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A Review on Integrated Agriculture Packages (IAP) for rural and urban dwellers in Tropical Afro-Asian World for Wastes Recirculation.

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Abstract
Gas emission from Petro-Chemical sectors and Hydro-Carbon wastes from Industrialized nations of the world are sources of pollution to man. Aside this they have been known to have detrimental effects on the atmosphere as they also contribute in no-small-measure to the present Ozone layer depletion and Global warming. In Tropical Africa, though may not be highly industrialized but the impact of Agricultural wastes disposal methods especially through burning and emission of hydro-carbons into the atmosphere is another phenomenon that contributes immensely to environmental pollution, ozone layer depletion and loss of biodiversity in the world today. Africa is endowed with abundant land resources with many water bodies for potential crop, livestock and aquaculture farming and development for food security for sustainability of the growing population, but these resources are underutilized possibly due to poverty or misplacement of priorities or total lack of budget implementation on the part of our policy makers. Agricultural wastes from livestock, crop farming and aquaculture are enormous and can be well disposed off by recirculation when these resources are put together for common goal rather than direct burning and contributing to Global warming. Asian countries such as Philippines, Japan, Korean, Indonesian e.t.c. have been involved in integrated farming for sometimes now possibly due to limited land resources. Many options are still available to rural and urban sectors in other Afro-Asian cities in integrated Agriculture packages (IAP). The crux of the matter is to meet human demand in animal and crop products with minimum inputs and without resulting to environmental degradation and further loss of natural plant and animal biodiversity. The paper reviewed some integrated options available in the agricultural sector in packages for implementation in Afro-Asian world. Such options include: Integrated poultry and or piggery cum fish farming, integrated Livestock cum fish cum rice farming, integrated poultry cum fish cum horticulture farming, integrated rabbit/cane rat cum fish cum rice farming e.t.c. The benefits accruing to all sectors of farming that are involved in integration agriculture packages (IAP) were highlighted. The immediate and future advantages of the IAP to the growing population in both rural and urban communities on jobs creation, staple carbohydrates and protein food security and supply and soil nutrients maintenance for sustainable ecosystem were also elaborated.

Keywords: *Integration, Agriculture, Aquaculture, Wastes, Recirculation, Afro-Asian.*

Introduction

The movement of human societies from a hunter and gatherer role to one based on settlements associated with agricultural and pastoral use, the environment has been altered by activities such as soil degradation, over grazing and deforestation. Early settlements were often located near coastal areas, where there was rich abundance of food, particularly in the waters of shallow estuaries and seas. The consequence include among others: deforestation in the hinterlands to provide timber for ship and home buildings which had a major impact on the development of coastal sedimentary system (Meiggs, 1983). An ecosystem is a community of living organisms together with the physical processes that occur within an environment (Ranschou, 1995). These are usually divided into a biotic factors including broad climate and geological as well as specific factors such as temperatures, water (rainfall and humidity), light, salinity, pressure and soil and water chemistry (pH and mineral content) and biotic factors, which are interactions with other organisms, including competition, predation, parasitism and symbiosis. Thus, there are a- biotic (non-living) and biotic (living) components of an ecosystem, all potentially interacting to form a functioning unit, distinguishable although not isolated from other ecosystems. Ecological studies have shown how energy flows through ecosystems from the capture of light energy by plants and conversion to the chemical energy in sugar to its passage through successive tropic levels and constant escape back into the environment (Lightfoot and Pullin, 1995). Equally, we have learnt how nutrients and water are cycled from the atmosphere to the soil, through plants, animal decomposers and back again, the intricacies of food webs and interdependence of species in coevolved mutualisms (Pullin, 2002).

