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Research Article

Least Strenuous Path: A New Bio Factor for Strategic Policies on Adaptations for Coping with Climate Change in Africa with Special Reference to Highly Suffered Zambia

ISSN: 2637-8078

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Submission: June 28, 2021

Published: August 09, 2021

Volume 5 - Issue 2

How to cite this article: Yadav RC, Yadav Jaya. Least Strenuous Path: A New Bio Factor for Strategic Policies on Adaptations for Coping with Climate Change in Africa with Special Reference to Highly Suffered Zambia. Significances of Bioengineering & Biosciences. 5(2). SBB. 000607. 2021. DOI: 10.31031/SBB.2021.05.000607

Abstract

Climate change is causing variety of environmental problems creating agricultural situations from bad to worst. A review of results of human centered extension studies revealed and confirmed the peoples' choice and attitude to adopt least strenuous path accompanying practices, which was perceived as a bio factor driving the adaptations. Rivers adaptations of natural courses of least resistance path was taken as a conforming substantiation that all policies and technologies for coping with climate change should be based on eliminating or reducing intensity of strains in agriculture. This strategy of least strenuous path was taken in devising practices which were easily adoptable and highly effective in reducing the severity of adverse impacts of climate change. Authors' past researches were selected for bringing integrated solution for creating adaptations of all technologies in coping with climate change, which reached to conclusion that mere three practices viz land formation of Raised Broad Bed and Furrow (RBBF), supplementation of one fourth of the Recommended Dose of N Fertilizers (RDF) and eco-zero weeding, a panacea shrine for agriculture will be sufficient for enhancing more than double yields in global agriculture, which should be quickly adopted as a policy tool. Further, a new change brought was reformation of forest land use, least affected by climate change, the most prominent land use in Africa into Forestry–Horticulture, for production of goods and services and wellness of people. Thus, this research brought new intellectual property for coping with the insurmountable global problem of climate change.

Keywords: Crop productivity; Diffusion of technology; Food security; Multivariate utility models; Small holder farming; Soil conservation

Abbreviations: RBBF: Raised Broad Bed and Furrow; RDF: Recommended Dose of N Fertilizers; GIR: Geographical Information Registry; GHGs: Green House Gases

Introduction

Agriculture is activity involved in producing food world over but is getting limited in its productivity functions [1,2]. There had been global concern on carrying out assessment on loss in such productive capacities of ecosystems comprising locations and natures. The climate change is becoming insurmountable deterrent for agriculture for which world over concerns have developed [3-10]. Loss in social economic status had also been studied [3]. Endeavors have been searching for losses and adaptations of measures to cope up with climate change devastations. Studies move around assessing abiotic factors on different adverse impacts and infrastructural degradations. Extension scientists concentrated their research on choice based human factors, which can never cover entire domain of problems and technological improvement measures did not come in picture. The countries where agriculture is irrigated, depression in yields due to drought or floods during the rainy season can get compensated by enhancement in yield under milder climatic situation viz winter

season. In Africa the extent of irrigated agriculture is low (<10%), [11] implicating agriculture largely remain dependent on rain. The climate change is making agricultural situations from bad to worst. Lot of alternative measures getting explored as per wisdoms but had not come to risqué.

The measures and policies are getting endeavored in academic disciplines viz extension and economics to evaluate adaptation of practices suitable for coping with climate change. But such endeavors while building lot of academic accomplishments will not be sufficient to make perceptible effect in their objectives. Review of such adaptation evaluating extension studies revealed some clue for adaptations. The review results supported evidentiary substantiations that adaptation by people follows a new route of least strenuous path accompanying practices. The objective of the present study was to substantiate the hypothesis of adaptation of least strenuous practice path by small holding farmers, in Africa, with special emphasis on agricultural situation in the most severally affected Zambia, South Central Africa and establish a new bio-factor for coping with agonies of climate change.

Material and Method

Impacts of climate change

In Africa for over the last two decades, droughts and floods have increased both in frequency and intensity. Climate aberrations had been building large percentage of countries population dependent on subsistence agriculture, below the national poverty line [9]. The adverse impacts of climate change, especially from droughts, floods and extreme temperatures have caused serious damage to all sectors of agriculture, infrastructure and affected both human and animals [1,10]. The ecosystem services got drastically reduced. Many bio-pandemics, diseases, and pests invasions such as locust had become unmanageable [12]. The climate change vitiated set patterns of climate disturbing normal dates of sowing and harvesting. Even storage of commodities got spoiled for lack of suitable storage structures or go downs. Horticultural tree fruit crops suffered damage becoming unable to produce normal expected harvests; thereby prices of commodities in market rose beyond imagination.

Zambia, country with special emphasis on severity of climate change

Figure 1: Map of country Zambia in Southern Central Africa, the most severely affected by climate change [11].

