



A Discourse Analysis of Postmodern Agricultural Research and Extension Models: An Epistemological Perspectivism

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ABSTRACT

A number of agricultural research and extension models are developed during postmodernism in order to increase the agricultural productivity and improve the livelihoods of farmers in developing countries. The objective of this review paper is to analyze the dynamism of these models following a postmodern epistemological perspectivism. One of the predominant agricultural research and extension models in postmodernism is the Transfer-of-Technology (ToT). It is a typical model for both national and international agricultural research and extension. In this model, all the key research decisions are made by scientists who experiment on research stations or under controlled and simplified conditions in farmers' fields. The resulting agricultural technology is then handed over to the extension services for transfer to passive farmers. This model is a typical positivist and reductionist research of normal science approach, with high input package and top-down extension. It succeeds in the uniform and controlled conditions of the resource rich farmers of the western, but fails to resolve the challenge of farmers in developing countries. Therefore, for many agricultural technologies innovated within the ToT top-down framework, failure rate in developing countries remains high. Meanwhile, this discontent has necessitated the realization of 'participatory movements' which consider farmers as key partners in research and extension. Thus, the

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attendance in the 'participatory movements' has become clearly discernible with increasing reputation. These 'movements' have progressed collectively as Participatory Research and Development (PRD) with greater sophistication and formalization of theoretical foundations. The PRD model is a methodological and philosophical contextualization to local reality that disdains positivism and reductionism but salutes pluralism and holism. This re-contextualization makes a new claim of empowering farmers. As a result, there is an indication that the ToT model has gradually losing its pre-eminence to the PRD approach in developing countries. Yet, contemporary agricultural research and extension in developing countries are based on a mixture of the ToT and PRD models. Particularly, international agricultural research institutes still hold the strong line of positivism and reductionism. For improving the livelihood of farmers in developing countries, therefore, a consistent attention need to be given to a more participatory, empowering, holistic and pluralistic PRD model that strengthens the agricultural research institutes-researchers-extension systems-farmers linkage.

Keywords: Postmodernism; epistemology; research and extension model; transfer-of-technology; participatory research and development.

1. INTRODUCTION

Agriculture forms the stamina of the economies of most developing countries, with the majority of the population depending directly or indirectly on agriculture and allied occupations [1]. To address the constraints to agricultural production in developing countries, national and international agricultural research organizations conduct agricultural researches rooted in 'western science' and try to transfer the best technologies to the farmers. One of the most dominant agricultural research and extension models used by these organizations is the transfer-of-technology (ToT) which is part of the 'normal' professionalism of agricultural scientists. Nevertheless, there has become a mismatch between the ToT model of agricultural research approach and the needs and livelihood strategies of the poor farmers in developing countries. The major rationale for the failure is the fact that the ToT model is deep-rooted in a culture of top-down and is often insensitive to realities on the farm [1-3]. The strong professional discourse of postmodern of the 1980s and 1990s was therefore to develop innovation systems and sustainable agricultures based on decentralization, diversity and democracy rather than centralization, uniformity and control [4-6]. The ToT typology is a positivist and reductionist methodology with multiple 'anomalies' as reasoned by the Kuhn's 'paradigm shift' [7]. These 'anomalies' have fostered 'social movements' for seeking for alternative model of the Participatory Research and Development (PRD) that makes farmers and extension workers more active participants in the agricultural research and extension [8-11]. This review paper seeks to analyze the dynamism of agricultural research and extension models

following a postmodern epistemological ¹ perspectivism ². This analysis is a positivist-reductionist, viz., holistic pluralistic discourse analysis for seeking solutions for the challenges of agricultural production in developing countries, meta-narrating the ToT and PRD models.

2. PHILOSOPHY OF POSTMODERNISM³ AND AGRICULTURAL RESEARCH AND EXTENSION MODELS

Postmodernism's philosophy is perhaps the values of the 'enlightenment' and its belief in the power of a positivist science research to uncover the laws of nature to promote development and to build a better world [12, 13]. In postmodern understanding, there are limitations in communication to ever absolutely describe reality. These limitations are due to failure of philosophers to discover or correctly describe reality. Due to this failure, the postmodernists believe that it is impossible to directly describe and understand the physical reality of what exists. That is, there is an implicit assumption within postmodernism that no theory will ever

¹ "Epistemology is a theory of knowledge is the branch of philosophy concerned with the nature and scope (limitations) of knowledge" (<http://en.wikipedia.org/wiki/Epistemology>).