Wise Use and Conservation of Biological Resources

Living communities can be altered by over use (clearing of mangrove, over fishing, catching frogs, bush burning etc) and whole species disappear in this way. They can also be destroyed by the inappropriate introduction of foreign species that result to crossbreeding and hybridization. The ecological literature abounds incase where species were introduced outside their original habitat and had a whole range of undesirable effects. The introduction of water hyacinth, a floating plant native to tropical South America as ornamental plant has resulted to water pollution in Nigeria recently. It propagates vigorously by stolons and when the rosettes are fully developed, they break free from the parent plant, and drift away, dispersed by the wind or current. One single rosette in a pond suffices for it to be covered in a matter of months. They block navigation, obstruct drainage channel and ditches interfere with hydro electrical installations and impede the penetration of oxygen in water, thus causing fish to asphyxiate, blocking water sports etc (Pieterse and Murphy, 1990). Our wetland is abundant in Africa of which only little portion is conserved. Numerous populations have existed for centuries in perfect harmony with wetland ecosystem where they lived and exploited them wisely. Some still do. The Wagenia fishermen of the Zaire River, Imraguen from Bane d'Arguil in Mauritania, the Coypu hunters of the Banadors of Uruguay, farmers in the flood plains of Chad, the Sphere of the Kafue flats in Zambia etc. These populations have certainly always, been aware of the contribution made by water to their lives (Hoffmann, 1976). For others, wetland could only be made useful by enclosing them into farmlands, to be drained kill aquatics farms for meat, and allow water to dry out. Thanks for the establishment of zoological and botanical reserve for the preservation of the natural heritage. The use of obnoxious tool such as bomb and little gauge wire netting materials in our water bodies in sourcing for fish (all in search for food) are rampart in Africa and hence depletion of the natural resources and loss of biodiversity.

Agriculture Perspectives

Agriculture includes the production crop for food and cash crops, Livestock including poultry (chicken, duck, geese guinea fowl etc) cane rat, forest resources and horticultural crops. While there are subsistence approaches to some, there are commercially cultivated farms for grains, cereals and root crops. There are also those that are strictly under the control of government for effective management, conservation and preservation purposes (Okorie, 1981). The current trend in dry season or fadama farming in Nigeria is gulping much of the Nigeria budget; individual product is managed separately of which integrated benefits are not achieved possibly due to inadequate knowledge in the area.

History of Aquaculture

Fish farming was born in China more than 2000 years ago. Steadfast development was achieved in Asia by adjoining it to agriculture. As a result, this region now provides 85% of the world agriculture output in 1995 (Symoens and Micha, 1995). Despite its resounding success, the Asian Agro-Piscicultural models have not been widely adopted in other regions of the world (Devendra, 1993, Gupta 1992, Pullin & Prein, 1995, Olah and Pekar, 1995). Ofori *et al* 1993). Fish farming was largely introduced to Africa after the World War II. It grew fast, receded just as fast and then wavered, although various methods were tested, from subsistence to semi-commercial and to intensive commercial fish farming. One of the reasons for quick withdrawal is the cost of feeding fish with whole commercial feed. Of recent Nigerian have once again embraced fish farming possibly as a result of the extinction of most of our wildlife which serve as bush meat in the rural communities. The cost of fish feed (especially the adoption of expanded imported (floating) feed) is a significant, creating negative impacts in fish farming.

Food Shortage and Malnutrition an Appraisal

African Nations is bedeviled by acute shortage of food. Nigeria like other developing countries is faced with acute protein shortage as a daily intake fall far short of the recommended minimum (FAO, 1993). Bush meat especially in the rural area constitute a substantial portion of animal protein intake but such animals are being depleted due to over hunting and conservation in our national game parks (FAO, 1988). According to Ayeni, (1980), an American consume 23-68 g /caput/day, a European consumes about 53g /caput/day and an average Nigerian consumes only 4.48g / caput /day of animal protein made of rodents, frogs, insects, fish and beef. It is now very clear that if African nations must stop dying of kwashiorkor and other malnutrition diseases, we must find a method of food production that will depend largely on nutrient recirculation; of which integration of agriculture with pisciculture is top most. Likewise, the estimated Nigerian demand for fish in put as high as 1.4 million MT tons with a wholesale value of more than one billion USA Dollars of this the Federal Department of Fisheries (FDF) indicates 511,000 MT tons are provided domestically from tilapias and catfishes cultivated under intensive and semi-intensive production systems. (FAO, 2007). The integrated agricultural packages (IAP) should be of immense importance to all developing countries especially in Africa interested in the problem of food security and economic development all in finding a lasting solution to unemployment problem in rural and urban areas. The concept of IAP is a four dimensional activities with emphases in fish farming, livestock (including poultry farming), crop farming, horticulture and forestry practices as major activities which cover the basic food nutrients needed by the populace.

Bio-Resources in Nigeria

Nigeria is endowed with inland water mass of about 12.5 million ha which is capable of producing over 512,000 MT tons of fish annually if well managed (Ita, 1986). Problems of the flagrant abuse of Nigeria inland and coastal waters through over-fishing, obnoxious and illegal fishing practices by unscrupulous fisher-folks have caused considerable damage to the fisheries, resulting in severe depletion of fisheries resource and a decline in domestic fish production as was the case at Kanji Lake (Ita, 1982, Abiodun, 2003); 714,509 ha of brackish water (Ajayi and Talabi, 1984) in addition to a coast line of 800km, and the greatest part of these water resources are found in rural areas.

