Indigenous Knowledge and Skills for Multifunctional Agriculture in the Bambara Culture of Mali

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Abstract

Multifunctional agriculture in the Bambara culture of Mali is dependent on improved agricultural production which is made possible by their indigenous knowledge and skills. Qualitative research tools such as interviews, discussions, participant observations were used to obtain data from the 200 respondents randomly selected for this study. Food security, health preservation, animal feeding are some of the important roles played by agriculture while the most important function of agriculture outside food production is that of the supply of medicinal herbs, employment, income and animal feeds. The Bambaras depend on their indigenous knowledge and skills because these have proven very effective over time and they were inherited from their parents. Soil identification, seed selection, seed preservation and treatment of seeds for planting among others are all done using indigenous knowledge and skills by the Bambaras. These knowledge and skills are usually accompanied by various sacrifices and rituals that were not disclosed to outsiders. Knowledge of the Indigenous knowledge and skills among the Bambara could form the basis for collaborative and cogenerative researches and the best approach for eco-sustainable agricultural development in Mali.
Introduction:

With the striking poverty, poor nutrition and the ever increasing rural population in Africa, efforts have been made at transferring skills, know-how and technologies to the rural populace, but all these efforts are not yielding the expected results and the farmers are left at a cross-road about their compatibility and intention. Issues about the sustainability of some of these technologies and skills introduced into the African socio-economic setting, have lingered unresolved for years now, with most of the solutions proffered dying not too long after their introduction. The main question being asked now is: should it be technology transfer or technology co-generation for Africans? Ndema (2000) contends “the technologies and skills of Africans should be recognised for any sustainable development to materialise in their setting”.

As the world rapidly changes in its approaches to development, farmers need to be put in the driver’s seat in decision making about their agricultural endeavour, making and taking their own decisions on innovations, their adoption, investment and implementation. The ability to produce food remains one of the keys to the enhancing of our standard of living as everything about agriculture affects our everyday lives. The quality of the food we take affects our health, just as our agricultural practices impact on our water resources, and over 80% of people in the world’s poorest countries make their living from agriculture. All efforts made at getting the rural population in most parts of the world especially in Africa to adopt modern systems of agricultural practices, have not been very fruitful as farmers still cling to their local know-how and skills to solve their day to day indigenous problems (Nene, 2001). For centuries villagers have learnt to develop their own skills and wisdom in addressing their basic economic, social, health, educational and employment problems. Recently, various studies and attempts have been made at identifying some of these indigenous knowledge and skills, most especially in Africa and in Asia, with similar efforts being made at conserving, perpetuating and integrating them with the modern know-how. In South Africa for example, local medicinal plants have been identified coupled with the application methods and efforts made at preserving and propagating their usage.

Barefoot College, an institution in India, was established to give a different dimension to the various approaches so far made in the area of technology utilisation with the goal of reviving and giving more respect and dignity to knowledge, skills and wisdom that have hitherto been devalued and discarded by modern-day planners and experts. Emphasis has been shifted to a more holistic approach aimed at integrating these skills and methods with the national development plans.

Until now the practice of using village knowledge and skills has only been paid lip-service. It had never really neither left the purview of mere academic acceptance nor enjoyed full and deserved confidence or given full opportunity. The Bambara people of Mali in West Africa remain one of the groups where indigenous knowledge and skills play a major in their agricultural life. It has been a way of existence for centuries and neglecting it would be very risky if meaningful strides are to be recorded in their agricultural efforts. If this has been a way of life and forms the basis of productive and eco-sustainable agriculture, it is therefore worth considering as it has far-reaching implications for food security and other agricultural functions in the area.
Purpose of study:

According to Niemeijer (1996), the development of an innovative approach to improving agriculture in Africa is long overdue. He argues that a diachronic study of African agricultural history reveals that many of the external preconceptions of the African society and agriculture is invalid. There must be a shift from a synchronic approach to a diachronic approach that must be firmly based on an understanding of the past.

A new approach to the empowerment of the rural population through identification, analysis, documentation, propagation and the possible utilisation of their own indigenous know-how skills and methods by change agents in their extension activities at the rural level would: Aid comprehension, assure high multiplier effect, reduce cost, assure mutual cooperation and understanding, help sustainable development and participation, reduce conflicts of ideas, approaches and methods and aid multi-functionality in agriculture.

It is with this background that the Bambara tribe of Mali is considered worthy of studying because this approach will be beneficial to its communities over the long term, in that it will make change agents understand the farmer better since he uses his own methods to explain things to him, the farmer realises that his skills and methods are valued and he can easily apply these in other areas of his life.

