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Spatially Appropriate Spacing of Innovation: An Anthropological Take on Diffusion and Adoption

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Abstract:

In the world of technological development various studies have been carried out analyzing and focusing only the community's inadequacies. The traditional ideologies, knowledge and practices are often subjugated by labeling them as redundant, and outdated in case of non-adoption of a new innovation. The paper focuses to build a model that demonstrates the appropriate spacing of an innovation in a locality as a major factor affecting the diffusion and adoption of modern technology. The locality embodies the geographical, ecological and economic limitations according to which the initiation of an innovation needs to be spaced. The model aims to bridge the gap between indigenous knowledge practices and modern farming techniques. The research was carried out in the villages of 'Ghora Gali' and 'Arukas' through a mixed blend of qualitative and quantitative methods. The data was collected from 200 respondents, 100 from each locale respectively. The paper demonstrates geo-ecology-eco determinism is determinant in diffusion and adoption of innovation.

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Key words: Diffusion, Innovation, Adoption Rate, Locality, Adopter Categories, Farming technologies.

Introduction

The dynamics of introduction of a new technology and its diffusion is vastly dependent upon the locality of the community and spatial spacing of the innovation. To enhance the desirability for technological change, that is intrinsic for development process requires, "reduction of elements of dynamic uncertainty". (Fischer et al, 1999) Thus it can be contracted that major "technological changes are accompanied by social and psychological change" while these responses are influenced greatly by how 'innovation diffusion process is managed" (Barton, 1983)

Failure of different innovations and various development projects is not a shocking phenomenon. The rationale behind the problem can be understood through the citation, "a possible reason for these failure rates is the inappropriate application of innovation diffusion models (Deffuant, Hut & Amblard, 2005; Hassan, Mourad & Tolba, 2010). It needs to be understood that "Innovation and diffusion" processes according to Fischer et al, (1999), no longer can be subjected to any distinction or inclination in preference since both are "interactive" in nature. So, the "conception of knowledge and its assimilation are a part of a single process" which need to be given equal priority.

Since diffusion and adoption both revolve around the community, thus "there is an urgent need to consider consumers' perceptions of the adoption (Kalliny & Hausman, 2007). Adoption manifestly represents needs, while needs are inescapably defined by the locality. Sadly the development network ignores the social and cultural needs, focusing exclusively over mechanization. This has inevitably led to a widened gap between the traditional and modern models of

development, "Partially because of the lack of fit between technology and culture" (Ronen & Shenkar, 1985; Newman & Nollen 1996; Soh & Sia 2004).

It has been affirmed repeatedly that "the value system of the individual is critical to innovation adoption (Daghfous et al., 1999). The notion becomes more compelling when Rogers (2003) defines the process of innovation-diffusion as an "uncertainty reduction process", which clearly means that the innovation be evolved around the individual and group needs, their opportunities and constraints. However, the discussion does not end at shaping need based innovation, rather the diffusion tools must also be fashioned according to the locality.

The process of innovation-diffusion progresses to the course of decision- making, based on various social, ecological, geographical and economic assets. Diffusion according to Rogers (1983) is a process through which, 'innovation is communicated' utilizing effective communicative channels over a period of time amongst the members belonging to a certain social system. The process is majorly dependent upon communication tools, beginning with "awareness" stage through "mass media channels" and then "adoption" which is "the result of human interaction through interpersonal networks." (Rogers, 2003)

The paper advocates the point that the adoption of the technology which is consequential of the innovation-diffusion process is affected by the spatial spacing of the innovation within a locality. The *Rate of adoption* according to Rogers (1983) "is the relative speed with which an innovation is adopted by members of a social system." The adoption thus is certainly affected by the locality, inclusive of geographical, ecological and economic requirements of the community. The adoption rate is mostly slowed down as these factors are often not accepted to be affecting, as Zhu & Kraemer (2005), states that the likely reason for failure of major development interventions is "the difficulty to evaluate the factors associated with accelerating the rate of diffusion."

