Traditional Cloth Dyeing Enterprise at Ntonso: Challenges and Opportunities

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Abstract

There is a growing awareness to the threats posed by synthetic dyes. Natural plant-based dyes have proved to be important alternatives to synthetic dyes in the textile industry. The study investigated the traditional cottage textile dyeing enterprise at Ntonso, in the Ashanti Region of Ghana, to identify challenges facing the industry. Data were collected through questionnaire administration, individual and group interviews, and from secondary sources. A total of 40 proprietors were randomly selected and interviewed at Ntonso. The results indicate that the textile dyeing enterprise is confronted with a number of challenges, including default in payments by clients, poor quality of some natural dyes on the market and lack of interest of financial institutions to support expansion of the business. The dyers have, over the years, utilised only two tree species as sources of textile dyes. However potential exists for natural dyes from many plants. But many of these potential dye-yielding plants have not been investigated for colour production and performance on cloths for use in the textile industry. Systematic investigation into the dye-yielding potential of these species and their practical application and performance in the industry would boost the industry in Ghana.

Introduction

Traditionally, dyes from plants were used for colouring silk, wool and cotton fibres but over time these were replaced by cheaper synthetic dyes (Anna & Christian, 2003). Lately, there has been increasing interest in natural dyes because of growing awareness of the threats posed by synthetic dyes. Increasing worldwide awareness of the pollution resulting from the production and use of some synthetic colorants (Paitoon *et al*., 2002; Kar & Borthakur, 2008) and their attendant effect on human health has led to a significant revival of interest in natural colorants.

In recent years, plant based natural dyes have emerged as important alternatives to synthetic dyes in the textile industry because of their non-toxic, non-carcinogenic and biodegradable nature (Bhuyan & Saikia, 2005, 2008; Samanta & Agarwal, 2009). Natural dyes derived from plants are environmentally friendly, and this makes them a priority for use in the textile industry (Bhuyan & Saikia, 2005; Debajit & Tiwari, 2005). Several studies have revealed that natural dyes have properties comparable to some highly rated synthetic dyes (Verissimo *et al.*, 2003; Kadolph, 2005; Siva, 2007; Purohit *et al.*, 2007; Padma & Rakhi, 2007).

In Ghana, great potential exists for natural dyes from dye-yielding plants. Jansen & Cardon (2005) reported that several plant species in Ghana possess dye-yielding properties. However, many of these dye-yielding plant species have not been investigated for colour production and performance on cloths.

The village of Ntonso, in the Ashanti Region of Ghana, holds a special cultural position for the production of traditional funeral cloths. These cloths are dyed using plant dyes and are used during important sacred ceremonies, including funerals. Over

the years, however, the number of people engaged in dyeing cloths at Ntonso has declined due to the importation of textiles and other garment products, and the use of synthetic dyes. Although the production of plant based dyed cloths at Ntonso has reduced, this cottage textile industry is still a major source of livelihood for women in the town.

With the growing interests in the use of plant dyes, the need to explore sources of natural dyes has become imperative. This paper examines the traditional dyeing enterprise at Ntonso to identify challenges facing the industry, and presents some useful information on potential dye-yielding plants for the cottage textile industry in Ghana.

Materials and methods

Study area

The study was conducted at Ntonso, a town in the Kwabre District of the Ashanti Region of Ghana. It is located in the centre of the Ashanti Region. The Kwabre District shares common boundaries with Afigya Sekyere District to the north; Kumasi Metropolitan Area to the south; Ejisu-Juaben-Municipal to the southeast; Atwima District to the west and Offinso Municipal to the northwest. The area lies within the geographical coordinates of 6^0 50' N and 1^0 31' W. The Kwabre District has a total land area of 24,700 ha, constituting about 1% of the total land area of the Ashanti Region. The study area is located in the moist semi-deciduous north-west forest type. Ntonso is Ghana's foremost *Adinkra* cloth design and manufacturing site.

Data collection and analysis

Data were gathered through questionnaire administration, individual and group interviews and from secondary sources. Reconnaissance visits were made to Ntonso to locate individuals involved in the small-scale cloth dyeing business and to facilitate questionnaire design and data collection. The questionnaire was pre-tested during the reconnaissance visits and necessary changes made prior to general administration. The questionnaires were administered to only those who own the small scale dyeing business.

A total of 40 proprietors were randomly selected and interviewed. The questionnaire and interviews sought information on age profile, educational level, gender, ownership, general raw material requirements, type of dyes used, plant/tree species for dye extraction, sources of the plant/tree species, marketing and financing arrangements. Also, factors affecting the cottage textile industry at Ntonso and efforts aimed at addressing the problems were gathered. The data collected were analysed with Microsoft excel by descriptive statistics (mean, frequencies).

Results and discussion

Age and household characteristics

Of those interviewed, 32.5% were married, with male-headed households, and 67.5% were female-headed households, who were either divorced or widowed. The mean household size of the respondents was 6.7 members. In terms of age composition, 82.5% were between 30–60 years (working age) and 17.5% above 60 years (Fig. 1). The results indicate that the younger people (less than 30 years) at Ntonso do not own the traditional cloth dyeing enterprises. Majority of the respondents (95%) were natives whilst

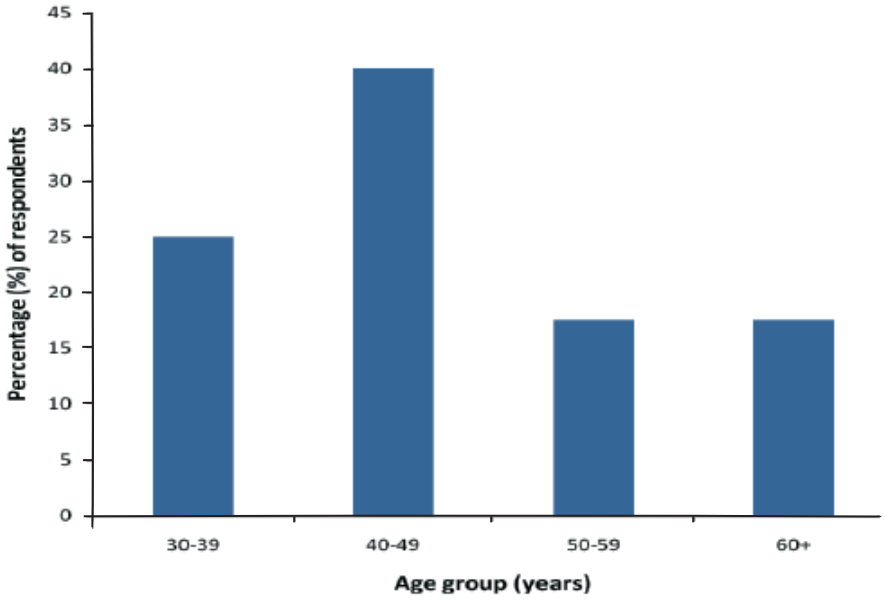

Fig. 1. Age distribution of respondents at Ntonso

the remaining 5% were migrants. About half (47.5%) of the respondents had completed 10 years basic education (primary to middle school education of the old system), 12.5% had 6 years basic education and another 12.5% had 9 years Junior high school education. About a third (27.5%) of the respondents had no formal education. None of the respondents had tertiary education. In a study of small and medium forest enterprise in the northern savanna of Ghana, Osei-Tutu *et al.* (2010) noted a similar trend in the level of education of the key operators.

Occupation and ownership

All respondents were women since they are those currently owning (proprietors) and involved in dyeing cloths with natural dyes at Ntonso. However, majority of these women proprietors have employees working with them in the textile dyeing enterprise. Many of these employees (60%) are female and the remaining (40%) male. In general, the men at Ntonso are mainly engaged in screen printing using synthetic dyes. The respondents have been engaged in cloth dyeing business as their main occupation for an average of 14 years. Trading (27.5%) and farming (50%) were additional occupation of some of the respondents.

Factors affecting textile dyeing activities of the respondents

The dyers at Ntonso presented a number of challenges they face. These included (a) default in payments by clients, (b) lack of financial support to expand business, (c) poor quality of dyes (especially the Kuntunkuni), (d) lack of drying facilities, which affect operations during the raining season, and (e) difficulty in accessing fuelwood for boiling

roots and barks to produce the dye (Fig. 2).