The objectives of this study are to:

1. find out the reasons for the practice of indigenous knowledge for agriculture by the Bambara people of Mali
2. nurture better understanding the Bambara people as to the relationship between indigenous knowledge and multifunctional agriculture
3. identify the basic indigenous knowledge and skills popular among the Bambaras for agriculture practices.
4. document the methods and skills
5. transmit to agricultural institutions and schools for awareness, understanding and application.

• Conceptual framework:

• Experiential learning:

Experiential methods of instruction provide longer term retention of knowledge than lecture, and explains about 60% of the variance in learning outcomes (Spencer 1986). Adults are motivated to return to learning activities by examining what is happening in their lives. Using and reflecting on their past experiences and prior knowledge, adults often both desire and need to modify, transfer, and reintegrate what these experiences mean in terms of their values and beliefs, their storehouse of knowledge, and their abilities and skills. (Taylor, 1994).

Adult learners such as men and women farmers can themselves call upon their past experiences and prior knowledge in formulating learning activities as well as serve as resource sources for each other during continuous learning events. For co-generative learning to occur, co-learners bring their frames of reference (their prior experiences and knowledge) into the process, and use those experiences as building rocks to develop shared knowledge. Roshelle (1999), argues that the neglect of prior knowledge could
result in the audience learning sometimes opposed to the educator’s intentions no matter how well those intentions are executed in exhibit, books or lecture settings. He continues by contending that prior knowledge appears to be simultaneously necessary and problematic. It is this version of the learning paradox (Berzter, 1985) that is called “paradox of continuity”. The most interesting lessons on prior knowledge from literature according to Roshelle (1999) are the following: First, educators must give up the notion of transmitting knowledge to absorbent minds because learning is a process of conceptual change. Secondly, conceptual change is a slow and transformational process. Rather than rejecting prior knowledge and accepting instructed knowledge, learners must gradually refine and restructure their prior knowledge. Thirdly, to overcome the paradox of continuity, researchers should study success, avoid dichotomy-based empirical methods, see prior knowledge as providing building blocks, look for learning as long-term transformation of knowledge into a larger, more systematically coordinated wholes. Connecting key players’ existing knowledge, beliefs and affective characteristics and experience with the new set of knowledge, skills, beliefs and attitudes is an important insight from adult learning theory that can be used to establish and enhance a cognitive learning process among farmers, extension agents, planners and researchers in Mali (Rohrer, 1986).

**Indigenous technology:**

An environmentally safe or sound and relevant technology (eco-technology) is one that meets the following criteria:
- it is an agricultural production technology that men and women farmers can understand and afford,
- it takes into account the fragile natural environment and the experiences of farmers in that environment,
- it is culturally compatible and socially acceptable and
- it can assure increased agricultural productivity without further damages to environment for future generations.

Based upon various studies, the World Bank (2001) established the effectiveness of potential low-cost technologies in reducing soil erosion and increasing yields. For example, centuries-old practices are being rediscovered, adapted and promoted in India. Deeply rooted, hedge grass, planted in the contour strips across hill slopes, dramatically reduce the effect of water run-off, reduce erosion and increase the moisture available for crop growth. World Bank (1992) found that 90% of soil conservation in India was based on such biological systems. In the Sahel area of Sub-Saharan Africa, simple technologies involving construction of bunks along contour lines for soil and moisture conservation have succeeded where sophisticated measures have failed.

**Multifunctional Agriculture:**

Brad DeVries (2000), considered “Multifunctional Agriculture” as those benefits other than food or fibre that can come from agriculture- benefits that often go unrewarded in the marketplace and that can vary tremendously depending on farming practices. Typically, these benefits include contribution to the vitality of rural communities (through maintenance of family farming, rural employment and cultural heritage), biological diversity, recreation and tourism, soil and water health, bio-energy, landscape, food quality and safety, and animal
welfare. OECD, 1998, views agriculture as being multifunctional when it has one or several functions in addition to its primary role of producing food and fibre. Brad DeVries (2000) goes on to present the specific aspects of Multifunctional Agriculture as:

- Viable rural communities
- Environmental Benefits
- Food security
- Landscape values
- Food Quality and Safety
- Animal Welfare

Methods and Procedure:

The broad objective of this study is to investigate the indigenous knowledge and skills in Agriculture as practiced by the Bambara people of Mali. Information was collected using qualitative research methods. Participants in this study were selected using the random and purposive sampling methods. Data were gathered using ethnographic techniques, naturalistic observations, informal conversations, and semi-structured open-ended interviews because these methods were most appropriate for gathering information related to the research. Data collection and analysis were achieved through an ongoing and interactive process throughout the research. Qualitative methods: Explanation of phenomenon, discussion, dialogues, direct observations were used in this study because these tools helped to understand the farmers world from the perspective of individual experience. It also allows for conjoining the data to the context in which it was collected and allows for a holistic approach to data collection and as a way of triangulating data collection techniques.