Zambia is a land locked country located in Southern Africa (Figure 1) with 16 million, covering 752,618 square kilometers. The population density of Zambia comes to be 22 persons/square km, which is quite low. Per capita land holding become about 4.755ha/person. In this situation, condition of small land holding farming compels one to think that the agriculture remains in patches and large areas remain under forests [13]. Thus, Zambia has high potential for extracting goods and services from forest ecosystems. The impact of climate change in Zambia is likely to be less severe on the forests than that on agriculture. The land lock limitations can be overcome by several measures to follow in the present study, that will turn its negative effect in good situation. Zambia is surrounded by countries, in North DR Congo, Northeast Tanzania, in East Malawi, in Southeast Mozambique and Zimbabwe

and in west again DR Congo. The large forest area is inhabited by gray hyenas and black hippo podiums, as depicted on country map in Atlas. This situation demands much wisdom to develop measures to enhance deriving goods and services from forest ecosystems in Zambia, in particular and rest part of Africa, in general. Here development of strategic policy and its adaptation are equally important for forest as that for agriculture. The innovative measures are expected to be the front runner in Zambia, convincing neighbor countries for adaptations. Thus, this study is expected to bring relief for Zambia, in particular and rest other countries, in general. From 1960xtox2006, the average annual temperature in Zambia increased by 1.3 °C and is further projected to increase by 1.2 to 3.4 °C by the 2060s with more rapid warning in the Southern western regions of country. As a result, there has been damage on crops, livestocksxandxfisheries leading to reduction of agricultural productivity there by creating food insecurity and deepening poverty, damage to energy infrastructures and affected water and its quality [10,13].

Crops and cropping intensity

Zambian agriculture sector comprises crops, livestock's and fisheries. The country's staple and the most staple cultivated crop is corn (maize) [13]. Other major crops are cotton, soybean, tobacco, groundnut, paprika (bell pepper), sorghum, wheat, rice sunflower seeds, coffee as well as sugar, fruits and other vegetables and flowers [13]. Zambia is one of the biggest seed exporter in Africa [13].

Least strenuous path as a new bio factor in adaptations of practices

Review of research results of studies [3-10] on extension on adaptation behavior of small holder farmers in Zambia and many other countries in Africa showed adaptation of practices, which encompass least stress paths i.e., easy to perform in difficult field operations. These adopted practices were crop varieties, date of sowing, diversifications, and crop insurance. Second preference to adaptation went for soil conservation, which cannot be specific to reduce adverse impact of climate change. There came lot of concern on choice based adaptations involving multivariate analysis [14-16], which overshadowed any development of innovative technology in the country. The bio factor perceived on least strenuous path adaptations was supported by Leopold [17] reported scientific fact that river channels exhibit remarkable similarity regardless of size, teleology -philosophical theory that everything in nature and its processes tend to a predetermined purpose and goal as world was driven by intrinsic force directed by hands of God, which would lead to greater perfection. This clearly did set law of least resistance adaptation of river courses under different climate, geology and geomorphologic situations. Leopold [17] exclaimed that this realization came late, which is a convincing analogy of Darwin theory in biological sciences. Therefore, new bio factor of least strenuous path is a wise perception in fostering adaptations in coping with climate change.

Production function and its relevance in selecting technologies for coping with climate change

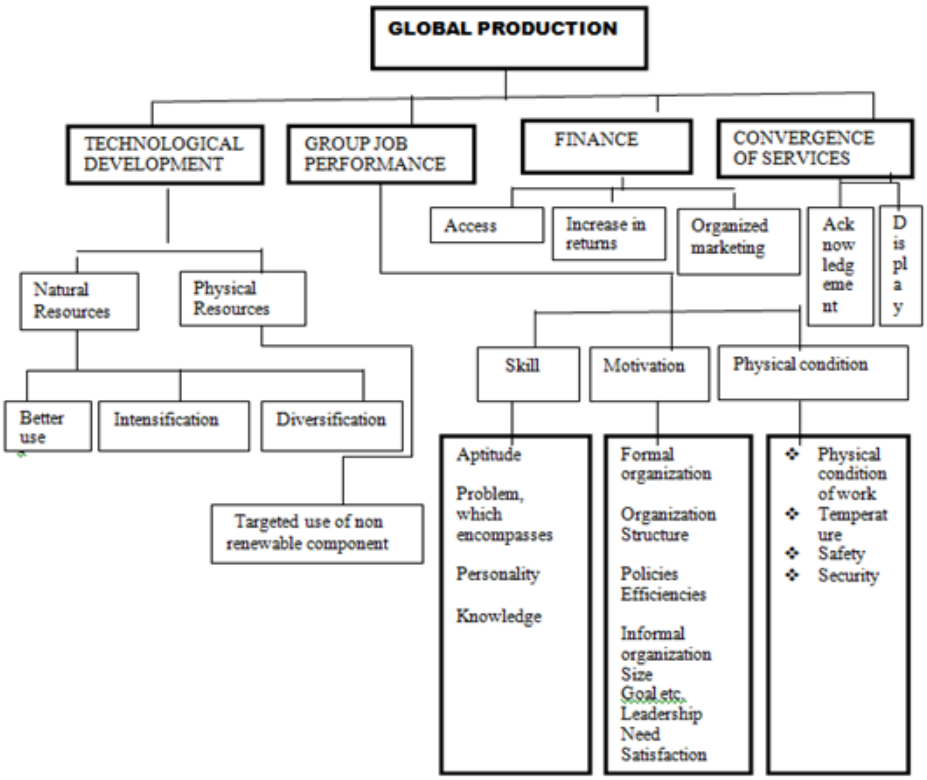

Figure 2: Idealised production function enables analyzing situations in any country of world for developing strategy for adaptation for coping with climate change.