Default in payments by clients. Marketing strategies include travels to towns and villages, particularly on market days, in search of clients. Also, 27.5% of the respondents receive contracts from intermediaries. However, default in payments after initial deposits is high. About 40% of clients fail to make the balance payments after the initial deposit.

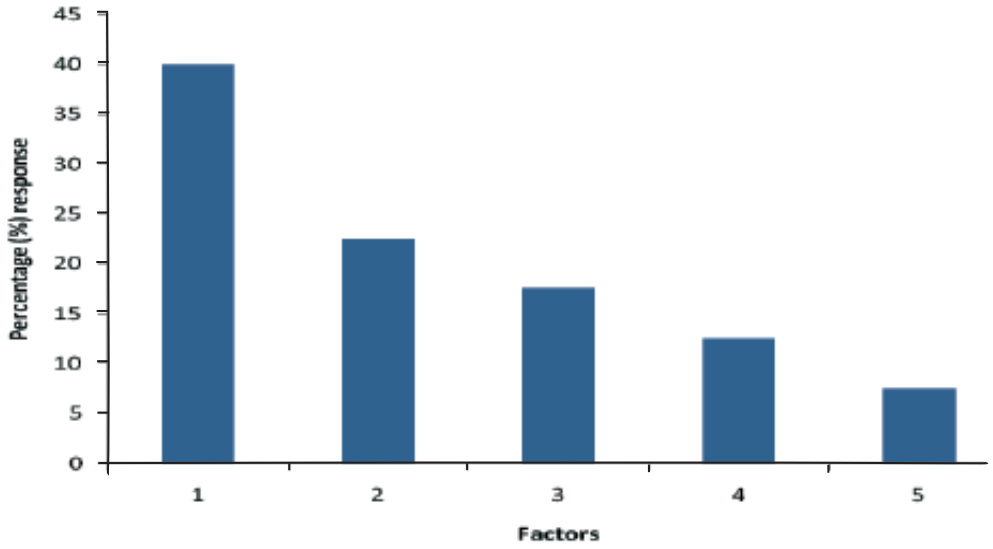

Fig. 2. Factors affecting textile dyeing activities at Ntonso. 1 = default in payment by customers; 2 = lack of financial support; 3 = poor quality of dyes; 4 = lack of drying facilities; 5 = poor access to fuelwood.

The low educational background is manifested in costing inputs and processes, resulting in inconsistent pricing of products. Furthermore, there is no set rule followed in determining the quantum of initial amount to be paid by prospective clients, and the mechanism for ensuring payment of outstanding fees. The dyers and prospective clients bargain over the prices and the payment terms. But the inability of the dyers to accurately cost their activities results in a low bargaining power on their side. This is not peculiar only to the dyers at Ntonso but usually associated with small and medium scale forest enterprises (Osei-Tutu *et al.*, 2010). To address these and similar challenges, Kozak (2007) and Biggs & Shah (2006) noted that establishment of cooperatives and networks would reduce to minimum disparities in pricing and payment defaults. Such groupings allow for scale efficiencies to be more readily gained and can provide other advantages such as higher degree of information sharing, and a business environment with less uncertainty and risk. Networking could create a platform for collaboration in determining the pricing of activities and products for all members.

Lack of financial support. The lack of access to loan facility from the banks and other financial institutions is a key challenge to the successful operation of small scale

cottage-based enterprise. The study showed that 65% of the dyers at Ntonso finance their activities through personal savings whilst the remaining 35% do so through credit facilities from friends and relatives. Fisseha (1987) and Mayers (2006) reported that 80% of financing for small and medium forest enterprises (SMFEs) comes from owners, families, friends and personal savings. Where enterprises are at the cottage or household scale, as is the situation at Ntonso, they tend to operate on extremely narrow margins, and, thus, usually require savings, as well as credit facilities (Carter *et al.*, 2007). At Ntonso, the women dyers lack physical assets to use as collateral against loans and other credit facilities. Only 5% of the respondents had made attempts to seek loans from rural banks but without success.