The geographical, economic and ecological barriers are among the various variables affecting diffusion and in response adoption. Rogers (1983) strengthens the argument of geographical determinism by stating that, "Members of a social system do not have completely free access to interact with one another. Status barriers, geographical location, and other variables affect diffusion patterns." Moreover, the economic yield also defines the rate of adoption of a community as Grigg (2005) states that, "The rate of adoption of innovations varies among farmers, according to their perception of the potential profit which will result." Ecological determinism also outlines the rate of adoption, as Grigg (2005) further states that, "Mountainous areas for the most part offer few opportunities to the farmer". Moreover, the citation further reinforces the case that the, "changes in the ecosystems could alter the location of the major crops production regions on the earth" and thus "agricultural production and productivity is particularly vulnerable to disruption by weather" (IFPRI, 2004).

Materials and Method

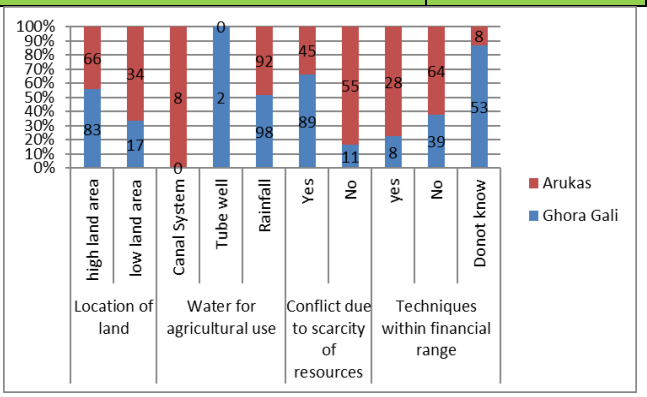
The study was conducting in the two villages of "*Ghora Gali*" and "*Arukas*", by gathering data from 200 respondents, 100 respondents respectively. The data collection tools included use of socio-economic census forms, interview guides, and informal interviews. The data collected sketched the locality's geographical, ecological and economic as constraints that affected the innovation-diffusion and adoption process negatively.

Results and Discussion

Table: 1 Non-Participation and Reason by Area

Causes of Non- Participation		**Locale**	
		Ghora Gali	**Arukas**
Geographical constraints	Landless	4.00%	7.00%
	Project not reached.	56.00%	27.00%
Household Head did not allow		0	4.00%

Economic constraints	7.00%	28.00%
Ecological restraints + project bias	15.00%	17.00%
Participant	**18.00%**	**17.00%**



The cross tabulation of the variables, sketches the complete scenario of diffusion of innovation and its adoption in both the field areas i.e. village of *Ghora Gali* and *Arukas* and the various constraints faced by the specific communities. Primarily, it can be observed that out of the 200 respondents interviewed, 100 respondents respectively, *Ghora Gali* exceeded in adopting the innovations by 18.00 percent while *Arkuas* had 17.00 percent participants. The technological innovations introduced, the tools of communication channels employed, geographical disparities, ecological and economic constraints and their effect on the dissemination and adoption of innovation were poles apart, and thus the dynamics of adoption for both areas cannot be put in the same line. However, the point of commonality is that within any locality, geographical spread, ecological assets and economic resources all are interconnected and thus mutually dependent.

Geographical Constraints

Table 1 demonstrates that the major cause sundering the diffusion and adoption process included geographical constraints, while data in cross tabulation bar chart also

verifies it. It shows that in *Ghora Gali* 83 percent of the residences was located in the higher hilly areas i.e. Highlands, while 17 percent were 'Lowlanders'. In *Arukas* 66 percent were 'Highlanders' while 34 percent were 'Lowlanders'. It clearly illustrates that *Ghora Gali* had a relatively tricky geographical setup than *Arukas,* and rationally would require more detailed planning when it comes to diffusion tools, and farming technologies.