Selection and Description of purposive Sample: The study was conducted in the Bambara ethnic group of Mali in four villages according to a defined procedure and set of criteria. The purposive sample included four groups of participants as follows: (1) Men farmers, (b) Women farmers, (c) the village traditional priests and traditional chiefs and (4) the youths. The study was conducted in four villages to provide an in-depth understanding of the indigenous knowledge and skills. The choice of the four villages was determined using the following criteria: agriculture as main activity, easy access (road conditions), commonality of language between the researcher and the farmers, prevalence of indigenous knowledge and skills, and the willingness of the village elders to participate in the study.

Mali is divided into eight administrative regions; each composed of from five to eight circles, which are further, subdivided into districts. The people of the Bambara ethnic group are from the Segou region. The following villages were selected randomly: Sanssanding, Zambougou, Diabaly and Kokry.

In these villages, 60 male farmers, 60 female farmers, and 60 youths were randomly selected for the study while 20 traditional priests were purposively selected for their involvement in agricultural issues and their availability at the time of study.
FINDINGS:

Why indigenous Knowledge and experience in the Bambara culture of Mali?

According to the respondents, indigenous knowledge has been part of them since it was transferred to them by their parents; it is considered paramount to also transfer it to their children. To the Bambaras, indigenous knowledge has been very accurate, available, easy to apply without much problem, makes use of what is available in their environment, economical and easy to transfer to their children without expending too much money. This in line with what the Indians expressed when they advocated for the Bare Foot College.

The concept of multifunctional agriculture:

According to the Bambara people of Mali, the concept of multifunctional agriculture has been and will continue to be an issue of concern to them because agriculture is their only source of livelihood and the only industry that sustains them both in the past and in the future. The roles of agriculture include that of employment since there are no industries to absorb them in the villages; provision of necessary raw materials for their own small scale processing industries like the local milling industry for the grains, the local meat roasting and drying industry. Agriculture also generates income for them which is expended in other socio-economic and cultural activities within and outside their family and community. Also, agriculture remains the only source of medicinal herb for them in the treatment of several ailments such as malaria, stomach upset, diarrhoea, dysentery, tuberculoses, fertility treatment, after-birth treatment and almost every other sickness since hospitals are not only too far away but also almost unaffordable.

Does Agriculture perform other roles outside food production?

Table 1: Response of villages to whether Agriculture plays other roles.

<table>
<thead>
<tr>
<th>Village</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kokry</td>
<td>100</td>
</tr>
<tr>
<td>Zambougou</td>
<td>98</td>
</tr>
<tr>
<td>Diabaly</td>
<td>100</td>
</tr>
<tr>
<td>Sanssanding</td>
<td>97</td>
</tr>
</tbody>
</table>
What is the most important role of Bambara Agriculture?

When the respondents were asked to mention the most important function of agriculture to them, the highest score, 98% of them gave the response that producing food in sufficient quantity remain the most important role of agriculture, while about 21% said that it provides viable employment for them. The latter is extremely important for the youths since most of them use their carts to earn a living from agriculture. According to the respondents, the third most important role of agriculture is the provision of income (40%) as already explained in figure 1. Surprisingly, 40% of the respondents claimed that agriculture is important in maintaining their environment because they claimed to have experienced various environmental disasters due to the harsh climatic conditions which only agriculture could help change. Next, considered also very important role of agriculture is the provision of medicinal herb for their traditional health system which is the only available and affordable health care system in some of the villages. Lastly, the provision of food and the maintenance of their animal especially sheep and cows (44%) was also considered very important since most of the families especially the men rear animals and it is considered a barometer of socio-economic status.

What is the most important problem involved in Bambara Agriculture?

Respondents (100%) rated the harsh climate that brings in dryness, heat and water scarcity as been the most important problem of Bambara agriculture. The Bambaras do not consider any other problem as being important because, they believe they have the capability to solve every other problem.

How do you assure that agriculture plays these roles at the village level?