Banks are often unwilling to lend funds to SMFEs due to perceived lack of sustainability and low repayment of loans (Osei-Tutu *et al.*, 2010). Banks are also unable to assess the loan-worthiness of SMFEs due to lack of records on SMFEs activities, and, in many cases, the lack of acceptable collaterals (Adu, 2009). Access to loans is often facilitated when SMFE operators apply as a well organised group, with information on executive body, constitution, bank accounts and records of association activities (Osei-Tutu *et al.*, 2010). Therefore, a well organised and functional dyers association could facilitate access to financial support for the dyers at Ntonso.

Poor quality of raw materials. Some of the dyers (17.5%) reported low quality of dyes from the Kuntunkuni roots. The dyers attributed the cause to the fact that sometimes dyes are extracted from immature Kuntunkuni plants. This study did not investigate this claim by the respondents. However, this could be due to increasing demand and the difficulty in accessing mature plant parts in some localities. Several authors have reported that variation in dye yield and colour is influenced by a number of factors, including growing conditions of plants, geographical location, soil conditions, age, weather and time of harvest (Vankar, 2000; Padma, 2000; Anna & Christian, 2003; Guinot *et al*., 2007); Rakhi & Vankar, 2007). These factors, singly or collectively, contributed significantly to the quality and colour shade produced by different plants investigated for dye production in Uganda (Wanyama, *et al.*, 2011).

Raw materials used in cloth dyeing business at Ntonso

All the respondents use both synthetic and natural dyes in dyeing textiles (mainly funeral cloths) at Ntonso. The natural dyes are obtained from *Rhodognaphalon brevicuspe* (Sprague) Roberty (local name: Kuntunkuni) and *Bridelia micrantha* (Hochst.) Baill (local name: Badie). These species are brought from the forest-savanna transitional zone of Ghana, a distance of about 120 km from Ntonso.

Currently, the dyers use only red and black coloured-dyes for dyeing the funeral cloths. The black dye is obtained from the root of the Kuntunkuni tree. The bark of the Badie tree produces a dark-brown coloured dye. Majority of the respondents (70%) mix these natural dyes (Kuntunkuni and Badie) and a black synthetic dye for dyeing the funeral cloths. The remaining 30% mix only Kuntunkuni and the black synthetic dye. The addition of the black synthetic dye is to increase the colour intensity.

Red funeral cloths are currently dyed using only red synthetic dyes. This is because the respondents are not aware of any tree species that could produce a red-coloured dye. There is, however, demand by clients for different colours of dyed cloths.

When asked about their willingness to use other species with potentials to produce different colours of natural dyes, 95% of the respondents gave direct positive responses. The remaining 5% were uncertain about the existence and quality of any such tree species for producing different colours of dyes. This underscores the critical need to search for additional potential sources of natural dyes. The Ntonso dyers need to have access to accurate information on plant species with dye-yielding potential and the technical know-how to use such species to produce natural dyes for the cottage textile industry.

Tree species with potential as sources of textile dyes in Ghana

The cottage dye industry at Ntonso has, over the years, depended largely on two tree species for the production of black and dark-brown dyes. To date, only synthetic dyes are used by the dyers to meet the demand of clients who require a different colour from black. Even so, only red synthetic colours are used by the dyers.

Meanwhile, over 40 plant species in Ghana are reported as primary sources of natural dyes (Jansen & Cardon, 2005). Fourteen of these are tree species with tremendous potential in the textile industry (Table 1). In addition, 10 other tree species, including the two currently used by the dyers at Ntonso, have secondary uses as dyes for textiles (Table 2). The information in Tables 1 and 2 reflect only a small aspect of the information that is needed to explore the potential of these species as sources of textile dyes in the textile industry. There is the need to systematically investigate their dye-yielding potential and practical application and performance in the industry.

The literature contains results of research from other countries on a few of the species in Tables 1 and 2. For example, in investigating colour production and yield of indigenous plants in Uganda, as potential sources of textile dyes, Wanyama *et al.* (2011) found that *Morinda lucida* (roots) and *Azadirachta indica* (bark) produced medium to fairly dark shades, indicating that these plants, although not currently being used as sources of textile dyes, have the potential to serve as sources of dyes for textile application. *M. lucida* has been found to be a good source of natural dye with good colour absorption on cotton fabrics and good in terms of fastness to light, washing and rubbing (Wanyama *et. al*. 2010).