² *Perspectivism is the term coined in developing the philosophical view that all ideations take place from particular perspectives. This means that there are many possible conceptual schemes, or perspectives in which judgment of truth or value can be made. This is often taken to imply that no way of seeing the world can be taken as definitively "true", but does not necessarily entail that all perspectives are equally valid* (<https://en.wikipedia.org/wiki/Perspectivism>).

³ "Postmodernism is a tendency in contemporary culture characterized by the rejection of objective truth and global cultural narrative or meta-narrative" (<http://en.wikipedia.org/wiki/Postmodernism>).

explain all things, but, with no reason for this assumption [7, 14]. Thus, one should be careful when communicating a framework of analysis through the artificial adoption of postmodernist language. Because such a question is important when one attempts to explore the influence of the postmodernist movement on the 'participation movement' in agricultural research and development methodologies to see the real challenges of the poor [2,15].

In postmodernism, agricultural research becomes fragmented and is top-down under the influence of contemporary cultural perspectives [2,3,15]. 'Deconstructing' agricultural research and development methodologies is, thus, important to ensure its explicability. According to Kloppenburg (2), the need to 'deconstruct' agricultural research and 'reconstruct' it into different lines is expressed as "given all the ills created by normal science-based agriculture, can this same science promote alternative forms of agriculture? In other words, can the cause of the problem be the source of the solution?" his answer to this question says "no". Basically, postmodern agricultural research and extension is a thematically and methodologically fragmented model and is referred to as the ToT model. He says, this methodology must necessarily integrate what has been excluded by the positivist science, internalize externalities and contextualize rationality. This requires that it should be socially reconstructed with the inclusion of the knowledge production capabilities of all marginalized groups at the grass-root level.

These are, therefore, major indications that there is a mismatching between local people demand and agricultural research aspirations, all owing to the very nature of 'normal science's positivist hegemonism' of the postmodern time which is mainly dependent on the ToT model. The modernism was entirely dependent on the ToT model, which continued to be used in postmodernism [16]. However, in postmodernism owing to the same fact, there is a consistent critique of the positivistic hegemonism, which confirms that it must be methodologically 'pluralistic and holistic'. At the same time, this is the condition for it to be thematically gendered, localized and ecologized [2,4,5]. That is, there is a need to integrate the social and environmental perspectives of multiple actors like farmers, scientists, institutions and all other national and international stakeholders to realize participatory agricultural research and development

methodologies. The postmodern major critiques of agricultural research and development methodologies are discussed hereafter:

Agricultural scientists tend to perceive farming systems through the narrow window of their professional discipline using the ToT model. In the ToT model, all the key research decisions are made by scientists who experiment on research stations or under controlled, simplified conditions (typical positivist and reductionist hegemonic approach of the normal science) in farmers' fields. This is usually their main focus of attention when visiting a farm and farmer. However, there are many internal linkages that matters in farming systems, particularly in the complex farming systems that resource-poor farmers often possess, but which professional disciplines often neglect. For example, the link between crops and livestock is often described in terms of "left-overs", as "crop residues" emphasizing only on grain yields [8, 17, 18]. But, in many farming systems the stover is used for multiple purposes like for animal fodder, fuel, construction materials, component of organic fertilizers, etc..., and is a vital part of the crop-livestock farming system. From this perspective, it possible to see that the risk minimizing strategies in professional research with the ToT model that is built into traditional farming systems is negligent. But, surprisingly, resource poor farmers often try to reduce risk by complicating and diversifying their farms and household endeavors. Furthermore, agricultural researchers tend to adopt one or two single criteria to measure performance, for example grain yield, pest resistance, disease resistance, drought resistance and the like. But farmers as managers of complex, risk prone systems have many different criteria which they weigh up and combine in the choice of crop varieties, in the choice of farm or watershed management activities [8,17,19] like straw yield besides the grain yield.

