Ginger Farming Practice in Jaba Region, Kaduna State, Nigeria

Ahmed Maigari Ibrahim
Department of Environmental Management,
Bayero University, Kano, Nigeria
E-mail: wadeconsult2@gmail.com

Abstract
The paper described and assessed ginger farming practice in Jaba region of Kaduna State, Nigeria; which is the largest area of ginger production in Northern Nigeria. The methods used include: Field observation; FGD; and In-depth interviews. The result shows that ginger farming practice in Jaba region is a full 12 months calendar event, with task and activities distributed according to operational and time requirements. The farming practice requires three basic attributes; good time management; right and needed labour; and sufficient fertilizer inputs. Rainfall abnormally, market glut, and fertilizers, are the major challenges facing ginger production in Jaba region, while processing at village level, middle men problems, and lack of credit facility and direct access to international market, are the constraints that exceed the strength and capabilities of ginger farmers to term with. The study recommends that, ginger farmers should be sensitized on the benefits of value adding strategies, new ginger slicing technique, should be explored, and Government should regulates the activities of middlemen, establish ginger marketing outlets, and provides attractive polices and avenue for ginger investors.

Key words: Ginger, Farming, Jaba region, Kaduna

Introduction
Ginger (Zingiber officinale) is a rhizome, which consist of numerous short finger-like structures or branches born horizontally near the surface of the soil. Two commercial varieties are commonly cultivated in Jaba region. The yellow ginger variety locally called “Tafin Giwa” with a bold yellow rhizome flesh is stout with short internodes. The black ginger variety locally called “Yatsun Biri” with a dull-grey colour rhizome. The yellow variety is more popular than the black variety apparently due to its high yielding capacity and pungency (Kure, 2007). Ginger is produced in several parts of Nigeria particularly in the Guinea Savanna Zone (southern part of Kaduna State) and to a little extent in Keffi and Akwanga Local Government Areas of Nasarawa State (Dauda and Waziri, 2006).

Ginger is the most widely grown by all farming communities in the Jaba region. Indeed, it is the main cash crop that all small holder farmers in the region are willing and deeply involved in cultivating due to high profit. This made some farmers in the area to devote all their farmlands to ginger production as against subsistence crops such as guinea corn or maize. In terms of local
consumption, however, it is the least among all the other cultivars. This is because; over 95% of its produce is exported to various countries of the world as export commodity.

Owing to the above outstanding and astonishing qualities of ginger production and its economy, one may expect its farming practice to be simple; just like that of the other crops grown in the area or elsewhere. But on the contrary, it requires special skills and know-how. Although, there are several studies in the area that have attempted to described and analysed the profitability of ginger farming and its associated livelihood mechanism, such as KADP (2000), Ajibaje and Dauda (2005), Dauda and Waziri (2006), Kantiok (2007), Kure (2007), Lawal (2007) Yakubu (2007), Nandi (2011), Nandi, Yurkushi and Ashiko (2011), NdaNmadu and Marcus (2011), Shehu et al (2013a&b), and Sati and Bala (2017), among others, but there exist no single attempt to describe the ginger farming practice in the area. This is highly imperative, because it will help in revealing and understanding the nature of the production processes, potentials, challenges and constraints. It will also highlight areas and specific aspects that require intervention. Thus the aim of this paper is to describe the ginger farming practice in the Jaba region of Southern Kaduna State, Nigeria, in order to fill this existing research gap.

Material and Methods
Jaba region; which comprises of five local government areas, namely: Jaba, Jema’a, Kachia, Kagarko, and Zangon Kataf Local Government Areas, Kaduna State, Nigeria, is a prominent zone of ginger cultivation. The distinctive geographical location of these areas that lies around the escarpment of Jos plateau, largely characterized with hilly undulating topography; cold and warm micro climate; and dense mountain/guinea Savanna vegetation, made the region favourable for the cultivation of wide varieties of cultivars ranging from trees to cereals and tuber crops. Some of the tree crops commonly grown in the area are: Coconuts, Oranges, Apple, Pawpaw, Banana, Grapes, Pears, Palm Canal, Elephant Palm, Sheer Butter trees (Vitellaria paradoxa), Locust beans (Parkia biglobosa) Mango (Mangifera indica), and Malina for timber. The commonly grown cereals and legumes are Maize, Guinea corn, Rice, Cowpea, Ground nuts, Sesame, Soya beans, Beniseed etc, while the tuber crops include: Yam, Cocoyam, Cassava, Potatoes, Ginger, and Turmeric, among others. Among all these cultivar, ginger is the most widely grown by all farming communities in the Jaba region.

