from late September to early October) after harvesting previous crop. Plowing the same unit of land will be repeated for about 3 to 5 times. By doing so, seeds of weeds get exposed to the sun periodically and most of them die until dry-planting of ginger takes place 2 to 3 months after land preparation (February/January). The land that has been pulverized to a fine tilth at the end of the rainy season when the soil is at moist condition will

Table 3. Characteristics of different ginger vernaculars cultivated in SNNPRS.

Cultivar group	Vernacular	Unique characteristics
Local	'Feminine Wolaita'	Highly palmated rhizomes Large sized rhizomes More productive
	Masculine Wolaita	High fiber content Highly pungent Large number of prominent roots
Introduced	Bilbo	One prominent root
	Bolbo	2 to 3 prominent roots

conserve its moisture for 2 to 3 months. Depending on the soil type and the moisture content of the soils as well as the capacity of the farmer to use oxen power, the frequency of tillage ranges between 3 and 10. Plowing the land just at the end of the rainy season allows dry season planting of ginger. It enables early planting of the crop to take advantage of using the total amount of the rainfall distributed in the growing season and the crop will complete its normal growth cycle, which in turn makes it more productive. Conversely, late planting, as the result of late onset of the rain, results in significant yield reduction as indicated by farmers.

Variety selection

Farmers identify two groups of ginger varieties in SNNPRS, that is, local and introduced, each group comprising two varieties with distinct morphological characteristics. In Wolaita, farmers classify the local cultivars as 'Masculine Wolaita' and 'Feminine Wolaita'. However, in Kambata, farmers identify one local cultivar known as 'Hargema', that shows great resemblance with the cultivar 'Masculine Wolaita'. In both administrative zones, the local cultivars have been under production since time immemorial. However, cultivars categorized in the introduced group were introduced to the area in the late 1990s. According to farmers, these two introduced cultivars have been disseminated through informal seed system. Most farmers are substituting the local cultivars with the new introductions. Each quarter of ginger production of the region tends to produce distinctive types of cultivars. The different characteristics/ requirements of the major ginger vernaculars currently cultivated in SNNPRS as pointed out by the farmers are presented in (Table 3).

As can be observed from (Table 3), farmers also identify quite a lot of variations among the different cultivars for pre-harvest requirements and post-harvest characteristics as well as differences in commercial values.

Method of propagation and management of planting materials

Ginger is propagated by planting pieces or portion of rhizomes which have at least one good bud. In SNNPRS, farmers developed their own traditional management method of ginger planting material. It involves two methods that is, underground storage method and indoor storage method. The former method is not a common practice but the latter is the popular seed management method that most farmers are practicing in the region. With the first method, ginger rhizomes of the previous crop are kept in the ground without being harvested until the time of planting. During planting time, the crop is harvested, rhizomes are cut into pieces of the required sizes and are immediately planted. In this case, it may take 2 to 3 months for the emergence of the new plants. The second method of propagation involves the following steps. First, rhizomes of the previous crop are harvested in November. Secondly, rhizomes are cut into pieces of the required sizes (usually to 2.5 to 5 cm length) and are placed mostly in plastic sacks, and finally, sacks containing the setts of ginger are stored in residential houses. After 15 days to one month of cutting the rhizomes into pieces, the cut pieces tend to sprout in the sacks where they are stored. Once sprouting is initiated, dry or wet planting will take place. Farmers indicate that the rate of germination of rhizomes using indoor seed storage method is very fast.

Farmers in the region plant larger pieces of ginger rhizomes. The reason is that larger pieces will be re-harvested as 'Kania' together with the newly developed rhizomes and are economically valuable when they are sold in mixture with the new harvest. However, no evidence has been reported on the quality of 'Kania' to be used as input for preparing any sort of ginger final products (that is, ginger powder, oleoresin, and volatile oil). A study by Hailemichael and Tesfaye (2008) in Tepi, Ethiopia indicated that seed rhizome size significantly affected dry rhizome yield. However, there have been no recommendations on the effect of the management of

planting material on yield and quality of ginger in the study area. Similarly, the effect of size of the cut pieces of rhizome on the yield of ginger also remains to be unaddressed.

Spacing, planting depth and time of planting

Size of cut pieces is one of the major factors that affect seed rate in ginger. Ginger growing farmers of the region also use approximately similar seed rate with that of research recommendation which falls in the range of 17 to 28 qt/ha. Because of its biennial nature, ginger needs to be planted as early as possible in the growing season to exploit the limited moisture in its growing areas in the region. It is customary to plant ginger in the dry months on plots of land which have been prepared during wet season with the objective of conserving water for dry planting. To make use of the conserved water, deep planting is essential. Long ago, Janson (1981) reported a planting depth of 5 to 10 cm used for ginger in Ethiopia. Planting depth is one of the most limiting agronomic factors that affect productivity of crops. Ginger producing farmers of SNNPRS prefer dry planting in December and January on the unit of lands that have been pulverized to a fine tilth during wet season for the purpose of moisture conservation. Farmers declare that this joint effect of planting time associated with the indicated tillage practice increases productivity. In general, seed rate, planting depth and time of planting need to be explored in order to exploit the genetic potential of the ginger varieties.

Fertilizer use

Farmyard is a major fertilizer used for ginger production in SNNPRS. However, it cannot support large scale production since the availability of farmyard manure is limited. On the other hand, the rate of its application for optimum yield per unit area has also not been determined for ginger. In addition, farmers complain that working with farmyard manure is laborious. For large scale production to be undertaken outside the homestead, the cost of transportation of farmyard manure is also very high.

Some farmers who plant ginger at large scale in the region also use compost as a source of nutrient for producing ginger making from all kinds of organic materials such as crop residues, kitchen wastes, garden cuttings, and manure. Compost supplies nutrients at the right time in required quantities. Compost is especially useful for improving the soil structure and fertility.

Coffee pulp and husk have been the other sources of nutrients used by the farmers that produce ginger at commercial level in the region. They purchase the coffee pulp and husk from the wet and dry coffee processing plants operating in their vicinity and even from the neighboring woredas and transport to their farm when they speculate high market demand for their ginger product.

Although the price of chemical fertilizers is unaffordable, and chemical fertilizers do not improve the soil structure, some farmers producing ginger at commercial level use DAP when they expect that they will get good prices. Almost all farmers do not use UREA in ginger production as they perceive that “UREA dries the soils”. Time of application is variable with season of planting. During dry planting, farmers do not apply chemical fertilizers. They apply the fertilizer by broadcasting approximately 3 to 4.5 months of planting during the cultivation at the rate of approximately 100 kg/ha when the rhizomes emerge. However, farmers do not use chemical fertilizers in small scale cultivation, and where prices are fluctuating. It has been a usual practice in ginger production to give a combination of organic and chemical fertilizers. However, the correct proportion of both nutrient sources for optimum yield/quality need to be defined. Similarly, research needs to be conducted to determine the correct type, rate and time of application of the chemical fertilizers for the optimum yield/quality as well as to analyze the economic aspect of fertilizer application. In India farmers apply manure 25 to 30 tons/ha or apply compost at planting, and N 36, P, 16, and K 66KG/ha (Janson, 1981). The recommended rate of chemical fertilizers at Tepi Sub Research Center for an optimum yield of ginger was 375 kg/ha urea and 175kg/ha DAP.

Weeding and pest control

In Ethiopia, farmers follow non-chemical weed management practices that include deep plowing of the seedbed at the end of the rainy season and frequent cultivation. Before the season of planting comes, farmers begin to prepare seedbed at the end of the rainy season (between late September and early October) plowing the same unit of land as frequently as 3 to 5 times. By doing so, seeds of weeds get exposed to the sun periodically and most of them die until dry-planting will take place 2 to 3 months after land preparation (January to February). Pests of ginger are root-knot nematodes, and shoot borers (Purseglove, 1972). So far, in Ethiopia, no disease and pest records of ginger have been reported.

Harvesting

In Ethiopia, it is not habitual to harvest ginger based on the end use. In SNNRS, for dried and fresh ginger, mature rhizome with a full aroma, flavor and pungency are harvested after planting when the leaves begin to turn yellow. Harvesting is usually manual taking no care whether the outer epidermis or the rhizomes are damaged or not. Two forms of ginger harvesting are identified in SNNPR, that is, one-season harvesting and

perennated harvesting. One-season harvesting involves harvesting of matured rhizomes within one growing season. In SNNPR, usually harvesting of ginger begins 8 to 9 months starting from late September when the leaves start turning yellow and the stems stop growing, which, may extend to March or until the onset of the 'belg' rain. Within the same growing season, farmers sometimes deliberately extend the time of harvesting speculating high market price. Sometimes ginger is grown as a perennial crop in SNNRS. In this case farmers deliberately leave the matured ginger rhizomes in the field for two or more successive seasons without harvesting.

Postharvest management practices

Postharvest management practices of ginger involve several activities. These include preparation of dry ginger, storage and processing. Farmers' practice in the study areas were identified and presented as follows.

Preparation of dry ginger

In Ethiopia, quality-reducing traditional drying methods have been used for the preparation of dried ginger. Actors of these methods include farmers, retailers and some wholesalers. The major actors of the drying process are individual farmers followed by the retailers. The contribution of wholesalers, who sometimes use cemented floor, to the total dry ginger preparation is insignificant.

Farmers spread the harvested ginger rhizomes on dusty and dirty floors without cleaning and trimming roots from the rhizomes to prepare a dried ginger or sometimes leave it on farm after harvesting until it loses some percentage of moisture and spread on floor for full drying. Sun drying of ginger is a laborious process which could take 30 to 45 days depending on the type of variety and weather condition. Brilliant and stable sunshine condition at Areka, for example, in most cases is not attainable due to some irregular showers of rain, which leads to mold development mostly in the introduced cultivars. For this reason, it is habitual to break the rhizomes into tiny pieces to enhance fast drying. Breaking the rhizomes into smaller pieces has its own negative impact on the quality of the dried product by decreasing the volatile oil content of the rhizome on one hand, and enhancing the development of the Aflatoxins on the other. Similarly, peeling off and damaging of the rhizome skin during the process of harvesting and drying should be minimized. While drying, the rhizomes need to be frequently overturned to maintain uniformity of the rhizomes until the product attains the moisture content of 7 to 12%, which is required for dry ginger.

Washing the rhizomes before drying, that is practiced by a single wholesaler company the areas, is unthinkable by farmers in the region. Surprisingly, no significant price variation per unit volume was made between products that have subjected to drying on the cemented and non-cemented floor. As far as the volume of ginger that a farmer owns and water availability for washing the rhizomes is concerned, washing rhizomes at individual farmer's level would be impractical. Therefore, it will be essential to design the strategy, which possibly involves cooperatives and/or interested investors. The cooperatives or the investors may collect fresh ginger rhizomes from individual farmers on a given price agreement and they may add value to the product by washing and drying or they can sellout the rhizomes after washing to any enterprise/company for further processing.

In general, drying process employed in the region so far for the preparation of dried ginger is too primitive and, hence could not maintain the product's quality. Consequently, its contribution to the livelihood of ginger growers and to the economy of the country has been insignificant. Thus, it calls for the joint effort of the actors including farmers, private sector, GOs and NGOs in order that quality dried ginger product might be supplied and become competitive in the global market.

Storage

Storage provides protection against weather, moisture, insects, micro organisms, rodents and any type of infestation and contamination. In SNNPRS, farmers often sellout their fresh ginger immediately after harvesting especially, when there is a high market demand. As a matter of fact, the ginger market has always been so much unstable and farmers are enforced to keep their produce in the storage for some period after drying until they get remunerative price. Producers store dried ginger in their houses using various types of traditional structures. Therefore, they use it as a means of value addition by changing time of supply of the produce. Moreover, storage is practiced to make use of the advantage of storage as 'saving cash in bank'. So far, no improved structure has been developed for ginger storage in the production area.

It is customary to store dried ginger either in bulk or in woven plastic sacks in non cemented dusty rooms, sometimes, for up to 10 years, depending on the type of the variety and the market demand. However, such storage condition not at all fulfills the basic requirements for safe and scientific storage. It is evident that the quality of ginger decreases with long storage period leading to decline in essential oil content. Nevertheless, some farmers continue storing their ginger for up to 10 years. Therefore, Post-harvest management of ginger like, preparation of dried ginger and storage are need immediate attention.

Processing

In Ethiopia, few companies are engaged under two categories of ginger processing activities. The first category is preparation of dried ginger and, the second is extraction of ginger oleoresin. The former has been mainly performed by individual ginger producing farmers with a negligible portion going to one private enterprise situated near Bombe, Wolaita, that is, drying ginger on cemented floor after washing. The latter has been carried out by two factories known as Ethiopian Spices Extraction Factory (formerly owned by the government and has recently been privatized), and KASK (privately owned and now on the hands of a Bank due to liability). The two companies (Ethiopian Spices Factory and KASK), which are engaged in oleoresin extraction could not operate to their full capacity due to the following reasons:

1. The dried ginger has been full of impurity as it is prepared traditionally by local farmers.
2. There is low percentage of oleoresin content per unit volume of ginger as a result of perenniated/extended harvest, long storage period, over drying and/or re-drying due to dampness.
3. The factories which were designed to extract pepper oleoresin formerly require high cost for modification of parts.

Currently, both factories are not functional due to transition. Even if they operate to their full capacity, it would remain insignificant as they absorb only the small fraction of the volume of the ginger yield produced per year in the region.

Apart from these, the Ethiopian Essential Oils Research Center sometimes extracts essential oils from different essential oil yielding plant spices for research purposes. Otherwise, no company in the region or at the country level was engaged in practical ginger processing activity.

Marketing of ginger products

The issue of marketing is of great importance for produces of ginger in the areas. This is due to the fact that almost all the total amount of ginger produced by small-scale farmers is supplied to market with negligible amount locally consumed. However, ginger growing farmers have been severely affected by fluctuating market prices over years. Hence, production of ginger in terms of area has been growing in response to good market prices and declining in response to depressing prices. Thus, it can be realized that market signals are very determinant factors dictating ginger production in the areas.

Marketable products of ginger

Three types of ginger products are supplied to market in these areas. The first one is fresh ginger which is usually supplied to market in rainy season for immediate cash demand. It is also supplied in dry season as assemblers collect it for re-sell to large traders after sun-drying. Dry season fresh ginger supply also targets local farmers who demand it as a planting material. Long ago, Ethiopia was exporting some fresh ginger to Egypt, Saudi Arabia and Yemen. The fresh Ethiopian ginger was reported to be a good product with a nice color, and quality which can be stored quite long (Janson, 1981). Currently Ethiopia is not exporting fresh ginger. Exporting of fresh ginger demands high quality ginger varieties and early time of harvesting as well as high financial capacity and transportation technology.

The second type of marketable ginger product is dried ginger. In Ethiopia, dried ginger is favorite ginger product exchanged in large volumes by all market participants at different stages of marketing from local assembling to export market. Dried ginger for this purpose is harvested 8 to 9 months after planting when there is mature rhizome with a full aroma, flavor and pungency. Further delay not only increases fiber but also decreases oil and oleoresin content.

The third type of marketable ginger products are extracted ginger products. These include ginger powder, essential oils, oleoresin and others. The extent to which rhizomes are treated prior to drying directly affects fiber and volatile oil content. Removal of the cork skin reduces fiber content but enhances oil loss through rupture of the surface oil-cells; thus, cleanly peeled ginger generally has a lower oil and fiber content (Pruthi, 1998; Weiss, 2002). The benefits from extracting and marketing these products are going unreached these times by the country.

Ginger production and marketing constraints

Several ginger production and marketing constraints were identified by farmers during the survey. Farmers recall that one quintal of fresh ginger was equivalent to that of about 11 quintals of maize before three years when this study was conducted. On the contrary, at present, the value of 20 quintals of fresh ginger is less than a value of one quintal of maize. This indicates that the market price of ginger is declining and that of food crops is rising. At present, a quintal of fresh ginger is sold for birr 20 to 30, which hardly surpasses the transportation cost to have a quintal arrived at the market. Moreover, as ginger crop is high-input user such as: high frequency of weeding and high input requirements including seed and fertilizers, the high cost of production could result in loss if market prices are below the expected level as there are irregularities. In addition, due to lack of facilities for ginger drying, long time is required to get dry ginger by using traditional practices that lead to development of fungi during wet weather condition contributing to low market price.

Generally, the market price of ginger is highly unstable.

In some years it rises up as high as Birr 2250 per quintal of dried ginger as opposed to less than Birr 150 per quintal when the price falls down. In the past, according to farmers, it was familiar to resume high price after some years of price fall. They argue that recently, the price change is uncertain and difficult to predict that would hamper further ginger production and storage in the region.

Marketing malpractice in ginger marketing has been a common practice, especially when the price of ginger becomes higher. It is practiced by both the producers and traders. Two forms of malpractices by producers in some areas of ginger production have been recognized. These are mixing a fresh ginger with a damp soil, and a dried ginger with special stones having exactly the same physical appearance with that of the dried ginger rhizomes. Marketing malpractices by regional traders is reflected mostly in altering weighing balance adjustments to their advantages. For example, their weighing balances for a quintal are commonly adjusted to read 125 to 130 kg for fresh ginger and 110 to 115 kg for dried ginger. Moreover, the unit of mass measurement known as 'Feresula', commercially an equivalent of 17 kg, is accepted as 20 kg by the regional traders when they buy the ginger from the farmers while when they sellout the product to the subsequent levels of traders, they restore it to 17 kg. Farmers have no role in deciding on the price of their produce. It is the traders through illegitimate brokers who decide the price of ginger. As a result, farmers have no choice than accepting the price set by a few traders. Some commercial farmers who attempted to transport their produce directly to the wholesalers to the central market had been put to tragedy by the action of brokers. If brokers get information that a farmer has transported the produce to the central market, they tend to shortly communicate each other and immediately block the farmer not to sellout the produce to the wholesaler. If the produce remains unsold, the farmer will be obliged to pay higher cost for hoarding the product. The existence of middlemen along the ginger marketing chain not only reduced the producers' share, it also exposed farmers to additional expenses by blocking the flow of information.

CONCLUSIONS AND RECOMMENDATIONS

Ginger has been produced as an important commercial horticultural crop in southern Ethiopia. Farmers produce different varieties and apply traditional management practices. External support in promoting improved varieties and management practices is almost non-existent. Ginger product markets are very volatile and price fluctuations create a disincentive for farmers in the production of the crop. Thus, researchers have to assist farmers in indentifying improved varieties with desirable market traits, appropriate agronomic and post- harvest management practices including drying methods, sorting and grading techniques, as well as processing technologies. Extension workers and other development practitioners have join hands with the farmers in addressing marketing problems such as: easing barriers to entry into markets by organizing ginger producers into producers and marketing cooperatives.

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