While formal agricultural research indeed has generated a vast amount of knowledge and fundamental insights in soil fertility and ways to enhance it, their adoption by smallholder farmers, especially in Africa, has remained below expectations. For instance, soil fertility research in east Africa has concentrated on producing recommendation for monocrop systems while most smallholder farmers plant crops in complex intercropping and mixed cropping systems. Although agricultural prices and soil characteristics are dynamic, recommendations

are always based on static input-output price ratio and soil conditions. Such research approach and assumptions render many recommendations irrelevant to smallholder farmers. Consequently, adoption of soil fertility technologies in the region is low, though many farmers appreciate the benefits of these technologies. The need to revise the current soil fertility recommendation such that they take into account the dynamic nature of soils and agricultural prices is apparent [20]. The research and development community has concluded that traditional transfer of technology, once successful in specific farming systems in Europe and Asia, is not the appropriate approach in the diverse smallholder farming systems in Africa. New approaches are needed in which smallholders are actively involved in the process, that focus on technology development and innovations geared to the specific physical, climatic, economic and social circumstances of smallholders and integrate this technology development in a process of improving the conducive environment for smallholders [21-23].

In totality, much of the rural development programs on sustainable agriculture in the Consultative Group for International Agricultural Research (CGIAR), International Maize and Wheat Improvement Center (CIMMIT), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), UK Department for International Development (DFID) and National Agricultural Research Systems (NARS), which are the main promoters of the ToT model, attempt at systemic adjustments to the sustainability crisis rather than to the approaches which need fundamental structural change (deconstruction). Additionally, agricultural research had been dominated by the search for marketable input commodities rather than by ecological and social knowledge geared to reducing the need for inputs [8,9]. Farmers of developing countries are resource poor. They need low risk and low input agricultural technologies that are developed mutually. Therefore, participatory research and extension models on the other hand explore local conditions through integrating agricultural researchers with local people, culture, perception and knowledge [8,9]. Some of the major arguments with the ToT model are discussed here after:

2.1 Positivism⁴

The foundation of the analysis of conventional approaches, which is a positivist science, with the ToT model rooted in a 'hegemonic normal science', has been a starting point in almost all the writings of Chambers in the last two decade for promoting and strengthening the PRD model as an alternative model to agricultural research and development for the poor farmers of developing countries. According to Chambers (9), the ToT model is claimed as epitomizing the essential inadequacy of positivist science in diverse fields. The philosophical re-contextualization of the movement away from positivism is therefore based on learning and organizational models that do away with this notion. Röling (24), Röling (25) says for example,

"An outstanding critic of positivist agricultural science sees agricultural innovation as best approached holistically, in terms of 'soft' models of knowledge and information systems".

2.2 Methodological Reductionism⁵

According to postmodern theorists, science does not mean to recognize the fundamental nature of human existence but to find out regular and recurrent patterns in nature to achieve stability, regularity and predictability [2, 5]. Norgaard (5) says "western science has sought to know the universal, 'unchanging characteristics behind a changing reality' and to provide one consistent set of laws about the nature of all things". According to Kloppenburg (2), this search for regularity is done, methodologically, through reductionism, produced through abstraction and simplification. Still, this is because normal science applies universal laws to function local specificities and particulars and has caused a number of 'anomalies' as reasoned in the Kuhn's paradigm (when used in a loose sense). And, this has become one of the reasons for the rise of the 'participatory movements' such as the

⁴ *Positivism is a family of philosophical views characterized by a highly favorable account of science and what is taken to be the scientific method. It opposes any kind of metaphysics and, in general, any procedure of investigation that is not reducible to scientific method*"(<http://www.newworldencyclopedia.org/entry/Positivism>).

⁵ *"Methodological reductionism is the position that all scientific theories either can or should be reduced to a single super-theory through the process of theoretical reduction"* (<http://en.wikipedia.org/wiki/Reductionism>).

PRD as an alternative model, in place of the ToT model, with the former model realizing localities. This was the reality, for example, as described by Chambers and many others in the 1980' and 1990's. Chambers (26) describes 'reductionism' as

"In project planningreduces the complexity of development to a single central problem identified mostly by outsiders. Thinking about poverty is reduced to a narrow technical definition meant to ensure that a scientifically universal understanding and a unique standard of measurement are achieved. Agricultural production is reduced to yields per hectare; food is reduced to grain production, etc...reductionist thinking is a mysterious way where intelligence and humane common sense seem inversely related. And since intelligent people dominate the discourse of development, we can expect reductionism to remain robustly sustainable".

In the context of agricultural experimentation, Chambers and Jiggins (19) explain the causes of methodological reductionism's bias against resource-poor farmers. They explain that "Reductionism excels in exploring the relationships of a restricted number of variables in controlled conditions. This suits only to a "large-scale simplified farming in which the natural environment is highly controlled, with monocropping and standardized mechanical, fertilizer and pesticide treatments". According to them, this model of agricultural research and development works only for resource-rich farmers who are financially powerful and politically organized enough to influence researchers and research policies. In addition, they are "culturally close to researchers in terms of values and attitudes" and are able to communicate more easily with them. This is obviously contrasting with the conditions under which resource-poor farmers operate. These are farmers in developing countries who have small landholdings and different priorities; their physical environment is more diversified and less controllable, interactions are more complex (for example, ought to practice shifting agriculture, agroforestry, crop rotation, multiple cropping, fallowing) and farmers' management, developed through constant adaptation is of paramount importance. Therefore, farmers need a research that is locally-specific and flexible [9,19]. Chambers and Jiggins (19) explain these facts as:

"For reasons, thus, which...are environmental, political, social and methodological, most agricultural science has a bad record in serving farm families who are resource-poor. Reductionist science is at the heart of the 'teaching' model of transfer of technology and, in general, of the diffusion of innovation model which has always dominated science".

The ToT model being embedded in normal science is, thus, conventionally oriented towards products and not towards clients. For this reason, Chambers and Jiggins (19) propose a "farmer first and last" model, against the notion of the ToT, where everything starts and ends with the farmer. That is, to redirect science towards the 'client' and to allow local knowledge to emerge, the research process should therefore be participatory (including all stakeholders), open-ended and holistic; its structure should not be pre-determined by hypotheses and the evaluation should take different criteria into consideration [6,17,27,28].

2.3 Holism⁶

Holism here is simply a question of identifying and understanding functioning components of farms and solving problems of the poor farming communities. Leeuwis (4) says that according to the philosophy of holism, the natural and the social world are essentially seen as predictable and controllable, which predetermines the procedures of problem analysis and resolution, including the type of diagnostic survey and the level of farmers' involvement. That is also why Chambers and Jiggins (19) insist on the shortcomings of the 'reductionist' ToT model, in terms of its cost, its method or its philosophy. To enlighten the same, Kloppenburg (2) indicates that the "solution to problems at the whole farm and local system levels does not lie with agricultural researchers but with 'those who think in terms of whole farms, those whose experiences are of whole farms, and whose knowledge has been developed by the integration of hands, brain and heart in caring labor on whole farms – that is...farmers".

Normal science embedded in ToT model of agricultural research methodology is basically a

⁶ "Holism is the philosophy that all the properties of a given system ... cannot be determined or explained by its component parts alone. Instead, the system as a whole determines in an important way how the parts behave" (<http://en.wikipedia.org/wiki/Holism>).

universalist, positivist and reductionist, lacking theoretical and methodological 'pluralism' [2,5,9, 29] thus does not able to help the poor farmers in the developing countries.

2.4 Epistemological Pluralism⁷

Kelly and Armstrong (15) says, to allow the suppressed voices of the poor farmers to be heard, scientists must accept pluralism and fight the hegemony of any single mode of knowledge productions. They say that, "confronting ethnocentrism means moving from conventional definitions and universalized theorizations of development towards more pluralistic conceptions of wellbeing".

From the point of view of ecological economics, Norgaard (5) summarizes the case for pluralism opposing the 'single method of knowing', as lacking philosophical contextualization and concept of entertaining diverse local issues. To him pluralism is more appropriate for addressing problems resulting from the possible biases of a single method. It sustains biological or cultural diversity, by counteracting the destructive hegemony of "western" form of knowing, technological intervention and social organization. Logically pluralism promotes participation and democracy at the grass-root level. Furthermore, Norgaard (5) explains the hegemony in "western sciences" as "the use of a single framework, without modification for regional differences, facilitates control from a single centre of analysis, which disenfranchises or disqualifies the majority, facilitates tyranny of technocrats, and encourages centralization...openness to multiple frames of analysis is a prerequisite to democracy and decentralization".