Other potential sources of new colorants that have not been used traditionally for dyeing but have been found by other studies to contain colorants of good fastness include Teak (*Tectona grandis* L.). Teak has been found to be rich in reddish to brown colorants. Dye extracted from Teak leaves with aqueous methanol produced brick red shade on silk and wool in the presence of different mordants (Samanta & Agarwal, 2009). The dye-yielding potential of many of the species listed in Tables 1 and 2 have been demonstrated in ecological setting different from what pertains in Ghana. In many cases, their commercial potential has not been demonstrated. Further research is needed to explore the potential of these species as sources of textile dyes in Ghana.

TABLE 1

Tree species in Ghana classified as potential primary sources of dyes for textile industry

Species name	*Family*	*Part used*	*Colour produced*	*Ecology/Distribution*
Acacia nilotica (L.) Willd. ex Delile	Mimosaceae	Pods and bark	Grey, black and light yellow	Native to the drylands of tropical Africa and found in the savanna zone of Ghana. It has been distributed throughout the tropics and became naturalized in many areas. *Acacia nilotica* prefers dry conditions, with an annual rainfall of 250–1500 mm. Restricted to riverine habitats and seasonally flooded areas on alluvial clay soils
Anogeissus leiocarpa (DC.) Guill. & Perr.	Combretaceae	Leaves	Yellow, ochre-red	A deciduous tree common near river banks in the savanna and dry forests (Hall and Swaine, 1981). Abundant in undisturbed forests (Hawthorne, 1995). Found from the driest savanna to the wetter forest borders, in wooded grassland and bush land and on riverbanks where annual rainfall is 200–1200 mm. It often grows gregariously on fertile soil in moist situations, from sea-level up to 1900 m altitude.
Baphia nitida Lodd.	Papilionaceae	Heartwood, root and leaves	Red	Often cultivated near villages more often as an ornamental shade tree or as fence and hedge, often grows as an understory tree in wetter parts of coastal regions, in rainforest, in secondary forest and on abandoned farmland, from sea-level up to 600 m altitude.
Caesalpinia coriaria (Jacq.) Willd.	Caesalpiniaceae	Pod	Black, blue	Tolerates a wide range of soil types and climates. It grows on rich clay soils and poor sandy soils with *p*H 4.5–8.7, and thrives in dry (warm) temperate climates to wet tropical climates with an annual precipitation of 600 mm up to over 4000 mm, and a mean annual temperature of 15–28 °C.
Combretum glutinosum Perr. ex DC.	Combretaceae	Leaves, stems and root bark	Yellow to brownish yellow	Widespread all over West Africa. Found in savanna and open woodland with an annual rainfall of 200–900 mm. It is particularly resistant to arid conditions, surviving where grasses will not, and it recovers quickly from burning. It often grows gregariously on sandy and degraded soils.

Craterispermum (DC.) Benth.	Rubiaceae	Bark, Leaves	Brownish yellow	Widespread in West Africa. Found in deciduous forest and along stream banks in the savanna.
Craterispermum schweinfurthii Hiern	Rubiaceae	Bark, Leaves	Yellow, brown	Found in evergreen fringing forest along water, swamp forest, drier evergreen forest and thickets, from sea-level up to 1500 m altitude.
Ficus glumosa Delile	Moraceae	Bark	Brick-red	Occurs on rock outcrops and rocky slopes in dry areas, less often in riverine and open *Brachystegia* woodland, occasionally on termite mounds. It is found up to 2000 m altitude.
Lannea barteri (Oliv.) Engl.	Anacardiaceae	Bark	Red	Occurs in wooded savanna and forest edges, and near rivers, usually at 500–1600 m altitude.
Lannea microcarpa Engl. & K.Krause	Anacardiaceae	Bark	Red-brown	Occurs in savanna vegetation. It prefers deep friable soil and is often found on cultivated land.
Lannea velutina A.Rich.	Anacardiaceae	Bark	Red-brown	Occurs in wooded savanna.
Morinda lucida Benth.	Rubiaceae	Root bark	Yellow-red, Scarlet red	Pioneer tree common in secondary forest especially in dry areas. It is widespread in Africa. Grows in grassland, exposed hillsides, thickets, forests, often on termite mounds, sometimes in areas which are regularly flooded, from sea-level up to 1300 m altitude.
Syzygium rowlandii Sprague	Myrtaceae	Bark	Black	Found in forests, often near water and in swamp forest, usually at 500–2000 m altitude. All species widespread in Africa, but varieties more localised.
Terminalia scutifera Planch. ex M.A.Lawson	Combretaceae	Bark	Yellow	Confined to coastal habitats with mangrove swamp vegetation or freshwater swamp forest just above the high tide line.