In the Bambara community, most of the villagers interviewed claimed that agriculture must be productive for it to perform its multifunctional roles and to assure this, they revert to their indigenous knowledge and skills that were handed over to them by their parents.

Their concept of the overall relationship between indigenous knowledge and multifunctional agriculture is presented in the following schema:

IK → TN, INFN, SN, EN → INCREASED PDN & PDTIVITY → MFA
Technology network (TN) in the Bambara culture is a very important variable in agricultural production hence in multifunctional agriculture. The Bambaras effect this through their elders, chiefs, the local marabous and elderly women. These are the group of people considered as the custodian of knowledge and it is their responsibility to guide and ensure good agricultural yield in the village from season to season, as they give instructions as to when, how and what should be practiced agriculture wise. These groups of people also decide when these knowledge and skills should be passed over to the next group of people and they select these groups of people themselves after several consultations among themselves. Some are selected at a very early age depending on the person’s star and what the traditional oracle says about him but most of the people selected are usually in the middle age range for maturity sake. These people are not only trained through their own experience in the whole village practice but also receive their special training especially on the sacrificial issues in the night.

Information network (INFN) is another variable in the indigenous knowledge system of the Bambara culture that ensures increased agricultural productivity. This is also effected through the village chiefs, family, age heads groups, professional groups, local greole, local theatres and local town criers. Through these groups of people, information is passed concerning all aspects of agriculture and the necessary planned and unplanned changes.

Social Network (SN) in the form of age groups, professional groups, extended family work group, help to ensure that each member of the village accomplishes his or her agricultural activities at the right time so as to enable him or her realise improved production. To the Bambaras, this is very important as they claim that they do not have the means to procure modern technology and more so that their farming activities are always too much for one farmer to accomplish alone.

Economic network (EN) achieved through the various village groups is considered very important during the planting season as it provides credit for the farmers. According to the Bambaras, each farmer makes contributions into the group that he belongs and this is considered as savings for him which he gets during the planting season, and when he sells his farming produce he saves through this system for the next planting season with minimal interest (1%). The savings and the credits are considered as obligatory for them since there are no credit houses in the village and in the town; the interest rate is too high.

Why do you revert to indigenous knowledge and skills only to assure improved agricultural production?

To the majority of the villagers (88%), indigenous methods and skills have proven more effective than the scientific methods and some of the respondents are not even prepared to bear the additional risk of having to try the scientific methods. Also, to some of them (79%), the scientific methods are not available as they claimed not to have received any improved skills or knowledge in relation to most of the crops they cultivate or even the animal they rear. They claimed that the extension agents rarely come them with improved technology on food crops or livestock but only come to present improved methods on cotton which is their main export crop. More so, the highly unpredictable adverse climatic condition also drives them away from welcoming any improved skills and knowledge as these would imply additional cost and may be unprofitable in case of climatic disaster.
Indigenous knowledge for them is the milestone and its role is summarised in the chart as follows:

![Chart showing the role of indigenous knowledge in various areas.](chart)

**Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>% Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of soil type</td>
<td>100</td>
</tr>
<tr>
<td>Choice of land for planting</td>
<td>97</td>
</tr>
<tr>
<td>Land preparation</td>
<td>100</td>
</tr>
<tr>
<td>Seed treatment before planting</td>
<td>100</td>
</tr>
<tr>
<td>Prevention of predators and thieves</td>
<td>96</td>
</tr>
<tr>
<td>Fertility treatment</td>
<td>100</td>
</tr>
<tr>
<td>A harvest estimates</td>
<td>100</td>
</tr>
<tr>
<td>Marketing</td>
<td>94</td>
</tr>
<tr>
<td>Processing and conservation</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field survey, 2003

To almost all of the respondents, there is no other choice as regards these practices other than their indigenous knowledge because they claimed not to be aware of any. Their indigenous skills and knowledge have been their only saving grace for years and these are the skills they are proud to pass on to their children through experiential learning just as they too have learnt.

**Seed selection, conservation, treatment and planting:**

Among the Bambaras, this is a very important stage in their yearly production of grain as it is their major source of energy and as such the Bambaras employ their traditional skills and knowledge to realise good harvest. These practices are explained as follows:
Table 3: Soil classification using indigenous knowledge and skills:

The Bambaras classified their soil for agriculture into four different categories as follow:

<table>
<thead>
<tr>
<th>Soil local name</th>
<th>Characteristics (colour)</th>
<th>Suitable crop(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boa bile</td>
<td>Red this soil has bad structure</td>
<td>Sorghum, maize, cotton may be planted</td>
</tr>
<tr>
<td>Boa dié</td>
<td>Problem soil too. White bright soil</td>
<td>Devoted to sorghum</td>
</tr>
<tr>
<td>Boa fing (1)</td>
<td>Dark soil</td>
<td>Preferred for sorghum, maize &amp; cotton</td>
</tr>
<tr>
<td>Boa fing (2)</td>
<td>Dark soil found in flood sites</td>
<td>Devoted to rice</td>
</tr>
</tbody>
</table>

Interview with the chiefs of the four villages involved in the study sites, 2003.