In fact, the global trend toward decentralization is recent to empower stakeholders. This is the concept of pluralism which has emerged from political theory and philosophy [30, 31]. In simple terms, philosophy of pluralism represents an acknowledgement of multi-stakeholder situations. Mitchell, Agle (32) and Anderson, Clément (33) say in rural development "pluralism refers to situations where a number of autonomous and independent groups with fundamentally different

values, perceptions, and objectives demand a role in decision-making about natural resource management outcomes"

Furthermore, according to Pretty (27) the philosophy of pluralism in participatory approaches entertains subjective nature of 'data' which requires 'triangulation' and 'visualization', as a central principle. Triangulation is required to account for multiple perspectives because "all views of activity or purpose are heavy with interpretation, bias and prejudice, and this implies that there are multiple possible descriptions of any real-world activity". On the other hand, the visualization process ensures transparency and permits open dialogue and therefore deepens and democratizes analysis. Through it, local people use local categories, criteria and symbols and thus share in the creation and use of knowledge.

3. PERSPECTIVISM OF PARTICIPATORY MOVEMENTS

Rapid and Participatory Rural Appraisal (RRA), Participatory Rural Appraisal (PRA), Farmer Participatory Research (FPR), Participatory Technology Development (PTD), Participatory Action Research (PAR), Community-Based Natural Resource Management (CBNRM), Sustainable Livelihoods Approach (SLA), Participatory Learning and Action (PLA) and the more inclusive Participatory Research and Development (PRD) are families of 'participatory movements' in postmodernism which have evolved as behaviors and attitudes, methods, and practices of sharing knowledge against the ToT model of agricultural research methodology. Since the 1990s PRA/PLA/PRD have spread and been applied in most countries of the developing world. Among the diverse domains of application, some of the more common ones have been natural resource management and agriculture, programmes for equity, empowerment, rights and security and community-level planning and action [8-11].

Epistemologically⁸ and ideologically, PRD seeks and embodies participatory ways to empower local and subordinate people, enabling them to express and enhance their knowledge and take action. Good performance has moved towards

⁷ "Epistemological pluralism (or methodological pluralism) is the view that different epistemological methodologies are necessary to attain a full description of the world". It opposes to the purely reductionistic enterprise of many fields of science and realism (http://en.wikipedia.org/wiki/Methodological_pluralism).

⁸ "Epistemology is a theory of knowledge is the branch of philosophy concerned with the nature and scope (limitations) of knowledge" (<http://en.wikipedia.org/wiki/Epistemology>).

an eclectic pluralism in which branding, labels, ownership and ego give way to sharing, borrowing, creativity and diversity, all these complemented by mutual and critical reflective learning and responsibility [6,8,29,34,35].

In re-conceptualizing the research and development process, there has been a growing interest in the use of participatory approaches, the PRD, in the natural resource management, agriculture and rural livelihoods researches [6,8, 10] in place of the use of the established conventional methodologies, the ToT. What is true of the participatory approaches in general is held to be equally valid of its sub-disciplines. For example, farmer participation methods are seen as offering 'a methodological revolution in contemporary agricultural research' [8,17,29]. Participatory approaches urge critical inquiry as a tool for social change, in which power relations are key lines of analysis. PRD is, promptly, social movement that becomes a radical challenge to the traditions of conventional approaches of "western sciences" and the ToT model leading to a 'paradigm shift'⁹ of agricultural research in developing countries.