Use of Animal Manure

Animal manure has been used in fish production as organic matter to stimulate plankton production (Ovie, 1996). Poultry manure has replaced normal fish feed up to 50 percent and gave significant growth rate in tilapia (Fasakin *et al*, 2000). Livestock manure contains considerable quantities of nutrients for fish and crop production. Protein content ranged between 10 and 30 percent depending what animal is in question (Pratt, 1975). In addition, soluble vitamins are also synthesized in the rumen and may appear in relatively high concentration in the feces and urine of cattle (Tuleun, 1992). Spataru (1976) mentioned that the main benefit of manure when fed to 1. Aura was in the production of benthic organisms and the result shows that tilapia hybrid ingest manure directly. In the same vein, Moav, (1977) observed that Chinese carp utilized about 96 percent of the valuable ingredients in poultry manure. Feeding of animal wastes to fish is an old practice in Asiatic countries (Azziz, 1978). Recent advance indicate the control of inflow of nutrient from animal waste, it is possible to achieve optimum growth for fish in warm climate (Muller, 1980). It has been observed that tropical and silver carp, catfish (*Clarias* and *Heterobranchus* species) and tilapia are most popular and their potentials for utilizing animal wastes is enormous (Meyer, 1977). Rodriguez *et al*, (1996) were apparently among those who utilize animal byproduct meal in tilapia fish practical diets and were able to solve problem of animal wastes management pollution control and protein for man. Livestock manure can be used both as base (during pond construction) and additional manure. Manure application enriches the nutritional value of the water and promotes the proper proliferation of natural food organisms for baby fishes. As the fish became less dependent on natural food organisms and more dependent on prepared feed, the need for nutritionally complete feed becomes more critical and inevitable (Shepherd and Bromage, 1992). The recommendable dosage for base manure application in grow-out pond is 7500kg/ha, and should be spread evenly in ponds after pond excavation. This improves the fertility of the water. Additional manure is applied after the pond has been stocked with fish and the dosage of 825 kg – 900 kg/ha day in wet weight or 100-200kg/ha/day in dry weight is recommended (Okoye, 1986, Delinche, 1986)

Advantages of Integrated Agriculture

It promotes the optimum utilization to wastes: The cost of fish feed has been reorganized as a major factor affecting the development and expansion of aquaculture enterprises in African countries (Olomola, 1990, Falayi, 2009). The feed ingredients that are rarely available for human consumption are also being competed for by the livestock industry. Integration of fish with poultry or livestock will assist in the reduction of feed cost because instead of whole artificial feed feeding, only supplementary feed would be needed by the fish.

Increase output and economics benefit: There is the advantage of using one stone to kill two or more birds as an adage. The feed meant for Poultry would serve as feed for fish through the droppings released into the pond waters and other poultry mash drops during feeding. Furthermore, when rice is introduced in the pond below, the manure also fertilizes the paddy rice to grow and produce. In the case of the release of waste water to the outside horticulture farm, the fortified nutrients in the waste water with further result to the growth and nourishment of the vegetables as water is channeled to every plant stands.

Employment opportunities: It creates more employment opportunities for job seekers and forms a beneficial circulation of waste to keep a balance in the ecosystem (Branckaert, 1995). People shall be engaged in keeping poultry, livestock and fish culture, rice tendering and horticultural practices. Sales of products such as eggs, old layers, pork, meat, fish fingerlings and table size, paddy rice and different vegetables are possibilities from the same spot.

Agro-aquaculture farming and the maximization of land and water use. The abundant nutrients from organic manure avert the in depending environmental pollution in the use of chemical as fertilizer and pesticide (Okoye, 1996). It discourages unnecessary deforestation, an agent of environmental a gradation by restraining total clearing of land and mangrove areas available for fish farming (Ayeni *et al*, 1986). Integrated agro-piscicuture practice is characterized by the inclusion of low input into the aquatic ecosystem through the manipulations of the ecological and biological characteristics of the components of the system in order to improve or change the production process (Ayeni and Otubusin, 1989).

Integrated Agriculture Package (IAP)

This is a concept derived from mutual symbiotic benefits between areas of agriculture. It connotes a linker or pathway between crop farming, animal production, fish (fin and shell) farming and forestry. Indeed, integrated Agro-piscicultural ecosystems constitute a complete man-made entity composed of organisms that interact with each other and with their land and water environment, in a given region, and are characterized by optional matter and energy transfers which maximize the production of animal proteins at the lowest possible cost.

Integrated Agricultural packages (IAP)

The summary of the studies carried out by Tokrisna, (1995), Little, (1995), Thien *et al*, (1995) and Gongfu, (1995), Kangmin and Peizhen, (1995) and Devendra, (1995) in Thailand, Northeast Thailand Vietnam, Canton Region (China), The Wuxi Region of China and Indonesia respectively cited three types of setting in the Integrated Agricultural Packages as follows:

Full integration: This involves complete integration of fish cum poultry or piggery cum rice-cum horticulture with the poultry or piggery located directly on top of fish pond and Fadama rice is planted inside the pond below. The waste water is released directly from the monk to the vegetable planted outside the pond dyke. The activities are in chain form. Manure is easily released from animals to the pond below without labour.

Semi – integration: This is a partial integration of fish pond with poultry, piggery or cattle ranch located a distance outside the pond and so manure is transferred to the pond from different location. It could be directly on pond dykes.

Free integration: Here operations are separate. Fish pond may near a hotel or supermarket or feed will or poultry farm. They are not close to each other but the owner feels he wants to maximize the use of waste from one activity to be fed to other. The resource (money) obtained from feed mill; hotel or supermarket is used to develop the fish pond. For the purpose of this conference, categories 1 and 2 above shall be emphasized in IAPs.

Integrated Package (IAP) Options

Integration of Agriculture with fish culture can be applied both inland and in the coastal regions with fresh and brackish water especially in the rural areas constituting about 70% of the people (FAO, 1988) in Nigeria and where uncultivated land and other potential integrated resource are abundant.

Poultry Cum Fish

This system can be in two ways. A farmer may which to build the poultry house directly on top of the pond or locate it on the dykes. The advantage which the formal has over the later is in the number of labour required and man hour (time spent on the work). The poultry droppings drop directly into the pond water and there is the need to scope and carry droppings from the one built on dykes to pond. About 1000 layers per ha of fish pond stocked with 10,000 – 20,000 fingerlings polyculture farm could be used (Otubusin, 1989). The farmer proceeds include: poultry, eggs and fish (fingerlings and adults). You will require feed for your poultry while the droppings fertilize the pond for fish production. Battery cages or galvanised floor, thatched or zinc roof could be used; depending on the available fund at hand.

Piggery cum Fish

It is advisable to build the pig pens on the dyke and close to the pond. Piglets of 8-10 weeks old of about 5-10kg each of improved breed can be fed with feed compounded with non-conventional feedstuff or with actual pig fattening ration. While the formal can be supplemented with vegetables and prolong the maturing time of about 5-6 months for pig and for fish to mature, the later can be fattened for only 3 months to attain market weight of about 40-50kg per pig can be stocked twice before fish is harvested. The control of external parasites by the use of insecticide or chemicals in prohibited. Hygienic management eradicates the above. About 80 - 100 piglets / ha is recommended (Otubusin, 1989). For rapid growth the male piglets can be castrated. Returns include pork fish (fingerlings and adults).

Duck cum Fish

The principle is same as in 1 and 2 above where dropping of duck/geese are utilized in fish culture. It differs in that duck/geese have opportunity to play around on top of pond water, there by spreading the droppings. Organisms such as tadpoles, frogs, mosquitoes, mollusk and aquatic weeds are part of duck feed. Juveniles fishes are advised to be stocked so as to be able to escape been predated by ducks. Fencing of the pond with the duck house is necessary to avoid loss of duck/geese to predators (dogs, cats and man). You may introduce breeder birds and allow propagation of ducking and goslings or just fattening program. The farmer returns are eggs, ducklings, old duck meat and fish (fingerlings and adults) (Falayi *et al*, 2003).

Rice-cum-Fish-poultry

This involves the use of rice paddies provided with centre trenches (1.0 meters wide) and about 0.5 meters deep) serving as place of refuge for fish during low water level (SEADEC, 1997). The dyke of the paddies could be as high in 50cm to hold water at desired depth. Grasses and weeds

on the dykes should be trimmed regularly to prevent harboring of predators and pests. Screens (wire mesh of 0.5cm) with wooden frame are installed at water the inlets to prevent unwanted fish species from entering or the escape of the stocked fishes. Suitable fish species are tilapia *Oreochromis niloticus, Sarotherodun gallileaus* or their hybrids or mono-sex, common carp *Cyprinus carpio*, catfish *Clarias* and *Heterobranchus* species can be stocked. These are obtainable at the National Institute for freshwater Fisheries Research, New Bussa, Niger State, Nigeria. Rice varieties that are insect and disease resistant, early maturing and high yielding are recommended. This is also obtainable at the National Institute for Cereal Research, Badegi also in Niger State, Nigeria.

About 5000 fingerlings to 1000 layers chickens per pond are recommended. The same feed to poultry would serve as nutrients source for the growth of planktons while planktons in turns serve as food for tilapia growth. The nutrients in water serve as fertilizer for paddy rice production. The farmers now harvest eggs, fish, paddy rice, old layers. Egg shell, thrash fish and broken rice can be ploughed back to poultry feed.

Livestock cum Fish cum horticulture

Utilization of small reservoir for irrigation as well as for fish production is possible. The irrigated land can be used for the cultivation of potatoes, tomatoes, water melon, cassava, banana, pineapples, pepper, cucumbers etc. Fruit trees (citrus) can be planted along the side of the dykes as cash crop. In Asian countries, rice, aquatic vegetable are planted. Fin fish, shrimps, crustaceans and mollusks are cultured as aquaculture components. Example of aqua-silviculture in the Philippines is the 4.4 ha farm of Melchor and Necitas sur in Puerto Galera, Mindoro (SEADEC, 1997). It exemplifies multiple use management. The mangrove trees are harvested selectively for 15 years before reforestation. Firewood, low cost building materials and prop gules are sold intermittently within the years. The family is bouyant in cash, food and fully occupied all round the years. The proceeds include the listed fruits and vegetables, chicken, pork, eggs, fin and shell fishes, glue from mangrove trees etc. This can be applicable in the coastal part of Nigeria.

Shrimp cum Rice Integration

Integrated home lot garden, pond and livestock and poultry is a traditional approach to family food production in rural area in Mekong Delta southern part of Vietnam. About 80% of farm house hold in the region has its own small pond-gardens and canal for aquaculture (SEADEC, 1997). Rice serves as major crop cultured with fish or shrimp. This has been practiced to improve food production and optimized land use and water resource. This can be applicable in Nigeria inland flood and coastal plains with fresh water prawn or the delta shrimps and rice or mangrove tree e.g. coconuts. A flat field close to a freshwater source is ideal. The rice field is modified for shrimp culture by raising the dyke for higher water depth or digging trenches (3-4 m wide and 1.5 m deep) along the periphery. The field must be thorough prepared before stocking the fish as follows:

i. Get rid of wild fishes, crabs, frogs and unwanted animals by using lime (100kg per 1000 M^2) or Derris root (1-1.5 kg soaked in 10-15 liters of water per 1000 M^2)
ii. Dry the trenches for 3 days, prepared field for broadcasting, transplanting of rice.
iii. Choose short duration, medium maturing varieties that are resistances to pests to minimize if not eliminate the use of chemicals.
iv. Stock 10-25 g shrimp juveniles at 70 – 80 kg/ ha ten days after rice broadcasting or 5 days after rice transplanting Fin fish can also be stocked along with shrimps.

v. Cover 8-10 percent of the water surface in the trench with plants branches to discourage poaching.
vi. Broken rice, cassava, potatoes, food remains (devoid of salt), rice bran, crabs, snails, fish and oil cake can serve as food supplement for the fish

Folder crops cum fish cum livestock or other wildlife

Cane rats, giant rat (rodent), guinea fowl etc have been successfully domesticated. Rabbits and snails are possible wildlife for integration (Ajayi, 1975, Ayeni, 1980, Otubusin, 1983, Fasakin *et al*, 2000). The principle of housing, feeding and cares are closely related with those earlier mentioned. The droppings are very reach in nutrients that would fertilize the lower pond waters for successful fish and folder crops production.

Tree crops cum fish cum, sugar cane, water melon and other vegetables

This can be integrated in a fairly sloppy terrain. The leaves and fruits from trees serve as feed to the pond along with animals on top or in dyke. The fish pond is fertilized and waste water from integrated pond serves the crops along the slope until it reaches the horticulture below. The list of integrated Agro-Pisciculture cannot be exhausted here and they are all geared towards conservation of resources.

Transfer of Energy and Nitrogen in Integrated Agro-Pisciculture Ecosystem

Fish growth in fish cum livestock pond, as in other integration depending on the availability of nitrogen and phosphorus as well as on the amount of organic carbon introduced or produced in them. The quantification of the complete energy resources, including bacteria production and the nitrogen transfer rates, in these ecosystems are still on experimental bases. Olah and Pekar, (1995) concluded that result obtained on energy resource, energy transfer efficiencies, nitrogen input transfer rates, nitrogen transfer rates in the pond circle and nitrogen output transfer rates in domestic sewage, pig, chicken, sheep, duck and geese integrated fish pond ecosystem clearly indicated that:

- around 5g manure organic –C M^2 d^2 is processable if the stocking density is high enough to disturb the sediment water interface.
- equal partitioning of energy metabolism characterizes the manure ponds: The amount of manure introduced, algal and bacterial produced organic compound is almost the same, ranging between 3-5 g C M^{-2} d^{-1}. Energy efficiency (that is the percentage of manure, algal and bacterial total energy converted to fish biomass production) is in the range of 1-9 percent but 3 percent is a well established average. The extreme values occur in specialized integration.
- the result of the quantified individual transfer rates of nitrogen and subtracting the total output from the total input, computed that nitrogen retention capacity of the traditional fish pond without integration and that of the pig, duck and geese integrations rewarded: 159, 302, 225 and 118 kg N ha^{-1} y^{-1}
- both theoretically and quantitatively, have established that these energy efficient and nitrogen retarding ecosystems may be applied on a wider scale to compress the stretched nitrogen spiral and to improve landscape nitrogen flux. This also opens up the possibility of this nutrient recycling type of aquaculture being used in the context of alternative agriculture which is gaining importance in the industrialized landscapes of the developed countries, as well as being a cheap protein producing mechanism for developing nations.

Sanitation

Hygiene condition in an integrated farming can be achieved. The pond silt comprising mud, leftover manure and feed may become detrimental to fish if not removed. Pond silt can be removed to the pond dykes or crop farms and use as organic manure outside fish pond (for horticulture and citrus plants that are completely out of integration system) (Pullin, 2002).

According to Eyo *et al*, (2003), Agro-Pisciculture Integrated Farming system is faced with some limitations wish include:

i. **Technical complexity:**
   It involves many fields of specialization. The problems of technical complexity arise in management because the farm manager may not be specialized in all the sub sectors of farming system.

ii. **Imbalance of model structure**: This results in the production of excessive waste (manure) which cannot be fully utilized by fish in pond or water body.

iii. **Water quality Problems**: There may be difficulty in water quality control measures especially in the tropics and sub-tropics where temperature is high, oxygen consumption is great and animal waste production is excessive. Insufficient supply of nutrient will result in less natural food organisms in pond. As a result fish will not grow nor develop well. On the other hand, if animal waste production is too high, fish may die due to rapid decomposition, which loosens oxygen content (Dissolved oxygen) in the water body especially in the humid tropics (Boyd, 1990, Ovie, 1996).

Conclusion

Integrated Agriculture practices (IAPs) maximized the use of land especially where land is expensive. Parcels of land that is unsuitable for crop farming can be flooded with water and use, thereby reducing competition for land. There is the general conservation of input resources. High cost of fish, poultry and livestock feeds can be brought low, exorbitant cost of inorganic fertilizers are removed by recycling of animal wastes. Efficient utilization of man power is achieved. The same man and material resources are utilized in all activities.

There is drastic decrease in calories, proteins and fat food per caput per day in Africa. A case of Nigeria was from 2213 g, 51.6 g and 497 g in 1961 to 2136 g, 46.6 g and 44.0 g in 1986 respectively (FAO, 1988). The demand for protein food is outstripping the supply. Integrated agriculture packages established fundamental advantages such that the environment can be manipulated to increase fish, meat and food and cash crops supply to our household and factories. Ayeni *et al* (1986) reported less than 1% of the potential sites (water mass) for aquaculture is utilized in Nigeria, and up to date the difference is not feet because fish is not found on every man table in Nigeria. The package of these various divergence systems would increase the general food production capacity in Africa and at lesser cost; and also rid of our environment of pollution, reduction in the loss of biodiversity through conservation of our natural resources.

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