After the new bio factor (Section 2.4) in adaptation policy issues it is important to develop technologies of different aspects which enable encompass least strenuous paths not only in extension but supported by different specializations in subject matter related to combating and coping with global warming and climate change. In this endeavor a production function, which had been patterned in land and water resources conservation measures [18-20] are brought here to serve as convincing readership for development of adaptable strategy. Figure 2 is a production function, which involves different groups of factors. These factor give first emphasis of technology, followed by its operation by group job by involving peoples individual participatory action, involvement of finance and convergence of services as existing services of line departments be converged in tackling the problems. Coming to further elaborations i.e., second level factors as depicted in Figure 2 for all first level factors in enhancing production, induce complications, but these play important role in accomplishing the set objectives in the production factors (Figure 2). Advancements in African countries on multivariate analysis [14-16] will foster acceptance in academics developments simultaneously. The first factor i.e., technology (Figure 2) involves technology of natural resources and for fixed resources.

The country Zambia, in particular and other countries of Africa, in general, having large areas do not suffer with such limitation of fixed land as a limiting resources, but their ecosystems need considerations (which will be taken up in subsequent part of this study). The other group viz natural resources, the technologies should bring better use, involve intensification and diversifications. The adoptable requirement here will be for developing technology involving least strenuous paths. This will ensure easy adaptation by the people. Basic requirement is that all technologies should fulfill necessary condition of new bio factor (Section 2.4). Development of practices with respect to climate change will come in subsequent part of the study. The next factor in the production function is group job performance, where it is highly applicable for industries, it can be equally applied in agriculture owing to the fact that individual participation will lead to bringing accumulated global impact fulfilling need of production, as it happens in industries. Since agriculture is open to sky in field, it suffers with climate change, role of natural technology become strong for this sector. The group job factors involve skill, motivations, and environmental factors, which go to 3rd level factors (as listed in Boxes).

The 3rd level factor of skill comprise aptitude, problems involved, personality and knowledge, which come from inheritance, brought up and care, which also include age, married status, education levels. Other group factor in this category include types of organization, formal or informal, set goal, policies and efficiency, fulfillment of needs, all of them remain as bio factor in one way or the other. Assessment of impacts of factors makes clear impact of climate change such as increase in temperature and use of air conditioning. Recent bio factor is building feel good and wellness that will enable human to adopt suitable technologies coping with the adversity of climate change. This is new innovative addition in enhancing adaption, working efficiency and comfort basic requirement onbringing harmony under changing climate to become supreme concern in devising policies for adaptations of technology towards coping with adversities of climate change. In multivariate analysis, attribute category of factor analyses [14,15] will be taken in coming part of study. Here again role of technology needs taking cognizance that implicate adaptation of least strenuous path is highly relevant. Elaboration of efficacy of such natural technology which provide relief from climate change and remain fostering least strenuous path forming adoptable practice were devised in the study.

The next item in (Figure 2) is finance in first groups of factors and 2nd level factors are access, increase in returns and organized marketing. Here bio factor involves in developing technology to produce enhanced returns and creating organized marketing, which will come after producing commodity quantity of high Geographical Indication Registry (GIr). These practices will get quickly adopted as they are least strenuous path technology and practices. The climate change alters situations which need to be taken care of in developing strategy of adaptations of market strategy packaging and safe storage. In the production function convergence of services of other resourceful line departments become necessary, as all facilities and budgetary provisions cannot be created in any one single department. The convergence of services is further expanded in two important subgroup viz acknowledgements and display, which will attract peoples, participation. Academic advancements in developing advances have moved by different approaches. Therefore, all approaches involve wisdom of high level in formulating strategy for adaptation for coping with climate change, highly relevant for Zambia and other countries in Africa, in general, should be equally considered in formulation of policy of adaptations.

Innovative technologies affecting in coping with climate change and least strenuous path accompanying practices

Assessment of likely rainfall factors: Hydrologist in early years i.e., last decade of 20th century and first decade of 21st century conducted studies on hydrologic model based forecasts of rise in temperature and snowmelt of glaciers causing rise in sea water levels. A novel partial duration series study on conceptual model for forecasting annual rainfall , high relevance was made [21,22]. This partial duration series analysis produced likely rainfall which matched with previously recorded years' annual rainfall. Thus, with rainfall and its correspondence in the partial duration series became good estimate of annual rainfall. After initiation of rainy season, occurrence, its similar pattern and known likely rainfall pattern was taken as the daily rainfall spell distribution of events for the year. This forecasted pattern of events matched with those actually recorded during study years of rainy season at the study site in India. This sets pattern of establishing at any country level of focus. Nonetheless, such forecasting brings a confidence in likely situation and inspire make necessary firsthand preparations. This forecast enabled selecting crops and variety in advance, which can grow well in such hydrologic years. For taking care of any discrepancy in success of forecast, which even do happen under any

high tech forecast and failure of prediction, change in distribution, a precautionary measure nursery is raised to be able to transplant as mid-season correction. This type of agro hydrological year adoption of nature agriculture practices produced food commodity bringing sufficiency during severe drought years [23-25]. The small land parcels transplanted by participatory action produced food sufficiency during the severe drought as well as flood years.

Appraisal of advancements in multivariate prediction models: Factors enumerated in (Figure 2) correspond to technologies, those can be measured in M, L, T units and can be optimized by mathematical theories of optimizations. Second group of factors on job performance involving human resources by multivariate utility modeling for which plentiful advancements have appeared by emerging mathematics, statistics, and engineering wisdoms [14,23]. The human related factor assessments are based on scores which need to be assessed by successive assessment of peoples' opinions. Exemplary updated utility model by Howards [14], Blank & Tarquin [23] for the choice based multi-variables. The factors in (Figure 2) are grouped as variables measurable in the M, L.T units and those related to human choice and related factors as attributes, which are resolved by assessing scores and by application of multivariate analysis [14,23]. The technologies falling in these groups innovated to follow least strenuous path so that all get adapted in coping with climate change.

Agriculture change of crop variety and dates of showing time and harvesting: It is fortunate situation that Zambia is well equipped with certified seed of crop varieties [13], which can be easily adopted. The sowing dates and harvesting dates can get assessed to some extent and those can be mid corrected in case of any failures. Study also revealed continuing backing for adoption of innovative practices. It need scientific management of crop nutrient manures and fertilizers [24-27].

a. Soil conservation: Climate changes induce important bearing on soil moisture conservation. Innovative technology on raised broad beds and furrows is exemplary measure which will convince farmers adopt it for multiple benefits. This soil conservation forms idealized low strenuous path for auto drainage and additional moisture storage for crop growth. Recent scientific innovations [28] established that Raised Broad Bed and Furrow (RBBF) system enables development of sulphur cycles which goes well on enhancing harvest index of crops.

b. Operational research project on watershed management: The climate change agonies are successfully circumvented by integrated land and water management practices, crop husbandry and many land uses under the watershed management. The conceptually perfected studies and success stories results are adequately documented [18,19,20].

c. New panacea science of weed management based on Nitrogen Cycle management: A highly innovative technology developed by application of nitrogen cycle management, which is totally free in adaptation and producing un imaginary yield of crops [29-37].

Enhancement in goods and services of other ecosystems

a. Livestock: Live stocks support food and nutrition and in Zambia serve as power source for performing operations in agriculture. The availability of oxen enable small holders organizes their operations and cover large areas under agriculture. Many innovative studies were endeavored on milk, dairy [29,38] to produce designer quality of cows and bring desirable male calf for beef or heifers for producing milk and producing least emission of carbon dioxide and methane Green House Gases (GHGs). However African people have first choice for beef, hence this factor render such development non sustainable. Therefore, adoption of tractor power will enable fulfilling power requirement in agriculture. It demands development of custom hiring services under which people will be able to use and pay the charges for tractor and allied mechanized operations.

b. Fishery: Fishery is getting accepted as universal non dispensable water user and producing most liked non vegetarian nutrition diets. Innovative designer quality fish production technologies were endeavored [40] will fulfill ever standing demand of fish consuming people.

c. Extraction of goods and services from forest ecosystems: Forestry is least affected by climate change. Form forestry ecosystems there have been services of wood production, producing oxygen, bringing carbon sequestrations and some minor forest products of leaf, nuts and fruits of low significance. Now biological sciences studies have shown tremendous reliance on such nut and fruits, which largely, otherwise , obtains from horticultural trees. In the forest areas their exist sites devoid of forest trees, in such sites plantation of horticultural trees , will enhance availability of goods and services of forestry ecosystems. It needs special endeavor to derive still more goods and services from all forestry eco systems prominent in Africa, including Zambia than the presently coming from them. Reformation of new practice of horticulture in forestry is a wonderful vision for adaptation as strategy by Government sectors that will not only become nonstrenuous, but will change life of people by inducing feel good and wellness. The new innovative proposition of Forestry-Horti will enhance efficacy of existing utility to new fortification. The barren areas in forest need to be replanted with fruit trees free from damages from birds, monkeys, and other wild animals on the ground. This strategy will attract worldly wisdom in intensification of forestry ecosystem that will reduce stress on other terrestrial Agri ecosystems to a great extent and enable countries cope with climate change. This reformation will bring lot of prosperity in Zambia with low population, in particular and rest all countries in Africa, in general. This new mission will be highly applicable, more than ongoing mission Agro-forestry in worldwide countries.

Data for the study

There have been useful applications in inducing new concepts, practices, academic wisdoms and their use in building least strenuous practices for coping with unsurmountable global problem of climate change. The experiences on derivation of goods and ecosystem service for building healthy people feel good and wellness is a new vision.

Result

New Concept of bio factor and its substantiation

The study results established (Table 1) that adoption of variety, sowing date and adaptation of non-structural measure such as crop insurance policy which were least strenuous path practices. Although soil conservation is given second priority; it needed specific objective oriented effect producing practices, which warrant input from land and water engineering specialty. The study using only human factors are not sufficient to bring practices that can help cope up climate change. Nevertheless, the studies provided excellent opportunity to enable perceive new crux of factors responsible deriving adaptations. The perceived bio factor of least resistance paths always keep building tendency of such adaptation. This fact implies that all climate change damages overcoming measures should also encompass least strenuous path.

Table 1: Feature strength and utility of adoptions based on human adaptation criteria.

S. No	Adopted Practices	Strenuous Path Nature	Sufficiency	Implications on Strategic Policy for Coping with Climate Change
1	Crop varieties	least	Certified seed accessible	A plausible situation for Zambia
2	Change of date of sowing and harvesting	Least	Compulsion made by climate change	May result in low yield and hardship for livelihood
3	Keeping and maintaining oxen	Moderate	Highly unsustainable	Fascination for eating beef is deterrent and non favorable
4	Maintaining radio	Least	Needs Govt Program	Countries have moved far ahead on audio visual facilities
5	Education	Least	Demand more effective practices	Change attitude for comfort
6	Old Age	Least	Need light exertion	Change in attitude
7	Marriage status	Least	Necessary change	Two thinking to coincide and match
8	Crop insurance	Least	Demands insurance premium	Claim settlement denial under many situation

For Zambia there is plus point that the country is well equipped with certified seed availability [13]. Therefore, the suggested policy issues brought out in conclusion need to be made specific to bring such changes in future endeavors. Non-structural measures involve high premium on one hand and subjected to many hurdles in settling likely compensations. Mere extension specialization on popularization of practices for preparing policy will be incomplete unless all round scenarios are taken care of. Therefore, convergence of expertise in agriculture, engineering and mathematics and biology to produce innovative technology to promote adaptation of measures is inevitable. For ameliorating any climate change adaptation of soil conservation should be replaced by operational research project on watershed management. Such vast experiences and success stories broadened the scope of extension and technology supplemented adaptations.

A policy tool linking theory, affecting driving factors, impacts and customization for moderated policy set principle in overcoming any problem of wide public interest, is brought out here (Figure 3). It is implied that any policy issue should put equal emphasis on building technology to have least strenuous path practice so that maximum no of people in all categories of farm holdings get equally eager to adopt. The accumulated impact of individual participation will bring visible impact of coping with climate change in all African countries with low irrigation and keeping all reliance on rainfed agriculture. This link based policy tool has proved its worthiness by bringing a rational approach in policy tool based on theory and customizations for moderating any local practices. The following table contain many exemplary necessary functions.

Least strenuous path bearing practices for coping with climate change

The climate change affected factors needs to be classified in groups as climatic factors, agriculture systems, crops and cropping methods and non-structural measures such as crop insurance, which require suitable policy formation in any country. In Zambia rearing oxen might be costly and non-sustainable as craze for beef in African countries, become unfavorable and under such situations tractorisation appear as most desirable as fast coverage of large sowing areas in short span of sowing dates, become crucial for rainfed agriculture. is an important factor for rainfed agriculture cropping. The basic inheritance in technology should include aspects as brought out in (Figure 2) and further elaborated in (Table 2). The technologies effective for coping with climate change need to have characteristic feature and follow least strenuous path. These considerations provide sufficient answer for various questions those will emerge for any developmental project. These answers will foster people unite for working their tasks for themselves and by themselves. These clarifications will convince people adopt best suited measures to fight climate change. The practice wise details of technologies and practices will follow. Here technologies need

to provide reliefs to the human resources, the farmers, finance crunch situation and shortage of resources of facility, budget and manpower. The required productivity enhancement effect of coping with climate change will get maximized. All needed factors are resolved in (Table 2). This situation will enable combating agonies created by climate change. Such claims made here in the study will get clearer as study moves to innovative technologies developed in various studies of this researcher.

Table 2: Convergence of different wisdoms building effective and low strenuous practices.

S. No	Group	Level 1	Level 2	Level 3	Practice	Strenuous Path Implication
I Technology						
1	Technology	Resource conserving	Better use	Intensification	Diversification	To follow
2		Fixed resource	Not limiting in Zambia as low population density			
3	**II Human Resource for Group Job Action**					
4	Individual participation	Skill	Motivation	Environment	Individual Participatory working for global impact	Build least strenuous path technologies for coping with climate change
5		Personality	Size of problem	Temperature		
6		Knowledge	Nature of problem	Safety		
7		Aptitude	Set goal	Security		
8			Policy and efficiency	New factors feel good		Change
9	**III Finance**					
10	Financial support	Finance	Access	Increase in return	Organized marketing	Bring system facilitating affordability
11	**IV- Convergence of Services**					
12	Convergence	In the project domain	Acknowledgement	Display	Facilitate	Promote

Innovative technologies fulfilling bio factor-least strenuous paths and effective in coping with climate change

Innovative technologies details for easy adoption overcoming all constraints are listed in (Table 3). Easy and convinced adoption will create relief from climate change. The output will be good governance and facilitating people enjoy life under any climatic aberrations. Many businesses will flourish generating prosperity and plentiful employments. There will be eagerness to know about all ten technological advancements enumerated in (Table 3). These are forecasting [21,22], technology for severe drought years, nature agriculture technology attributes [23], Operational research project, soil conservation [18-20]. Developing forecasting model [21,22], for assessing attributes inhuman factors [23] productivity enhancement practice [24-28], broad bed and furrows RBBF [29], nutrient management practices [30], formations and watershed management [18,19,20]. The weed management science devised on innovative application of nitrogen cycle management produced new approach made innovative measures [31-37]. Other agriculture sector viz live stocks [38] and fishery [27] were again comprehensive development of innovative technology for coping with climate change. All soil conservation should be replaced by operational research project on watershed management. Long time working experiences and success stories broaden the scope of extension and technology adoption, the main theme of the study evaluation of adaptations.

Table 3: Innovative technologies in different aspects of climate change situations.

S. No	Aspects	Area of Specialization	Technology Name	Effect	Solution	Policy Strategy
1	Rainfall and daily events distribution	Hydrology	Academic advancement forecasting	Least strenuous	Make preparation	Subsidize needed inputs
2	If drought year	Agro hydrology	Nursery raising	Least strenuous	Nature agriculture	Scientific backing, TV and Radio
3	Operational Research Project	Watershed management specialist	Field demonstration for improving it	Least strenuous working	All climate change problems solved	Launch mission ORP
4	Plant nutrient	Enhance use efficiency	Supplement one fourth of N by manure	High harvest index	Aerobically composted manure	Provide facilitating subsidy
5	Soil conservation tech	SWCE	RBBF	Least strenuous	Auto drainage and moisture conservation	Facilitate mechanized bed formations.

6	Eco zero weeding	N cycle management	Eco seeding	Least strenuous	Unimaginable high yield	Non-monetary input technology
7	Ecosystems services	Agriculture	Eco agriculture	Least strenuous	Highly adaptable	Low bad impact of climate change
8		Livestock	Designer cow	Least strenuous, but involving	Most ideal cow breed for milk and beef	Ample dairy products
9		Fishery	Designer quality fish	Least strenuous	Highly nutritious food	High quality fish
10		Forestry	Forestry-Horti new mission	Least strenuous	Wood, leaf, nuts and fruits	New policy on forestry.

The most wonderful reformation of horticulture in forestry in forest areas devoid of forest trees is new application of bio factor for building feel good and wellness and enhancing utility in producing nuts and fruits [27,39,40], which are available from trees and bushes. Thus, selected bushes and horticultural trees which are not liable to any damage by birds, monkeys and on ground moving wild animals need to be selected and planted. This, horticulture in forestry is highly suitable for African countries, in particular and all countries of world, in general. Thus, this reformation will enhance utility of existing land kept under forestry, getting justification of use of bad land for carbon sequestration, eco-restoration and production of woods and producing oxygen. This Government policy strategy will be least strenuous and governments policy will make peoples' life easy, livelihood least affected by climate change world over and comfortable. This reformation is highly suitable and warranted for all countries in world to provide relief from climate change that will bring good effect in building feel good and wellness and enhance utility of forestry ecosystems' goods and services without any botheration for any work on this by individual level. This policy strategy is new wisdom surpassing ongoing mission agro-forestry. The new reformation will fortify desirable interaction in public and applauded for good governance in any country. Now countries worrying for livelihood will get free from such worries by strategic policy adaptations by governments. The problems of infrastructure and damages created by climate change on agriculture will get solved to great extent by simple reformations in ongoing practices of forestry world over.

New innovative development of bio factors and least strenuous adoption overcoming bad effects of climate change

Table 4: Innovative improvements on enhancing productivity of crops in Zambia by adaptation of least strenuous path encompassing practices. Source: *It is proven practice [29], appropriate measure for bringing sustainable development goals. **Innovative nutrient management for agriculture RDF is recommended doses of fertilizers for respective crops and main crops in intercropping, ***Eco zero weeding agriculture, ****X Presently harvested yield in Zambia (data not available), *****Bio-factor as booster for adaptation, ******New Strategic policy for promotion of agriculture free of climate change.

S. No	Crops	Land Management*	RDF+One Fourth Aerobically Composted Manure**	Eco Zer Weeding Based on N Cycle Management***	2x****	Level of Strenuous*****	Strategic Adaptation******
I Rainy Season Cropping							
1	Corn (Maize)	RBBF	do	do	2X	Least	Conduct demonstration and provide input facilities
2	Sorghum	RBBF	do	do	2X	least	
3	Groundnut	RBBF	do	do	1.5X	least	
4	Soyabeans	RBBF	do	do	1.5 X	least	
5	Paddy	RBBF	do	do		least	
II Winter Season Cropping							
6	Wheat	RBBF	do	do	1.5X	least	do
7	Tobacco	RBBF	do	do	1.5X	least	
8	Paparica	RBBF	do	do	1.5X	least	
III Intraseason Cropping							
9	Sugarcane	RBBF	do	do	1.5X	least	do
10	Cotton	RBBF	do	do	!.5X	least	
IV Inter Cropping							
11	Maize+ Groundnut/ Soybean	RBBF	do	do	2.X	least	do

12	Maize+Paddy	RBBf	do	do	2X	least	
13	Groundnut+Maize	RBBF	do	do	2X	least	
14	Sorghum Ground nut/Soya bean	RBBF	do	do	2X	least	
15	Sunflower-Paparica	RBBF	do	do	2X	least	