TABLE 2

Tree species in Ghana with secondary uses as dyes for textile industry

Species name	*Family*	*Part used*	*Colour produced*	*Ecology/Distribution*
Khaya senegalensis (Desr.) A. Juss.	Meliaceae	Bark	Brown	Deciduous and gregariously found in low-lying areas besides streams. It is moderately found in the dry semi-deciduous (inner zone type) forest and savanna woodland.
Milicia excelsa (Wel w.) C. C. Berg	Moraceae	Bark		Pioneer tree, abundant in dry semi-deciduous forest but present in all forest types (Hawthorne & Gyakari, 2006). Deciduous tree. It is moderately found in all the major forest types except the Wet evergreen forest of Ghana.
Pterocarpus erinaceus . Poir	Papilionaceae	Heartwood	Red	Found in open forest and wooded savanna
Rhodognaphalon brevicuspe (Sprague) Roberty	Bombacaceae	Bark, root	Red-brown and black	Scattered throughout most forest types. Commonest in moister types
Tectona grandis L.f.	Verbenaceae	Leaves	Red	Most dominant species in plantations in Ghana. Teak has been planted in all ecological zones in the high forest zone.
Vitex doniana Sweet	Verbenaceae	Bark	Warm grey	Occurs in a variety of habitats, from forest to savanna, often in wet localities and along rivers, and on termite mounds, up to 2000 m altitude. It occurs in regions with a mean annual rainfall of 750–2000 mm. It is most commonly found on alluvial soils.
Senna singueana (Delile) Lock	Caesalpiniaceae	Stem bark		A species of the drier tropical Africa regions and is often found in thickets, deciduous woodland, and savanna. It is frequently associated with termite mounds, in luggas or riverine.

Phyllanthus reticulatus Poir.	Euphorbiaceae	Fruit, Root, Bark	Red, Black	Grows along watercourses, but also in scrub and hedges, on waste places, and in mixed evergreen forest. This species is often common in moist places.
*Bridelia micrantha (*Hochst.) Baill.	Euphorbiaceae	Bark, leaves, twigs and wood	Dark-brown	Fairly common, especially in low-lying evergreen forests riversides, etc.
Azadirachta indica A. Juss.	Meliaceae	Bark	Red-brown	In Africa, it is found in evergreen forest and in dry deciduous forest. Adult *A. indica* tolerates some frost, but seedlings are more sensitive. It quickly dies in waterlogged soils. *A. indica* requires large amounts of light, but it tolerates fairly heavy shade during the first few years.

Conclusion

The study presents some of the challenges facing small-scale individually owned cottage enterprises in Ghana. These include lack of platform for mutual learning and cooperation, lack of access to financial support, lack of opportunities for scaling up and hedging against risks. Since the majority of the operators lack physical assets to use as collateral for loans from the banks, collaboration through networking or formation of cooperatives appears to be the best and the most practical option for the future.

A major drawback on the progress of the cottage dye industry at Ntonso is the limited range of plant species for the extraction of dyes. The dyers have, over the years, utilised only two tree species as sources of textile dyes. There are currently no plantations of these two species to ensure continuous supply of dyes. This has necessitated the use of synthetic dyes by the dyers. But the study by Jansen & Cardon (2005) and other studies (e.g. Wanyama *et al*., 2011; Samanta & Agarwal, 2009) have shown that a number of tree species, found in Ghana, have the potential for dye production for the textile industry. The systematic evaluation of these species is imperative and would further boost the textile industry in Ghana.

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