The Bambaras do their own soil classification using the soil colour and location mainly as the main factors of distinguishing the various soil type. According to Diallo, D et al 2001, the farmers could do their soil classification and are also conscious of all the problems associated with each type of soil. As such, they know where to grow their crops to obtain the maximum yield.

IK practices for conserving the genetic diversity of seeds include:

- Conservation of different varieties
- Knowing the various associated culture with each variety
- Partitioning the varieties in different farm lands

The choice of seed varieties is done by the family head and this is based on:

- Hereditary
- Production constraints
- Soil type
- Production objective
- Available variety

Choice of farm land depends on:

- Condition of the existing plants on the land, if they develop very well, then the land is likely to be selected otherwise it is rejected.

Choice of grains and seeds selection generally depends on:

- The height of plant as this is a measure of good growth and development
- Grain maturity
- The colour of grain as this has to do with maturity and state of health
- The state of health of the plant as only healthy plants can produce healthy seeds

Final grain selection:

- Get the grains and put them in a bowl containing water, the good ones would sink and the bad ones would float. There after, the good grains are dried for planting. This exercise is usually done by women that have passed menopause because they are
considered to be pure and cannot contaminate the seeds. This exercise helps to remove all insects and impurities from the seeds.

**Seed treatment:**
- There are trees mentioned as follow that are used to treat the seeds before planting:
  1. "Toro Sina" in Bambara from, the *ficus* family, Sinjan (*Cassia sieberiana*), Sunsun ladon (*Diospyros mespiliformis*) and also *Cassia nigricans* called Zereme. The skin of these trees pounded and mixed with the seeds and will likely give better yield.
  2. Cefereke (*Securadata longipedonculata*). The root of this tree is put in water and the soapy content is used to wash the seed which is then dried before planting. Hence the seeds so treated are protected against diseases. (Mr. D. Traore, ). The other trees used according to Mr. Traore include:
    - Bunbun ladon (*Bombax costatum*)
    - Kana koroni (*Vitex madiensis Ovli*)
    - Balenbo (*Crossopterix febrigera*)
    - Tufin (*Acacia piñata*)

**Certain traditional seeds’ treatments are done with animal parts such as:**
- The guinea fowl’s stomach also mixed to seeds is likely to give better harvest.
- The head of a particular grass cutter also mixed with seeds will ensure better yield
- The head of certain snakes are also cut, dried and ground into powder which is later mixed with the seed before planting.

The explanation given concerning the exercise is just to protect the seeds for pests, birds and other soil predators and to enhance organic growth.

**Conclusions, Implications and recommendations:**

The Bambaras identify very well with their indigenous knowledge and skills in their agricultural practices. To them agriculture plays more roles outside of its core food production function but this could only be effected if and only if agriculture is productive. Hence the Bambaras revert back to their indigenous knowledge and skills not only to make their agriculture very productive but also to make it multifunctional since these inherited skills have proven to be very effective over time. In the light of this, a number of indigenous knowledge and skills were highlighted in the Bambara culture that are related to soil identification, preservation of seed varieties, seed selection and treatment before planting, grain preservation and management.

These imply that Bambara agriculture though largely traditional, tends to be organic in nature since every tool for the practice of their indigenous skills come from or tied to nature. Since these skills and knowledge have proved effective overtime, it could be studied intensively for its adaptability and improvement. The Bambaras’ skills and knowledge should be understood by change agents as starting point for the delivery of their package.

It is recommended that an intensive study should be conducted in all areas of agriculture for documentation for the research units, and researchers in Mali should have collaborative study with the Bambaras on their indigenous knowledge and skills so that some of these could be proven scientifically.
Educational importance: Indigenous knowledge and skills if well documented will serve as reference point for understanding the Bambaras in Mali. This will help change agents and researchers in their approach to technology generation and delivery as the skills of these people would start as the take-off point. Most of these indigenous skills and knowledge are also areas of collaborative research with local people especially in the promotion of organic agriculture.

REFERENCES: