

Review

Bird Scaring Technologies in Rice Production: The need for Policies Prohibiting Participation of Women and Children

Augustine Odinakachukwu Ejiogu and Victor B.N. Okoli

Department of Agricultural Economics, Extension and Rural Development, Imo State University, Owerri.

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A disruptive technology improves a product or service in ways that the market does not expect typically by being lower priced or designed for a different set of consumers. There are arrested technologies which reduce human drudgery but have not taken root and are therefore marginalized on account of the neglected sector which they serve. In Nigeria, bird scaring in the agricultural sector, is to date effected manually; in the aviation sector, it is never done manually. Nigeria's total consumption stands at 4.4 million tons of milled rice, but produces only about 2.8 million tons. The deficit is augmented through rice importation. Of all the problems of rice production, that of birds scaring tends to be the least discussed in literature and by extension a neglected area. This neglect has in effect arrested bird scaring technologies that upgrade the traditional tedious and laborious use of women and children in bird scaring. For 3-5 weeks during the milk stage of rice in the field, women and children spend the hours of 7am-6pm on end daily scaring birds. For the women, the activity is an additional burden to their domestic chores. For the children, their attendance to school is adversely affected. This paper presents some alternative bird scaring operations in rice farming. It also proposes some policy measures aimed at releasing these technologies for mass adoption and thereby effectively relieving women and children from manually scaring birds in rice fields.

Keywords: Bird scaring Technologies, Rice Production, Policies Prohibition.

INTRODUCTION

A disruptive technology or disruptive innovation is an innovation that upgrades a product or service in ways that the market does not expect by being typically lower priced or produced for a different category of consumers (www.disruptive-technology.com). In this sense, at least two sets of innovations are under consideration when

discussing the concept of disruptive technology: one predating the other and the more recent improving a product or service in ways unexpected by the market.

In a related concept, there are technologies which reduce human drudgery but have not taken root and are therefore marginalized on account of the neglected sector which they serve. In the agriculture sector, bird scaring in rice production is to date effected manually. In the aviation sector, bird scaring is never done manually.

Rice (*Oryza sativa*) is the most important food crop in the tropics. It is a major staple food for the people of

West Africa and the fastest growing commodity in Nigeria's food basket (Akande, 2003). The importance is such that it is both a ceremonial and a staple food in many homes. Most countries in Sub Sahara Africa consume more rice than they produce. For instance, Nigeria's total consumption stands at 4.4 million tons of milled rice but produces only 2.8 million tons. The deficit is made up through massive rice importation.

For 3-5 weeks during the milk stage of rice production, women and especially children spend the hours of 7am – 6pm on end daily scaring birds in rice farms. For the women the activity is an additional burden to their domestic chores; for the children their attendance to school is adversely affected.

In spite of the importance of rice in the economy of Sub-Sahara Africa, manual labour still predominates the bird scaring operations. The problem is not so much lack of improved bird scaring technologies as the absence of strategic commitment to enhancing the environment enabling elimination of use of vulnerable women and children as bird scares.

Of all the problems of rice production, that of birds scaring tends to be the least discussed in literature. This neglect has in effect arrested bird scaring technologies that upgrade the traditional tedious and laborious use of women and children in bird scaring.

It is against this background that this paper reviews some bird scaring technologies in rice production with a view to influencing and informing policy measures aimed at releasing these technologies for mass adoption and thereby effectively relieving women and children from manually scaring birds in rice fields. The rest of the paper is divided into the following sections: background on rice research in Nigeria, production, consumption, and importation of rice in Nigeria, traditional use of women and children in scaring birds from rice fields, the concept of arrested technologies and conclusion and recommendations.

Rice Research in Nigeria

Rice (*Oryza glaberimma* Stend) is indigenous to Nigeria and has been in cultivation for the past 3500 years (Hardcastle, 1959). The earliest cultivation of improved rice varieties (*Oryza sativa* L) started in about 1890 with the introduction of upland varieties to the high forest zone in Western Nigeria. By 1960, *O. sativa* had taken the pride of place over *O. glaberima* which is now limited to some deep flood plains of Sokoto Rima River Basin and other isolated pockets of deep swamps all over the country.