The study area is located between latitude 9o5’ to 10o10’ North and longitude 7o16’ to 8o35’ East (Figure 1). The climate of the area is tropical continental with distinct seasonal regimes, oscillating between cool to hot dry and humid to wet (dry and wet seasons). The rainy season starts from April and ends in October with a mean annual rainfall of 2000mm. August and September are the wettest months and the annual average temperature ranges from 23oC to 28oC. The months of November to March are the dry season periods. The primary occupation of over 75 percent of the active population is farming (Shamah, 2009), with ginger as the main cash crop. It was estimated that about 1,728.930 metric tons of ginger are produced annually in the Jaba region (Kaduna State Perspective, 2009) and currently it has increased to about fourteen times; 68,000 metric tons (fieldwork: 2018).
The data for the study was derived from field observation, Focus Group Discussion (FGD), and in-depth interviews with male respondents drown from the five local government areas that formed the Jaba region. Two different FGD sessions were held in each of the Local Government Areas with purposively selected male respondents; forming a total of ten FGD sessions. The respondents were categorized into two different groups: the elderly group (A) and the youth group (B). The elderly group comprised with ginger farmers aged between 45 to 70 years, while the youth group comprised with ginger farmers aged between 25 to 40 years. As a whole a total of 95 male respondents with varying years of experience in ginger farming (5 to 52 years) were involved.

The in-depth interview, on the other hand, involved interviews with key informant respondent purposively selected based on their experience on ginger activities. A total of five people; one each from the five local government areas were individually interviewed. Both the focus group discussion and in-depth interviews centred on ginger farming practice in the study area, specifically, activities, operations and issues such as site location, field preparation, seed selection and storage, planting, weeding, fertilizer application, harvesting and processing, challenges and constraints, among others were raised and consensus views were noted. Table 1 shows the distribution of the FGD sessions across the study area.

Source: Fieldwork, 2017
Table 1: Distribution of Focus Group Discussion and In-depth Interview Sessions

<table>
<thead>
<tr>
<th>LGAs</th>
<th>Location</th>
<th>FGD Sessions</th>
<th>Number of Respondents</th>
<th>In-depth Interview</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaba</td>
<td>Kwoi</td>
<td>2</td>
<td>12</td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>Jema’a</td>
<td>Kafanchan</td>
<td>2</td>
<td>12</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>Kachia</td>
<td>Kachia</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Kagarko</td>
<td>Kagarko</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Z. Kataf</td>
<td>Zonkwa</td>
<td>2</td>
<td>7</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>5</td>
<td>44</td>
<td>51</td>
<td>95</td>
</tr>
</tbody>
</table>

Fieldwork: 2018

Result and Discussion

Site Location

Consensus views from all the FGD sessions revealed that ginger can be cultivated on any available land except stony and waterlogged or marshy land. Thus, it is a common practice when locating a site for ginger cultivation in the area to avoid stony and marshy conditions. Respondents maintained that stony farmland does not allow ginger to grow wide tubers while waterlogged farmland made the ginger tubers to get rotten. Based on relative assessment, five major categories of farmlands were identified for ginger cultivation in the area. These are: flat or gently sloping farmland; stony farmland; marshy farmlands; flood plain farmland; and hilly farmland. However, among these, flat or gently sloping farmlands are the most prepared site for ginger cultivation in the area. This according to the respondents allows the ginger plant to grow very well and produces high yield, compared to otherwise. Table 2, shows a preference ranking of ginger cultivation site.

Table 2: Preference Ranking of Ginger Cultivation Site

<table>
<thead>
<tr>
<th>Farmland Type</th>
<th>Preference Ranking</th>
<th>Access</th>
<th>Availability</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat Farmland</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Flood Plain</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Hilly Farmland</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Marshy Farmland</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Stony Farmland</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: Fieldwork, 2018

Key: 1 = First, 2 = Second, 3 = Third, 4 = Forth, 5 = Fifth

Table 2, shows flat farmlands are the most prepared farmlands for ginger cultivation in the study area for reasons of easy access, readily available, and high yielding harvest, while marshy farmlands are the least for season of very low yielding harvest. Respondents revealed that about 75% of the ginger cultivated in the region is grown on flat farmlands while the remaining 25% on flood plain, hilly and stony farmlands respectively, but never in a marshy farmlands.
Field Preparation
Unlike most tuber crops which are usually grown on either mounds or ridges, ginger in the Jaba region is grown on flat bed. This according to respondents has been the practice in the area for long time unmemorable. Consensus views revealed that if ginger is cultivated on mounds or ridges it will not yield much and the quality (flavour and pepper spices) would not be the same than if cultivated on flat bed. This anointed belief has been proven right by a comparative experimental study by Sati and Bala (2017). The study also revealed low runoff and low soil erosion in the flat bed method compared with mound and ridges methods.