3.1 Conceptual Competence of the ToT and PRD Models and a Paradigm Shift

As discussed above, currently, in agricultural research and development methodologies, there are attempts to lay theoretical foundations based on a new paradigm, referred to as a 'participatory' or 'learning' paradigm. There are numerous influences in the practice and theory of participation. There are many linking concepts which are rooted in 'social constructivist theories' whose basis is a critique of positivist, mainstream science and with explicit objective to move on to an alternative model of science [9]. According to Chambers (26), "postmodern theory and the experience of participation are mutually reinforcing". Making concepts explicit is possible by way of participatory paradigm, as a new perspective or model (PRD), which aims at the empowerment of the resource-poor, whose interests have been risked due to the old perspective or model (ToT), which is a reductionist, positivist, non-holistic, non-pluralist, nonparticipatory, non-democratic, non-contextualized, externalized and irrationalized

approach to agricultural research resulting in a lot of 'anomalies' (when loosely used in line with Kuhn's Paradigm Shift).

According to a postmodernist view, a 'model' or 'paradigm' is a representation within which one set of truths hold. The major critique of a paradigm refers to its 'deconstruction', such as its limits in explaining a phenomenon or in solving a problem that other paradigms cannot solve. When the philosophy of Kuhn's paradigm shift (loose sense) is used, in the old paradigm of the ToT model, farmers are not actors, are separated from the process and researchers, do not interpret the content and do not share ideas and give options. It is this preoccupation with the centralized, technically oriented solutions, which has made it fail to improve the prospects of most of the world's smallholder farmers. This can be seen as 'anomalies' that made the global shifting to a new way of doing research and development with the poor peasants in developing countries.

Fundamental to this emerging 'paradigm shift' (from the ToT to PRD) is reassessing the traditional conception of research and development as a process primarily concerned with generating and transferring modern technology to passive end-users. According to [9], the "people centered" principles have influenced the course of "western culture" over the last thirty years, changing several research and development programs. These principles, larger humanist movements in the natural and social sciences and the emergence of postmodernism and chaos theory urged organizations to adopt the "people first" orientation, which has necessitated and brought in a 'paradigm shift'. Chambers (9) says: "This newer paradigm maintained that big was not always better, centralized hierarchies were doubted, big outcomes may be born of small inputs and that a 'more heads are better than one' philosophy would more readily sustain productive, durable change. In international relief and development organizations, however, 'people centered,' practice became 'participatory development' and great deal of persistent and determined effort went into fending off old dragons to ensure participation occurred in the design, implementation and evaluation of many programs".

Unlike the ToT model, the PRD model (as a participatory research model) is people-centered in the sense that the process of critical inquiry is informed by and responds to the experiences

⁹ *Paradigm shift is revolutionary science and is the term used by Thomas Kuhn who wrote that "Successive transition from one paradigm to another via revolution is the usual developmental pattern of mature science."* (http://en.wikipedia.org/wiki/Paradigm#Paradigm_shifts).

and needs of people participating. It is about power which is crucial to the construction of reality, language, meanings and rituals of truth; power functions in all knowledge and in every definition. Power is knowledge and knowledge creates truth and therefore power. It is also about praxis, which recognizes the inseparability of theory and practice and critical awareness of the personal-political dialectic [11,36]. Fortunately farmers of the western countries do have power and knowledge and influence agricultural researchers whereas farmers of developing countries have the knowledge but do not have power to influence agricultural researchers.

Like all relativist approaches and methods, the shift to more holistic, pluralistic and participatory models portrays significantly from Kuhn (7) belief of a paradigm shift, that is, the beginning of a scientific revolution. That is why Jameson (37), sees participatory approach to research and development as a potential method of an emergent development paradigm whose main feature is a rejection of 'evolutionary, universalistic, positivistic and utilitarian assumptions' which dominated "western science" since the time of Bacon, Descartes and Darwin times. Chambers (26) on his part explains:

"If these justifications are considered valid, the principles of participatory research, ... Their epistemological basis rests with the notions of unpredictability of social phenomena, the subjective nature of 'data' and the endemic nature of 'problems'. The response to unpredictability and the endemism of problems is iteration and optimal ignorance. Iteration is the principle through which methodology is adapted to specific situations (actors, problem situation, local environment). Optimal ignorance is the methodological recognition for the complex, diverse, dynamic and unpredictable realities of people, farming systems and livelihoods, comparisons and judgment are often more potent and practical than precise measurement. As such, it can be seen as a response to the reductionism ..."

Some of the tangible applications of the PRD models include the development of the paradigm of 'agricultural knowledge and innovation systems (AKIS)' and the implementation of 'Management of Agricultural Knowledge Systems' in the Netherlands and many developing countries in bilateral cooperation.