For Zambia there is plus point that the country is well equipped with certified seed availability. Therefore, the suggested policy issues brought out in conclusion need to be made specific to bring such changes in future endeavors. There is need to introduce land and water management [29], nitrogen cycle management [11,12] manifested agriculture practices [30], weed manure [31-37], which become least strenuous are brought out here. The information is based on innovative practices adopted and confirmed producing results, which are universally applicable for adaptations for coping with climate change. This research brought out here for bringing universal adaptation in agriculture and enhancing its efficiency and productivity. From (Table 4) it is clear that only type of bed preparation for plant is Raised Broad Bed and Furrow (RBBF) , which can be prepared by general purpose tractor of 1.8 m width track based tractor in RBBF [29]. The RBBF is proven innovative measure that is capable enough to fulfill accomplishing all sustainable development goals set by the United Nations [29]. The comprehensive article will attract readership interest globally, hence its reference is quite adequate as space limitation here does not permit bringing all aspects here in the present manuscript. Therefore, references cited will enable learned and interested readers refer for any substantiation for any lack in the present study. These innovative agricultural practices are universally applicable. Hence, all get quickly adopted and problems arising due to climate change brought under cope up condition.

Discussion

This study perceived least strenuous path bearing practices as a bio factor governing adoption of practices for coping with climate change, a global in surmountable problem. This study covered entire sector of aspects involved in enhancing total gain from any production process, which involve need of technology, human resources, finance, and convergence of services of other line departments were on least strenuous paths so that those can get easily adapted by people to come up with climate change. The following section is adding further ratification of various issues on this research.

Least strenuous path as a bio factor

Studies on human factor on adoption involving human choice revealed that adopter followed practices which involved least strenuous path. This fact was perceived as a bio factor, which was parallel to natural carving of river course followed by rivers of least resistance [17]. Lot of efforts have gone on refinements of mathematical modeling Howard [14] named as utility modeling in statistics and mathematics. This bio factor consideration of creating practices involving least strenuous path, will get easily adopted by people in coping up with adversities brought by climate change.

Bio factor least strenuous path the most ideal factor for developing strategy for coping with climate change

Human attitude is factor in human resources being one of wing of production function in any industrial enterprises, which is equally applicable for enhancing productivity of agricultural systems working in open fields, where climatic aberrations affect a lot in terms of involvement of risks. But human attitude being a universal factor such lessons from industries can be brought in agricultural practices for peoples' adoption. This fact was equally supported by Leopold [17]. Individual participation of completing their own job, for them self and by them self is always applicable under all situations. This fact became inspiring factor to look from all angles which are involved in climate change. Such consideration enabled development of new approach of practices involving least strenuous path for acquiring strength for coping with climate change. Therefore in climate change factors which appear in visualization will get maneuvered by the innovative technologies for production function (Figure 2, Tables 2 & 4).

Integrated factors involving least strenuous path are required for coping with climate change

In any production process, which become ecosystem, all activities falling in categories need technology, group job function, finance, and convergence of services, all need to be taken care of. The practices devised to have inheritance of developing least strenuous paths, will get adopted by all and net global effect will be of high volume. Thus, inevitable, and insurmountable climate change which cannot be stopped, but adverse impacts brought to level for coping with it. Therefore, integrated approach on fighting adverse impact of climate change will be highly effective and appropriate approach.

Enhancement in ecosystem services can be arrived based on bio factors

The new bio factor enables guiding factor for deriving goods and services from different ecosystems. Such ecosystems are agriculture producing cereals, pulses and oilseed, Live stocks and fishery, where need of technology human group job action, finance and convergence of services need to be looked at. Such factors are brought out in (Figure 2 & Table 1). The forestry is a true eco system, which have been aimed at producing different effects. Here, considerations of human factor of feel good and wellness [41] involving universal need. The fruits and nuts for accomplishing it will be available by reformation of forestry in Forestry-Horti, whet her is any botheration or limitation of adoption by any category of farmers. Although, existing universally, in large area occupied by forestry in Africa, is not looked from such feel good and wellness aspects. In consideration of deriving such fruits

and nuts, it is highly appropriate to bring Forestry-Horticulture, where in forest areas devoid of forest plantations, can be brought under horticulture plantations, which are free from damages from birds, moneys and on ground moving wild animals. Present study [40] provides comprehensive details on ecosystem services. This new transformation in no way disturbs peoples belief let live and live with comfort and acquire tremendous wellness producing resources. Ministries of Forest and Environment world over show concern on desertification and relying on stake of forestry cover increase, which get enhanced to low level. The new transformation will enable the forestry ecosystem to acquire their set objectives in better way than the presently existing form.

The Forestry-Horticulture will be more effective and having vast potential than ongoing mission of agro forestry aiming fulfilling objective of forestry ecosystems. Thus, as forestry is controlled by governments, change in strategic policy for making forestry-horti getting least affected from the climate change, without involving question of individual adoption, will make peoples life happy and maintain feel good and wellness. This new strategic policy of trans formation of forests to forestry-horti ecosystem will overcome all pending problems from climate change. This new system will enhance goods and services from vast land areas occupied under forest and reduce pressure of agriculture ecosystems. Net effect will be enhanced efficiency of fulfillment of objectives of forestry, enhancement of goods and services from forestry ecosystem, no limitation of peoples' adaptation and reducing cost of land and pressure on agricultural systems. This becomes a wonderful way of coping with climate change at global level. This new transformation of forestry-horticulture will serve better way directly to human than before. This new transformation does not hinder in any way ongoing projects and without involvement of extra money on combating climate change.

Bio factor based innovative measures become easily adaptable

A relook on (Table 4) clearly shows that the present study on bio factors has got transformed to include land formation, as RBBF [29], aerobically composted organic nutrient supplement through manure [30] and Eco zero weeding, serving as panacea shrine for agriculture, which involves support on formation RBBF for which small subsidy on mechanised bed formation and construction of composting chambers will make again nonstrenuous task for people adaptations. The Eco zero weeding is non-monetary input involving science [31-38] will get quickly adopted by people that will enable countries cope up with climate change. The productivity of crops, as depicted crops of Zambia, which are common in almost all countries, will get enhanced by many fold. Counties will be able to have quick appraisal with their own country yield productions/ha of each crops. Thus, in spite of any adversity brought by climate change situations will get overcome to high degree of successes. Here innovative practices are applicable to all sites without any need of research and alteration. Countries suffering from lack of research support need not bother for further research for their customization. Therefore, these (Table 4) practices acquired status of theory for policy tools (Figure 3). All developed and developing countries should go for launching such agri-tech and reformation of forestry ecosystem in countries and get free from agonies of climate change world over. Countries need to look at only on three practices viz RBBF formation and construction of Aerobic Chamber for composting can be fostered as per conventions prevailing in countries. The Eco zero weeding is practically non-monetary input practice, which needs training on operation. These technology adoptions will be new policy tool with least strenuous paths. The technical human resource is well established by study [39,40] for infrastructure expertise, which will facilitate combating calamities of climate change at global scale.

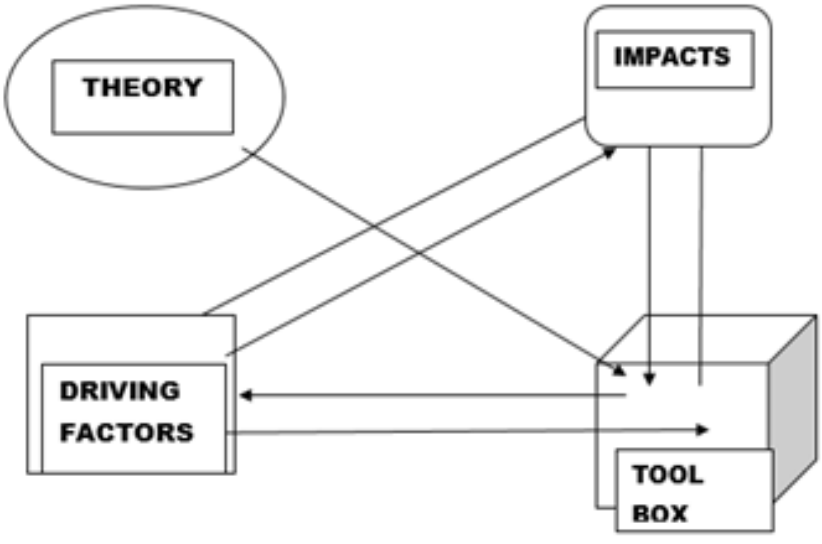

Figure 3: Linking theory, affecting driving factors, impacts and customization for moderated policy tools for policy formulations.

Relevance, efficiency, efficacy impact producing and sustainability of this bio factor approach

Bio factor is highly efficient in technology adoption, it is effective, its impact coming visualized and sustainable, as it caters fulfillment of human needs, which inspire people to come in action for enhancing productivity. As human need is a dynamic, it will stand cup scaling as before one need is satisfied other need emerges thus the bio factor will always remain bringing sustainability. This research has very clearly brought out factors which need to be carried out without going for any alteration. Thus, this research equips entire world over countries escape adversity of climate change [41].

Strength, weakness, opportunity, and threat (SWOT) analysis

The bio factor is strong driver for adaptation, it is free from any weakness, this creates new opportunity and adoption of technologies in (Table 4). The bio factor involving least strenuous path involving practices is free from any threat. Enhancement in productivity will bring prosperity and employment generations making global gentry acquire accomplishment of comfortable livelihood. The new reformation of forestry-horticulture will be able to overcome poverty in African countries due to lack in irrigation and enhanced climate change adverse impacts. This study brings new simple adoptable measures for combating adversities made by climate change.

Conclusion

Present study perceived, substantiated, and established new bio factor of least strenuous path for technology adaptation largely attempted on human extension factors. The study demonstrated different factors as they involve in any productivity function. All technologies were devised to encompass least strenuous paths so that all technologies coming in agriculture, livestock and fishery get fully adopted by all categories of framers. The new bio factor leads to reformation of forestry sector totally owned by government, in new forestry-horticulture system, which is the most sustainable under changing climate to serve by providing goods and services without imposition of strenuous task. For agriculture systems the study provided most innovative practice enabling all countries adopt as per their governance norms and get equipped to cope up in better way than that is going on. Thus, this new bio factor based study produced new intellectual property enabling world over countries cope up with insurmountable climate change.

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