Active and systematic rice research started in Nigeria in 1953 with the establishment of the then Federal Rice Station at Badeggi, Niger State, now the headquarters of the National Cereals Research Institute. However, improved technologies to meet rice production needs of

Nigeria weigh heavily on the side of varietals improvement, germplasm collection and conservation, to the exclusion of technologies that will release women and children from scaring birds in the farms. This has found expression in the continued use of women and children in rice fields as bird scarers.

Production, Consumption and Importation of Rice in Nigeria

Rice Production

The three important activities of an enterprise are namely: finance, production and marketing (Pandey, 2000). The finance functions involve raising funds, generating returns from the capital raised and also paying returns to the suppliers of the funds. The process of transforming inputs into outputs is called production (Adeyeye and Dittoh, 1985). The finance production, and marketing functions in an enterprise are in fact not sequentially but are performed simultaneously and continuously.

Rice production is carried out over an area of about 143 million hectares in the tropical and subtropical parts of the world (Kochhar, 1981). Over 65% of the world's rice production comes from China, India Bangladesh, Japan Pakistan and the adjoining Islands in the Pacific. Only a little under two percent of the world's rice production comes from the United States. However, United States is a rice exporting country.

Ecosystems for rice production are determined by the interplay of such variables as geology, climate, soil types and hydrology vegetation and a range of socio-economic factors (Barker and Herdt 1979; WARD, 1994). Water conditions or balances and soil fertility are two major physical factors which determine productivity of rice-based cropping systems (IITA, 1988; Anyaegbu and Iloka (1982). Rice is the only crop adapted to flooded conditions; water is the most critical limiting factor of all physical requirements.

The general approaches to increasing rice production are boosting the yield per hectare and expansion in area under cultivation. But increasing agricultural production comes with economic, environmental and social costs that may ultimately limit growth (Bender and Smith, 1997). Brown (1994) argued that many of the techniques used in increasing yield over the past decades such as increased fertilizer use crop breeding and irrigation have been known for a century or more and may not bring much additional growth. This argument is fundamentally flawed to the extent that it does not recognize the strategic roles of research and development in improving and upgrading these techniques.

In Nigeria, about 40% of the present area under rice cultivation is rain-fed upland and 60% is under swamp (Chaudhary and Nanda, 1985). The average yield per

hectare of rain-fed upland is 0.6 metric tons. However, with the adoption of improved varieties and package of cultivation practices the per hectare yield can be increased. Similarly, the yield per hectare of swamp rice of about 1t/ha can be increased. Paddy rice production rose from 0.134 million metric tons to 0.344 million metric tons in 1970 cultivated on 0.156 million and 0.255 million hectares respectively (NCRI undated). Rice is cultivated in virtually all the agro-ecological zones in Nigeria.

Significant improvement in rice production in Nigeria occurred in 1980 when output increased to 1 million tons while area cultivated and yield rose to 550,000 ha and 1.98 tons per hectare respectively (Akande, undated). According to (WARDA, 1994), Nigeria has become the highest rice producing country in West Africa and third in Africa after Egypt and Madagascar.

According to Bender and Smith (1997) crop yields are influenced by the interaction of soils and plants the climate and socioeconomic circumstances such as prices, the quality and cost of labor and the availability of credit. Strategies to increase yields in a given area of the world depend first on identifying which factors are most limiting and then searching for ways to push the limit outward.

According to IITA (1988), constraints to rice production include shortage of farm labour, absence of efficient farm tools and farm machinery, lack of fertilizer and credit facilities. The constraint of farm labour tends to be more of its relative cost than being in short supply.

In terms of labour, Nwagbo and Onwuchekwa (1987) stated that 25% of the farmers used only hired labour while 55% used both family and hired labour. Men, women and children all contribute to farm labour in rice production. However, some farm operations are age and gender specific. This view is consistent with Nwagbo and Okorji (1987) who stated that whereas men participated in all farm operations, no woman or child was involved in tillage operations. Children helped in weeding and harvesting activities but were mostly employed for bird scaring.

Reporting on labour use, Njoku (1988) stated that the total amount of labour employed per hectare was 103 man-days of swamp rice and 123 man-days for upland rice. Forty-one percent of the labour came from household sources while 59% was hired in swamp rice production. For upland rice production, 33% of labour came from family sources while 67% was hired. Njoku (1988) arranged the following farm operations in their ascending order of labour use: harvesting, land preparation and weeding. In the views of Nwagbo and Onwuchekwa (1988) out of a total of 1434 man-hours equivalent used to produce one hectare of paddy rice, bird scaring took the highest amount of labour (612 man-hours). According to Nwagbo and Onwuchekwa (1988), wage rate varied with the nature of farm operations. Tillage operations attracted the highest and bird scaring attracted the least. Labour accounted for 82% of the total

cost. In the views of Njoku (1988) labour tended to be one of the greatest constraints to increased rice production.

Rice Consumption

Rice consumption in Nigeria has been on the increase (NAERLS, 2005). For instance, in 1989 the demand for rice was 2.31 million metric tons while the supply was just 1.38 million metric tons. According to USAID MARKETS (2008), total consumption of rice stands at 4.4 million tons of milled rice while annual consumption per capita stands at 29kg. In 1970 the per capita consumption was 3.5kg and increased to 14kg in the 1990s. Induced by income growth, the consumption per capita has continued to rise at 11% per annum.

Rice Imports

According to NCRI (undated), in the 1960s Nigeria was almost 99% self-sufficient in rice production and consumption. Twenty years after, this self-sufficiency declined to 38% as demand over-stripped supply. This 62% deficit necessitated massive importation of rice by the Federal Government of Nigeria.

Because rice importation is paid for in foreign currency, it is therefore a source of concern as this relates to the balance of payment position of the country. According to Akande (undated) Nigeria spent \$0.1 million on rice importation in 1970. In 1999 the value was \$259 million. Akande stated that between 1961 and 1999, Nigeria spent \$4 billion on rice importation alone.

According to Biyi (2005), volume of rice imported in 2003 was 2.5 billion metric tons at the price of N29.85 billion. In 2004, the volume imported was 0.84 billion metric tons at the price of N30.31 billion.

Concept Technology in Rice Production

Most rice in West Africa is produced small-scale farmers who use little or no external resources and have varying balance between subsistence and commercial objectives (WARDA, 1994). These farmers largely operate under traditional rain-fed rice production technologies and move from extensive to more intensive cultivation without adapting their traditional practices to the new objectives.

According to Swanson (1996) technology is the application of knowledge for practical purpose aimed at improving the condition of human and natural environment and also carry out some other socio-economic activities. It is a means of increasing and exploiting our understanding of nature for our own benefit (Ikeme and Uvere, 1995). Establishing a symbolic relationship between science and technology, Williams

(1985) referred to science as a systematic search for truth which provides the basis for technology. It should be pointed out that art, conceived as practical and human skill and their application, additionally forms the bedrock for technology. With respect to technology, Williams (1985) referred to is as the application of techniques which leads to increase in production.

In terms of production, agricultural technology adds greatly to farm productivity (Salvatore and Dowling, 1987). The modern miracle of technology that has increased agricultural potential throughout the world is referred to as the Green Revolution. According to Ruttan and Binswanger (1978), Green Revolution ordinarily refers to the development and diffusion of high-yielding cereal varieties, particularly wheat and rice, in the developing countries of the tropics and semi-tropics, beginning in the mid-1960s.

According to Mafimisebi (2010), two categories of technology exist: material technology and knowledge based technology. Also known as "hardware" components an example of material technology is improved rice varieties. An example of knowledge based technology also known as "software" component is planting date.

The development of technology be it material or knowledge-based is driven not only by the imperatives of engineering but also by the cultural and ideological values of the society concerned (Ikeme and Uvere, 1995). According to Muller (1976) modern large-scale technology is basically a result of the cultural demand or values of western society. This concept of culturally-driven technologies has given impetus to the exploitation and adaptation of imported technologies to suit local environmental, social and economic needs.

Going by the argument of cultural and ideological values imprinting on the development of technology, the need arises to investigate why bird scaring technologies in rice production is still dominated by the manual use of women and children in the rice farms. Since the 1920's when rice research began in Ibadan (NAERLS, 2005), the popularity of rice as a food has been growing in Nigeria. However the same cannot be said of releasing women and children from bird scaring operations in rice farms in Nigeria.

The Use of Women and Children in Scaring Birds

The employment of women and children in scaring birds in rice farms basically involves stationing them in the farm to effect the driving away of the pests from the rice using such means as shouting, singing, dancing, throwing missiles etc to generate both visual and acoustic stimuli that scare the birds away. Children also use catapult to scare away the birds.

In spite of the importance of rice in the economy of Nigeria, manual labour is still employed in driving away

birds. The issue is not so much lack of improved bird scaring technologies as the absence of strategic commitment to the prohibition of the use of women and children as bird scares.

Women predominate in agriculture. Any disregard to the development of labour saving technologies especially as they relate to bird scaring in rice farms has negative consequences on the working women.

Going by the continued increase in the per capita consumption of rice in Nigeria, fixated reliance on women and children and in fact on human beings to prevent the birds from doing harm to their rice in the field will to that extent perpetually prevent the people from realizing their potentials for increasing rice production. This eventually translates to sinking further into the poverty quagmire.

Employing the child-bearing women as bird scarers in rice farms is an extra burden on the traditionally demanding role of parenthood. For the elderly women it is work beyond retirement. For the school-age children, they miss classes, have less time available for homework and self-study. In extreme cases the children drop out of school. They enter the labour force prematurely. According to Robson (2004) children who are engaged in farming have lower school attendance.

The Bird Scaring Process

One of the cultural practices in rice production is bird scaring. It involves an array of activities aimed at driving away birds from rice during specific period the crop is growing in the field.

During the milk stage of rice production birds are driven away from the rice farms. During this stage, grain-eating birds invade the rice fields and suck the milky grains leaving traces of empty or poorly filled grains, broken stems and cut panicles. According to USAIAD MARKETS (2008) birds are a problem during grain filling or milk stage. Birds suck the sugary semi-liquid substance leaving behind an empty husk. At later stages when the grains are ripening, birds also cause grains to shatter. Birds' invasion of rice farms causes whitehead and very low yields.

In terms of bird control, NAERLS (2005) stated that scaring devices are used and added that human bird scares are employed from 6am to 7pm two weeks after planting and from heading to harvesting. USAID MARKETS (2008) stated that control of birds is done manually by the use of scares and spoilt video tapes which make noise whenever the wind blows. NCRI (undated) categorized control measures into (i) direct protection, (ii) chemical repellants, (iii) agronomic repellency and (iv) indirect protection.

According to NCRI direct protection involves the use of human bird scarers, scare crows and flash tapes, use of different forms of traditional noise making devices, noise produced by more sophisticated techniques such as

carbide cannons at a rate of two per hectare with positions and directions of fire changed every other day; and periodic use of shotgun to augment explosive scarers.

Application of chemical repellants such as Thiram, is effected to repel ducks and bush fowls which damage seeds at sowing time; at the maturity the following chemicals are applied for repelling grain eating birds: mesurel (methicarb) 3kg/100l/ha, Thiram 3kg/100/ha, Aluminium ammonium sulphate 10kg/100/ha. Agronomic repellency includes avoidance of extended sowing dates, avoidance of establishment of rice farms close to forests where birds perch. Indirect protection entails destruction of the resting colonies or roost through the use of ground or aerial spraying and by use of explosives.

Farm Radio International (2009), stated that different methods be combined to keep birds away from rice fields. It further stated that often women and children are sent to the fields to guard against birds. This practice has serious consequences because it adds to the work-load of women and keeps the children out of school.

To all intents and purposes, bird scaring in Nigerian rice fields is manually effected through the deployment of women and children to the rice fields. NAERLS (2005) called this method human bird scarers, USAID MARKETS (2008) referred to it as manual control of birds and NCRI direct protection method involves use of human bird scarers.

According to Nakamura, Japanese farmers use many methods to protect their rice from birds, the most effective being covering the field with netting. However, nets are costly and cannot be used in expansive fields. According to Nakamura, the most common method of protecting rice is to scare the birds away using stimuli which arouse aversion in the birds and eventually drive them away from the field. Nakamura classified the stimuli into two main groups namely visual and acoustic.

Visual stimuli include plastic bags set out in fields to flutter in the wind. In addition to driving away birds already in the field, the plastic bags deter birds on the wing from coming and landing on the rice farms. Other visual stimuli include human effigies, scare crows and balloons with eye spots painted on them.

Acoustic stimuli scare birds with sudden loud noise. According to (Nakamura 2011), one of such stimuli is the wooden clappers that are banged together by pulling a string or by the wind. Nakamura added that Japanese farmers most commonly use banger which produce a loud noise from an explosion of gas. Furthermore, recorded distress calls and alarm calls of birds are often used to scare away birds. Artificially synthesized versions are also used as they are amplified and broadcast through a loudspeaker.

Bird scaring technologies in Japan, for instance place emphasis on reducing the tedium and drudgery of manual labour. On the other hand, those available in Nigeria are not just heavily dependent on manual

labour but on the manual labour of women and children.

Problems Posed by Birds in Rice Farms

Controlling pest or nuisance birds is more difficult than any other pest, insect or animal known to man (www.kingtrog.com.all). According Gallagher *et al.* (2002) birds can be very damaging to rice especially when they occur in large flocks. During the ripening period in Northeast Asia, some fields are protected by being covered with bird nets which are widely available. In both Asia and Africa various forms of bird scaring are employed to keep birds out of rice fields. While reflective ribbons or used video or cassette tape are widely utilized for birds scaring in Asia, people shouting or hurling dried mud and other missiles at the birds is common in Africa. In Nigeria in particular the people are women and children. Sound cannons and owl or hawk look-alikes are also used in developed countries.

The relative ease of scaring birds depends on which of the following three situations they are found in:

i. Roosting birds are easy to scare. Birds roost in a particular location out of habit. When this habit is broken the problem is solved.

ii. Feeding birds are difficult to scare. This is so because any attempt at scaring is an attempt at denying them their daily bread.

iii. Nesting birds are impossible to scare. Reason is that their mothering instinct is so strong that they defiantly return to the nesting site. However, birds can be stopped from selecting a site in the first place.

Bird populations especially pest birds are increasing (www.Kingtrog.comm.all). Bird damage is getting worse. Little research has been carried out into bird control.

Arrested Bird Scaring Technologies

According to NCRI (undated) the following factors are constraints to increased rice production: research (breeding and selection of low level management of rice), pest and disease management, simple and cheap farm implements, institutional and infrastructural support, credit facilities and input support delivery, marketing channels, irrigation facilities and extension services.

Under research constraints canvassed concentrated on problems of area cultivated and technologies utilized. NCRI stated that in severe cases pest and disease management account for 100% losses. However, no specific mention was made of bird pest and the less satisfactory use of women and children to drive them away from rice farms. Under farm implements as a constraint, NCRI stated that traditional farm operations are carried out with hand tools which make farming tedious and cumbersome. NCRI concluded that research efforts should aim at developing suitable implements for

weeding, land preparation and planting. No reference is made to the development of farm implements for bird scaring, despite the fact that bird scaring takes the highest amount of labour and ironically the least paid operation in rice cultivation.

Women together with children (boys and girls) predominate in agriculture. In most social/cultural milieus, they tend to be categorized as the vulnerable group. Hence issues that have direct bearing on them tend to be easily overlooked except in strict and formal discussions on the root causes of poverty and inequality. This argument is supported by Donahue (2009) who stated that whether girls (women) are able to benefit from new technologies often has to do with preexisting issues of social exclusion and discrimination. In the words of Eboh (2011), despite the credential of the agricultural sector as the main financier of colonial and post colonial regional and national development in Nigeria, the sector has continued to suffer neglect which began with the discovery of crude oil and the oil boom.

The traditional use of women and children for bird scaring operations in rice farms is as old as rice cultivation in Nigeria. New and improved bird scaring technologies are available (though not necessarily affordable). However, the use of women and children in bird scaring operation in rice farms persists till date. The price component of these technologies tend not to be a strong point when it is realized that Nigeria can instead afford huge foreign exchange earnings to import rice as opposed to using a fraction of it to adapt and transfer these arrested technologies to the rice farmers. The technologies can be referred to as arrested in the sense that either by omission or commission by policy makers and relevant stakeholders the technologies have not taken root.

The bird scaring technologies are arrested on account of their innocuous offence of attempting to reduce the drudgery of a vulnerable group who are engaged in a near neglected sector in most sub-Saharan African countries including Nigeria. The technologies tend to be generally out of commission because they improve the manual bird scaring method in a way inconsequential and immaterial to policy makers. Some of the arrested technologies are highlighted as follows:

- i. Use of reflective ribbons or used video or cassette tape tied round the rice farm in a crisscross manner which the birds will think is a net.
- ii. Use of non-coloured net placed vertically like a curtain tied to poles fixed on either side across the rice field. Depending on the size of the field, several curtains of nets are fixed at different intervals across the field.
- iii. Setting up scare crows and hanging cassette tapes in between sticks.
- iv. Combination of these methods to check the birds learning and adapting to a particular method. Because of this problem of habituation, it is advisable to also change tactics and never rely on any one for too

long.

v. Farmers in the same area should plant at the same time as larger area of land with rice that ripens at the same time incurs less damage.

vi. Use of castanets is also advocated. Castanets are produced using small metallic boxes like old cans. Pebbles are put into them and the cans closed. The castanets are hanged on trees at different points in the rice field. The castanets are linked to one another using a strong rope. Whenever the birds appear, a single person sitting under the shade of a tree can pull the rope effectively producing a loud noise that scare the bird pests.

vii. A more advanced technology is the bird scaring HELIKITES (www.gaskites.com). The scientifically designed and patented Vigilante Helikite is a bird control system that works well over a long period of time because birds find it extremely difficult to overcome the innate terror of predatory hawks that Helikites create. The Vigilante Helikite can fly at great heights of up to 60 metres thus enabling them to be seen over hills or hedges and to have excellent birds-caring ability over vast areas This is far more than is usual with any other method. To buy a Vigilante Helikite is cheap. So also the helium gas cylinder with enough gas to fly a Helikite for nearly a year. In the U.S, this goes for about \$50 or less. (www/Allsopp%20Vigilante%20Helikite%20-%20Reliable%20Bird%20Control.htm) These technologies should be effectively released to the rice farmers and thereby relieve the boredom, drudgery and the perpetuation of poverty attendant to the use of women and children in scaring birds in rice farms.

Solutions and Recommendations

Based on the discussions in this paper, the following solutions and recommendations are suggested.

- i. Alternatives for reducing women involvement in bird scaring should be explored.
- ii. Emphasis should be placed on research into appropriate technologies that will release women and children from the drudgery and tedium of scaring birds in rice fields.
- iii. Similarly, for self-sufficiency in rice production in Nigeria, effective and purposeful support system should exist. For example, there should be functional credit facilities, improved and timely input delivery and aggressive and effective extension services. Credit facilities should be targeted at women rice farmers. This not only enables the women acquire improved technologies for their livelihood but also gives them choice over what livelihood to engage in. This argument is supported by the fact that women comprise 85% of the 95 million poorest borrowers in the microcredit sector; without collateral, they tend to face difficulty if banks

iv. tighten their micro-lending requirement (World Bank, 2009, Buvinic, 2009).

v. There should be a ban on the use of children in all forms of labour including bird scaring.

Future Research Directions

From agriculture to aviation, education and Information and Communication Technologies through finance to mortgage and across sectors, industries, and disciplines, the world is being reshaped. The attendant implications are legion—less energy and less tedium for processing natural resources, less waste in processed raw materials—and these translate to desirable effects on the environment. Men and women are continuously creating comfort and utilities and unyieldingly upgrading them. However, these developments have not been felt in bird scaring activities in rice farms in Nigeria to the extent that women and children are used as human scares. There is the need to investigate, for instance, why in the aviation sector bird scaring is never done manually while in the rice subsector of the agriculture sector, that is the rule rather than the exception.

CONCLUSION

A disruptive technology is a technology that improves a product or service in ways that the market does not expect typically by being lower priced or designed for a different set of consumers. At least two sets of technologies are under consideration when discussing the concept of disruptive technology: one predating the other and the more recent improving a product or service in ways unexpected by the market. There are technologies which reduce human drudgery but have not taken root and are therefore marginalized on account of the neglected sector which they serve. In Nigeria, bird scaring in rice production is to date effected manually. In the aviation sector, bird scaring is never done manually.

Most countries in sub-Saharan Africa consume more rice than they produce. Nigeria's total consumption, for instance, stands at 4.4 million tons of milled rice, but produces only about 2.8 million tons. The deficit is made up through rice importation

In spite of the importance of rice in the economy of sub-Saharan Africa in particular, and Nigeria in general, manual labour still predominates the bird scaring operation. The problem is not so much lack of improved bird scaring technologies as the absence of strategic commitment to the environment enabling elimination of use of vulnerable women and children as bird scares. This paper reviews some bird scaring operations in rice farming and points out the poverty perpetuating propensities of continual use of women and children in

scaring birds in rice farms. It also proposes some policy measures aimed at releasing these technologies for mass adoption and thereby effectively relieving women and children from manually scaring birds in rice fields. In this day and age, it is more development oriented to send children to school than to prematurely send them to the world of work.

Definition of Terms

Bird Scaring: It involves an array of activities aimed at driving away birds from crops during specific period the crop is growing in the field.

Arrested Technologies: These are technologies are that have defied mass adoption on account of their innocuous offence of attempting to reduce the drudgery of a vulnerable group who are engaged in a near neglected sector.

REFERENCES

- Adegeye AJ, Dattoh JS (1985). *Essentials of Agricultural Economics*. CARD University of Ibadan.
- Akande T (2003). "The Rice Sector in Nigeria" United Nation Crop Project (UNCP) country Agricultural Project on Trade Liberalization in Agricultural Sector and the Environment, Geneva. Pp.10.
- Akande T (undated). "An Overview of the Nigerian Rice Economy" In www.anoverviewoftheNigerianriceeconomy.htm. Accessed 14 February, 2011
- Anyaegbu SN, Iloka AU (1982). *Upland Rice Production* Agricultural Extension Research Liaison and Training National Roots Crops Institute, Umudike Extension Bulletin. No. 2 pp 214
- Barker CB, Herdt WR (1979). *Rain-fed Lowland Rice as a Research Priority: An Economist View*. International Rice Research Institute, Philippines pp.93-96.
- Bender R, Smith R (1997). *Population Food and Nutrition*. Population Bulletin, London. Vol. 51, No.4 4 Feb. 1997.
- Biya D (2005). 'Government Policies and Competitiveness of Nigerian Rice Economy'. Paper presented at the workshop on rice policy and food security in sub-Saharan African organized by WARDA, Cotonu Republic of Benin, November 07-09 2005.
- Buvinic M (2009). The Global Financial Crises: Assessing Vulnerability for Women and Children, Identifying Policy Responses". Prepared for the 53rd session of the UN Commission on the status of women.
- Chaudhary RC, Nanda JS (1985). "Strategy to Boost Rice Production in Nigeria". Proceedings of the National Workshop on Rice Production Strategies in Nigeria (Eds, C.O. Oputa., J.S. Nanda and R.C. Chaudhary). Federal Agricultural Co-ordinating Unit Ibadan pp. 139-144.
- Donahu A (2009). "Building Evidence and Policies for Inclusive Societies". Conference background paper 5th UNICEF-GPIA International Conference New School, NYC.
- Eboh EC (2011). "Agricultural Economy of Nigeria: Paradoxes and Crossroads of Multimodal Nature". 56th Inaugural lecture of the University of Nigeria, delivered January, 27, 2011. University of Nigeria Senate Ceremonials Committee, p.61.
- Farm Radio International (2009) "Combine different methods to keep birds away from rice fields" radio scripts package 89, script 10, December 2009.
- Gallagher KD, PAC, Mew TW, Borromeo E, Kenmore PE (2002). "Integrated Pest Management in Rice". In International Rice Commission Newsletter Vol. 51.
- International Institute for Tropical Agricultural IITA (1988) *IITA Annual Report and Research Highlights 1987/88* IITA Ibadan, Nigeria.