This was in effective recognition of the weaknesses of the ToT model, beyond hidden western reductionism. Then, agricultural development cooperation has substantially evolved in this new stream of thoughts and facts. The DFID of the United Kingdom have extensively worked on the issue, and have brought into perspective the inclusion of market and socioeconomic concerns into technology and innovations issues in order to better impact farmers' livelihoods. In so doing, research approaches have been modified to become research for development (R4D). The Forum for Agricultural Research in Africa (FARA) and the Food, Agriculture and Natural Resources Policy Advocacy Network (FANRPAN) are now working along this line, with greater emphasis on inclusive policy decision-making [38-40]. The agricultural innovation system (AIS) framework is also one of these approaches. The AIS framework makes use of individual and collective absorptive capabilities to translate information and knowledge into a useful social or economic activity in agriculture. The framework requires an understanding of how individual and collective capabilities are strengthened, and how these capabilities are applied to agriculture [41].

3.2 Epistemology of Scientific and Local Knowledge

According to Molnar, Duffy (42) 'there is only one science' and that is "a way of accumulating knowledge in inters subjectively testable ways". While some other ways of knowing exist, and may be superior to science in some contexts, they are not science. The issue is, fundamentally, one of making a distinction between knowledge based on pure reason and thought (rationalism¹⁰) and knowledge obtained from experience and interaction (empiricism¹⁰). Local knowledge has both forms, that is, it is both rationalist and empiricist. It is neither superior nor inferior to scientific knowledge; it is adapted to specific and local situations which science does not able to deal with. From this point, it is possible to see that the western science, in the form of conventional agricultural research, has been maladapted to local systems where it does not normally fit or valid and is unable to change

¹⁰ "Epistemological rationalism holds that the source of knowledge is reason and logic and contrasts with 10 'Epistemological empiricism' which holds knowledge and concepts are wholly based upon our personal experiences" (http://atheism.about.com/library/glossary/general/bldef_rationalism.htm).

the livelihoods of the poor farmers in the developing countries. Additionally, scientific knowledge is virtual but not democratic, ignores social values of local societies and considers scientists as the only source of knowledge that can influence policy and solve all sorts of problems. According to Popper (14):

“The proper epistemological question is not one about sources; rather, we ask whether the assertion made is true —that is to say, whether it agrees with the facts,…”

As farmers' rights and democratic research, the outside professionals should accept the nonscientific or people's or local knowledge that grass-root level organizations and farmers always know best to tackle their own problems. There is now considerable practical evidence that experimentation is the norm rather than the exception among rural communities in developing countries.

4. CONTEMPORARY PERSPECTIVISM OF AGRICULTURAL RESEARCH AND DEVELOPMENT METHODOLOGIES

There is a discourse over whether participation is appropriate in all relief and development interventions. Disagreement exists over whether such methods are relevant in all phases of programs, from conception to exit evaluation. However, the consensus of new perspectives suggest that research and development can no longer be the exclusive domain of scientists, but rather a joint process requiring the participation of a wider range of actors, users or stakeholders bridging scientific and local knowledge for the best use for the poor farmers of the developing world. More importantly, the current discourse redefines the role of local people from being merely recipients and beneficiaries to actors who influence and provide key inputs to the process of development [11,29,34,36].

The most important perspective is the holistic and pluralistic approach which solves the power relations between agricultural researchers and farmers and targets conservation and sustainable use of natural resources, agricultural production, development of less-favored areas, local governance and decentralization and citizens' rights [10,36] in developing countries.

5. CONCLUSION

Agricultural research and extension in developing countries need to be a holistic and pluralistic

approach that enhances the power relations between agricultural researchers, extension workers and farmers. A model that strengthens the link between researchers - extension workers - farmers would have better potential for the realization of the outputs of agricultural technologies. Such a model also needs to integrate conservation and sustainable use of local resources, local institutions, and indigenous knowledge and gender balance. This is because the basis for any type of development particularly for the poor farmers in developing countries is the ability of individuals, organizations, and societies to improve on what they are currently doing, to improve their individual and collective capabilities.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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