The flat bed field preparation method is usually carried out in two steps; tillage (Kaftu) and flat leveling, locally known as Bugu. The tillage is done either manually or with the aid of harrowing machine (by those that have large farms or can afford), after which manual flatting of the surface bed followed. This operation is usually done in April after heavy first rain or in some cases March, where the soil is moist or soft. Irrespective of the farm size, field preparation operation is highly labour intensive. For example, a field that can produces ten bags (100Kg/bag) of fresh ginger stuff, it will require ten people to till it in a day (average of 6 working hours) and also the same is required for flatting the surface bed.

Seed Selection and Storage
Ginger as part of the rhizome family is propagated through planting its buds. Thus, the selection of ginger seed, according to the respondents in Jaba region is guided by the size and fatness of the ginger tuber. Irrespective of the variety, wide and fat ginger tubers are usually selected for seed (planting); usually those with about 5 to 6cm wide and 2 to 3cm thick. Other properties being considered in ginger seed selection are the number of budding tendencies (about 5 and above) and non physical mutilation or damage of the ginger tuber. The seed selection operation is usually done after harvest around September to October. While access to ginger seed for the onward planting could be through self produce; gift from relations or neighbours; and purchase from refutable ginger farmers.

The perishable nature of ginger, made its seed storage very delicate, as the storing period at times reached a minimum of 4 months and a maximum of 6 months, that is, around October up to March. In managing this situation, farmers in Jaba region uses four main storing devices to store impending ginger seeds. These are: open ventilated shade; pit burial device; leaving the ginger tubers un-harvested in the field, until the next growing season, locally known as Suna, and clay pot storage. Among these four storing devices, respondents maintained that open ventilated shade device is the most widely used by ginger farmers in the study area followed by Suna, and pit burial, while clay pot storage is becoming less in usage. However, choice to any one of these devices at individual farmer’s level is guided by their varying circumstances. Where there is no fear of damage by animal and it involves substantial amount of seeds to be stored, farmers often chooses open ventilated shade device, while on the contrary, pit burial device is mostly used, but it has the disadvantage of high labour demand and vulnerable to termite damage if unnoticed. The Suna strategy is mostly used in the periods of market glut or under a situation where the other three devices are not suitable or feasible. Figure 2 describes how these devices are being carried out.
In all the methods used, ginger seeds are kept with less disturbance for a period of about 2 to 3 months, except where the need of turning and adding of water spray arises, about once in a month. In the fourth month of storage or afterwards when the ginger buds have started shooting, the impending ginger seeds are manually cut into pieces, based on the number of buds per tuber. Next to that, is to allow the positions of cuts to dry up, under open shade condition, before taken back to the storage device in use or to the planting ground.

**Planting**

Ginger planting in the Jaba region is usually carried out in the month of April to early May. The planting operation is done manually after a farmer is fully satisfied with the soil moisture condition following successive rains. The operation involves digging of small planting holes with hoe, usually by male individuals, while small children or females put in the bud seedlings and cover with hand or foot. The planting space interval is usually 4 to 5 inches side wise. This strategy according to respondents helps in reducing weed invasion. Like other operations, ginger planting is also labour intensive. For example, a field that may yield ten sacks (100Kg/Sack) of fresh ginger, it requires about 14 people to plant it, 7 people each for digging planting holes and putting in bud seeds respectively. Moreover, attached to planting operation is covering the entire planted field with dry grass (hay) or foliage of shrubs in order to facilitates quick germination and protect the seedling from sun heat (Plate 1). The dry grass is usually left untouched in the field for about one month, the expected period of full germination of the planted seedlings, after which it would be removed and filed in along the plants space interval to decay. It requires about 100 bundles of dry grass to fully cover a field that can yield about 10 sacks of fresh ginger, and the labour requirement for such operation, according to the respondents, is on average 5 people.
Weeding