- IITA (1993). *Sustainable Food Production in Sub-Saharan Africa 2: Constraints and Opportunities* IITA Ibadan, Nigeria, p.116.
- Ikeme AI, Uvere PO (1995). "Mobilizing indigenous technology for Agricultural and Rural Development" in Eboh, E.C., Okoye, C.U., and Ayichi, D. (eds), *Rural Development in Nigeria Concepts, Processes and Prospects* Auto-century Publishing Company Enugu pp.89-102.
- Kochhar SL (1982). *Tropical Crops a Textbook of Economic Botany*. Macmillan Publishers, London.
- Mafimisebi TE (2010). Technology Adoption and Economic Development: Trajectories Within the African Agricultural Industry" In Ekekwe, N. (ed) *Nanotechnology and Policy Information Science* Reference NY pp. 304-305.
- Muller J (1976). Choice of Technology Within the Framework of a Development Policy. Lecture during course appropriate technology and developing countries. Technical University Eindhoven.
- Nakamura K (2011). "Damage to crops by birds" www.Damage%20to%20Crops%20by%20Birds.htm accessed 14 Feb. 2011.
- National Agricultural Extension and Research Liaison Services, NAERLS, (2005). *Technologies and Economics of Rice Processing*. Extension bulletin No 106 NAERLS Ahmadu Bello University, Zaria.
- National Cereals Research Institute (NCRI) (undated). "Training Manual on Rice Production" An unpublished mimeograph produced for the presidential initiative for paddy production for Abakiliki and Omor Mills and other rice processors in the Southeast zone of Nigeria.
- Nwagbo EC, Onwuchekwa SC (1988). "Economics of Rice Production by Farmers in Abakiliki Area of Anambra State" *Improved Agricultural Technologies for Smalls-scale Nigerian Farmers* (Eds G.I.O. Abalu and B.A. Kalu) Nigerian Farming Systems Research Network.
- Nwagbo EC, Okorji EC (1987). 'Cocoyam in farming systems of Anambra State of Nigeria" paper presented at a conference on cocoyam, Umudike 1987 pp.3-10.
- Njoku JE (1988). 'Costs and returns of rice production under alternative production systems: A case of Ohaozara area in Imo State, Nigeria". *Improved Agricultural technologies or Small Scale Nigerian farmers* (Eds, G.O.I. Abalu and B.A. Kalu) Nigerian National Systems Research Network pp. 36-72.
- Onwuchekwa SC (1988). "The economics of rice production by small scale farmers in Abakiliki Agricultural Zone of Anambra State" unpublished M.Sc. Thesis, department of Nigeria, Nsukka, pp. 99-109.
- Pandey IM (2000). *Financial management*. New Delhi, Vikas Publishing House PHGD.
- Robson E (2009). "Children at work in rural Northern Nigeria: Patterns of age space and gender". *Journal of Rural Studies* 20:193-210.
- Ruttan VW, Binswanger HP (1978). Induced Innovation and the Green Revolution. In Binswanger, H.P and Ruttan, V.W. (Eds.) *Induced Innovation Technology Institutions and Development* (pp.358-408). Baltimore, MD: Johns Hopkins University Press.
- Salvatore, Dominick, Dowling, Edward (1977). *Theory and Problems of Development Economics*. Schaums Outline Series McGraw-Hill Book Company, New York.
- Swanson BE (1996). Strengthening Research Extension Farmer Linkages. In Swanson, B.E., Bentz, R.P. and Sofranko, A.J. (Eds), *Improving Agricultural Extension: A Reference Manual*. Rome, FAO.
- USAID MARKETS (2008). *Improved Packages of Practices for Rice Production* United States Agency for International Development Funded Maximizing Agricultural Revenue and Key Enterprises in Targeted Sites. P.16.
- West African Rice Development Association WARDA (1994). *West African Rice Development Association Research Highlights* WARDA, Liberia pp 30-34.
- Williams SKT (1985). *Rural Development in Nigeria*. University of Ife Press Nigeria.
- World Bank (2009). "Protecting Progress: The challenges Facing Low Income Countries in Global Recession". Background paper prepared by World Bank Group staff for the G-20 leaders meeting, Pittsburgh USA 24-25.
- www.Kingtrog.com.all accessed 16 February, 2011. www.gaskites.com Accessed 14th February, 2011.
- www/Allsopp%20Vigilante%20Helikite%20%20Reliable%20Bird%20Control.htm Accessed 16 February, 2011