Consensus views from all the FGD sessions revealed that weeding of ginger farms is conducted three times. The first weeding operation is usually done around May, after full germination of the ginger seedlings. For bigger ginger farms or those that can afford, first weeding is done by applying chemical herbicides known as ‘selector’ (Forceuron), which selectively kill the weeds only. While for small ginger farms or for those that cannot afford to buy herbicides, they used hand picking method to get rid of the weeds. In the subsequent second and third weeding operations, chemical herbicides are not used in any case; instead hand picking method is used throughout. Although the second and third weeding are determined by the nature of individual farm and its tendencies to weed re-growth, the increasing intensity of rain from May onwards, through August to September, in the region made the period of second and third weeding almost uniform. Second weeding is usually conducted around June to July, while the third weeding around August and September. In all the weeding operations, the weed residues are usually left in the farm to decay. Respondents attributed the reason of such practice to a simple way of adding manure to their farms. Conventional literature has attested that mulching helps in controlling soil erosion, conserves soil moisture, and improves soil nutrient.

Fertilizer Application

‘Taki shine ribar noman chitta’ (the profit of ginger farming is determined by fertilizer), this is the assertion of one Alhaji Adamu Shekari (Sarkin Kasuwar Jaba – Kwoi) in an attempt to describe the importance of fertilizer application to ginger farm. Nevertheless, consensus views from all the FGD sessions revealed that fertilizers are applied three times during the life cycle of ginger production in the region. The first or the initial time of fertilizer application is during field preparation (Kaftu or Bugu), that is around March to April, and it is mainly organic manure, not in any case chemical fertilizers. Respondents attributed reasons of this practice to: the best kind of fertilizer ginger requires during its germination period and growth, and chemical fertilizers are too hot to young ginger plants and if applied, it will result in making the ginger plant to wilt or even die. This goes in agreement with the analytical findings of Phillips-Howard (1995) that organic manure such as ash material, has a high pH (10.2), which tends to neutralize soil acidity and contributes to soil-softening effect. The subsequent fertilizer applications involved mainly chemical fertilizers such as NPK or Urea, and they are applied after second weeding (around May to June) and third weeding (around August and September) respectively. The reason for this according to respondents is to enable the plant to produce big tubers, better pepper spices, and yield more. Further assessment of the fertilizer needs of a ginger farm, during production
cycle, revealed that, a ginger farm that can yield about 10 sacks of fresh ginger stuff, requires about 2 trips of ‘pick up’ vehicle full of organic manure and one bag each of chemical fertilizer for the second and third fertilizer application, respectively.

**Harvest**

Full production cycle of ginger farming is usually attained around November to December, when the leaf of the ginger plant turns to yellowish brown colour; signifying that it is ready for harvest. The harvest is done manually with the aid of hoe by able male workers, who dig out the ginger tuber while the female workers or children gather and collect the tuber stuff in baskets or other containers to any designated packing place or space. However, for the Suna; the ginger intentionally left on farm un-harvested due to market glut or speculative tendencies is harvested around April through May to June. Respondents revealed that the Suna produce are normally sold out in fresh form, since the rainy condition of April to June does not allow open space drying of dry ginger stuff. Respondents estimated that about 30 trucks load of fresh ginger derived from the Suna produce is sold out weekly to various parts of the country and export, for a period of about 5 months, April to August annually (about 15,600 metric tons). While for the dry ginger, respondents estimated that, about 50 trucks load of dry ginger is exported weekly from the Jaba region, in a complete 12 months (January to December); about 52,400 metric tons. To sum up, this amount to about 68,000 metric tons of ginger is harvested annually in the Jaba region. Thus, this among other things entail how buoyant its economic basis is; how productive the agricultural ecology of Jaba region is; and the amount of pressure the environmental set up of the region is subjected to.

**Ginger Processing**

As at the time of this study, ginger in the Jaba region is processed locally in raw form, there exists no factory or mechanical devices used in adding value to it. The local processing involves slicing or peeling the fresh ginger tubers into parallel parts with knife and kept it under sunny open space to dry, which usually takes about two weeks. After that, it is packed in sacks for sales or storage. This operation is carried out from November to January, while further sorting and cleaning (by the middlemen) continues up to April. The nature in which the drying and packing is done at individual farmers level, determines the type of selling quality grade. Where the fresh ginger tubers were thoroughly washed, well sliced and dried in a good condition, free from laden dust particles or stains, it results in having a physically clean and whitish or light cream stuff known as ‘American Standard’ (Plate 2). The ‘American Standard’, has the highest selling price grade, depending on the nature of market, it attracts a price range of =N=12,000 to =N=20,000.00 per 40Kg weighted sack. Next to that is ‘Zero Mozo’ (Plate 3a), this is the ginger stuff that is well sorted and free from Mozo but is not as clean as the ‘American Standard’ type. Mozo is the ginger tuber that dries before slicing, usually as a result of inadequate moisture at certain stage of the plant growth, damage by insects, or got rotten. A 40Kg weighted sack of Zero Mozo, sometimes referred to as grade 1 type, attracts a price range of =N=8,000 to =N=15,000.00. The last category is the unsorted, which contains Mozo and all sorts of ginger residues. A sack of this kind, usually un-weighted, attracts a price range of =N=6,000 to =N=8,000.00 or more, depending on the size of the sack used. Plates 2 and 3 portray these ginger stuff categories.
3.8 Production Calendar Pattern
The life cycle of ginger production in the Jaba region is a complete 12 months period; there exist no free month without any production activity. However, based on the observed production calendar pattern, the month of May, is the busiest with four different activities usually being carried out, while the months of February and July, have less production activity. This observed pattern has been presented in Table 3.

The production calendar pattern, among other things, shows ginger production in Jaba region, in particular, requires three basic attributes. Firstly, successful ginger production requires good time management; apart from knowing what to do, it is also important to know when to start what and when to finish it, as delay or late can leads to poor or low harvest. Secondly, it requires high labour input; as such non availability or inadequate labour supply at a certain stage of production activity can either affect the growth of ginger plant, its yield, quality or
both. Thirdly, it requires high fertilizer inputs, unlike most cereals crops that produces excellent yield with only one application of fertilizer, for ginger, it is basic to apply fertilizer three times; before planting, after second weeding and third weeding respectively, otherwise, yield and quality (pepper species) would be compromised.

### Table 3: Calendar Pattern of Ginger Production in Jaba Region

<table>
<thead>
<tr>
<th>Activity</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan</td>
</tr>
<tr>
<td>Field Clear</td>
<td></td>
</tr>
<tr>
<td>Planting</td>
<td></td>
</tr>
<tr>
<td>Weeding</td>
<td></td>
</tr>
<tr>
<td>Fertilizer</td>
<td></td>
</tr>
<tr>
<td>Harvest</td>
<td></td>
</tr>
<tr>
<td>Seed Store</td>
<td></td>
</tr>
<tr>
<td>Processing</td>
<td></td>
</tr>
</tbody>
</table>

Source: Fieldwork, 2018

### Challenge and Constraint

Respondents indentified rainfall abnormally, market glut, and fertilizers, as the major challenges facing ginger production in Jaba region, while processing at village level, middle men problems, and lack of credit facility and direct access to international market, as constraints that exceed the strength and capabilities of ginger farmers to term with. Rainfall abnormally, which is not only peculiar to Jaba region, but to all northern Nigeria, is a big challenge to the entire agricultural production, not only ginger production. To ginger farmers in particular, inadequate amount of rainfall that are occasional experienced, affects the yield of ginger. Therefore, where farmers envisaged or observed delay in the onset of rainfall, respondents maintained that, they overcome the situation in two ways. First, is by shifting to alternative crops such as sorghum or maize, and secondly by reducing the amount of ginger cultivation to half or one-third. On the other hand, if the rain abnormally is at the mid part or towards the end of the wet season, the commonly adopted strategy is to delay harvest until the next harvesting period or season (Suna).

‘Market glut’ is a microeconomics concept which describes a situation in which there is excess supply of products or commodity as against the demand for it, under perfect competitive market. This situation according to respondents often happens, especially when the price of ginger rises, it entices ginger farmers to increase ginger production in the subsequent growing season which in most cases result in over production in relation to its market demand. Where such is noticed, those that are yet to harvest their farms or have just started, pauses harvest until around May to June, when there is high demand for fresh ginger stuff. This strategy, according to respondents is greatly helping ginger famers in Jaba region to break even.

Availability of fertilizer, both organic and inorganic, is a major need of ginger farmers in the Jaba region, but surprisingly, it is not always been met with ease. Thus, in order to term with this challenge, ginger farmers in Jaba region have devised soil fertility management strategies in ginger farmlands. These are: mono-cropping, crop rotation, mulching, and application of organic manure, derived from several sources, such as ginger residues, burnt or decomposed domestic waste, digested human excretes, animal and bird’s droppings, etc. In order to ensure that soil fertility of ginger farms are well managed, ginger crop is grown alone not in association with other crops (mono-cropping). This strategy, according to the respondents,
helps in reducing competition on the available nutrients and as well allows ginger plant to grow well. In addition to that, the site where ginger has been cultivated for a year or two is being rotated with another different crop in the subsequent year, such as sorghum, cowpea, groundnuts or maize, after which in the third year if a farmer wishes, he can plant ginger. This strategy of crop rotation, according to respondents, enables ginger farmland to relatively regain its fertility and in the subsequent year allows ginger plant to grow well.

On the other hand, processing at the village level is usually associated with dirty and poor handling, which eventually reduces the quality of ginger stuff. Respondents attributed this to careless handling habit of some rural people, inadequate labour supply, and insufficient ideal space for drying. The middle men who intercept ginger stuff from farmer and convey to the main buyers, create a bottleneck of manipulating market prices of ginger stuff to their advantage and delay in paying farmers their payment after market deal. This according to respondents makes some ginger farmers to reduce production and in some cases stop ginger farming for quite some times. Lack of credit facility and direct access to international market are serious impediments to ginger farming in Jaba region; as inadequate funds limits farmers to small scale production, while non direct access to international market, retards farmers from reaping favourable price returns. Therefore, unless these bottlenecks are overcome, ginger processing in Jaba region will remain unchanged.

**Environmental Implication**

Conventional literature has revealed that agriculture, especially mechanized farming, has serious environmental repercussion, such as induced soil erosion, soil mining, soil and water pollution, degeneration of genetic resources, and ecological imbalance, among others (Marriott, and Wander, 2006; Letourneau, and Bothwell 2008; and Arnhold, Lindner, and Lee, 2014). In Jaba region, however, small holder ginger farmers are minimizing soil mining through multiple soil fertility management practices such as mulching, crop rotation, use of organic manure, and chemical fertilizers. Also, the use of flat bed, covering plated field with dry grass or shrub foliage; during field preparation and after planting, respectively, and zero tillage during weeding operations, conserves soil moisture and minimizes soil erosion (Kremen, and Miles, 2012; Tittonell, 2014; and Sati and Bala, 2017). In this regard, it can be deduced that ginger farming practice in Jaba region is environmentally friendly.

On the other hand, however, the apparent use of herbicides in first weeding operation and application of chemical fertilizers after second and third weeding are aspects that require further investigation; as conventional literature has revealed the consequential effects on ecosystem and pollution of water respectively (Geiger, Bengtsson, and Berendse, 2010). This, indeed, may be the obvious future position of ginger farming in Jaba region, especially if one, evaluates the amount of herbicides and chemical fertilizer needed to produce about 68,000 metric tons of ginger annually, and the associated ecological implication. Although based on field evidence, there is no clear basis or reliable empirical data to conclude on that, but the cumulative effect over time could be enough to draw some caution against persistent use of chemical inputs in ginger farming in Jaba region and elsewhere with similar characteristics. Therefore, this aspect of ginger farming practice (chemical inputs) requires in-depth research in order to fully determine its environmental implication and the entire sustainability of ginger farming in Jaba region.
Conclusion
From the foregoing periscope, it can be deduced that ginger farming practice in Jaba region is a full 12 months calendar event, with task and activities distributed according to operational and time requirements. The farming practice requires three basic attributes; good time management; right and needed labour; and sufficient fertilizer inputs. Also, the operational challenges are not beyond the level of ginger farmers capabilities, while the identified production constraints are areas that require immediate intervention.

Therefore, in order to improve the ginger farming practice in Jaba region and beyond, the following recommendation should be upheld:

i. Sensitization of ginger farmers on the benefits of value adding strategies, which will go along in obliterating problems associated with ginger processing at village level;

ii. Simple and user friendly ginger processing technology, especially ginger slicing technique, should be explored in order to improve the quality of ginger stuff and reduce high labour demand;

iii. Over reliance on chemical fertilizers should be reduced and instead attention should be directed on organic farming culture; and

iv. Government should regulate the activities of middlemen, establish ginger marketing outlets, and provides attractive polices and avenue for ginger investors.
References