Now the geographical constraints that led to non adoption, primarily, included exclusion of respondents from the development circle due to the lack of land i.e. 4.0 percent in *Ghora Gali* and 7.0 percent *Arukas*. Mc Gee & Warms (2004), Hadi *et al.* (2014) cited that, "Ownership of agriculturally usable land, large and small holding", define who will be preferred and who will be excluded" from the development process. Secondly, majority of the community members were excluded as they were not reached by the project directly, i.e. a massive majority of 56 percent in *Ghora Gali* and 27 percent in *Arukas*.

According to the perceptions of the community members, the category of "not reached" includes; Firstly, a majority of the respondents that were astonishingly completely unaware of any development project working in the area. As, Rogers (1983) states that mass communication channels are the most "rapid" and "efficient" means to disseminate the information about the existence of new innovation and create "existence knowledge". It can be noted in the light of the data that the project communication tools were not planned appropriately, and the primary stair of diffusion dependent upon creating awareness about the existence of an innovation was left to "interpersonal channels" leading to ineffective diffusion.

Secondly, there were respondents who knew that a project objective on bringing agricultural intervention comes to the village however were not directly approached or interacted with, as their residential area was not within the sphere of the

point of inculcation of the innovation. The point of impregnation in both the villages were plain land area, closer to the main road that could be easily accessed by the project team, while the hilly areas were completely excluded. Fischer and Villa (1999) noted that innovation is "interactive" in nature, however, the communication channels of diffusion were solely dependent upon face-to-face- interaction instead of mass communication channels. Meeting timings, training material, asset distribution criterions and all other relevant information was passed on exclusively on the basis of geographical proximity, convenience, familial ties, and personal networks. On the contrary, if "opinion leaders' according to Tolba and Mourad (year missing) were involved as key informants in dissemination of project information to the local people without being biased, or selective the project would have been more effective in maximizing the benefits of the individual at the grass root level. Moreover, Rogers (1983) believes that communication is more "effective" when individuals are 'Homophilous", thus the outcome of exclusion by the community members themselves, and exclusive diffusion of information can be easily comprehended.

Analyzing the geographical setting of both the locales, it can be observed that '*Ghora Gali*' is spread over a larger area, the houses are set up far apart, while the land is more hilly with no proper roads what so ever. On the other hand *Arukas* is relatively a plainer area; houses are in a closer proximity. The project staffs ineffectual communication tools ignorant of the geographical constraints led to community's selective diffusion of information. As Rogers (1983), states that "Status barriers, geographical location, and other variables affect diffusion patterns."

Economic Constraints

The table further puts light over economic constraints, demonstrating that 7 percent of the respondents from *Ghora Gali* and 28 percent of the respondents from *Arukas* did not adopt the introduced technologies due to economic constraints. The bar chart also is in accordance with this constraint. The community when inquired "if the project techniques were within their financial range", the 8 percent of the respondents from *Ghora Gali* said "Yes", 39 percent said "No", while 53 percent were unaware of any project techniques. In Arukas, 28 percent of the respondents said "Yes" the techniques were financially achievable; however 64 percent disagreed and said that if the project assets and labor is not provided the techniques cannot be adopted; while 8 percent were unaware of the project techniques. This shows that *Ghora Gali* faced serious geographical constraints, while *Arukas* was dominated by economic constraints. The data is supported in the light of the citation by Syed (2009) who, states that "it is more likely for the poor households to give up potentially workable technologies, income opportunities and production choices due to their repugnance to risk."

The data is further analyzed keeping under consideration the technological innovations introduced in both the locales. In *Ghora Gali* water management and agricultural modernization techniques included formulation of dug wells, roof top harvesting, kitchen gardening, modern wheat and maize cultivation, mushroom cultivation and honey bee farming. However, the focus of the project staff was strictly over modern maize and wheat cultivation and roof top harvesting. While, *Arukas* was introduced with kitchen gardening, road side harvesting, fish farming, drip irrigation, tunnel farming, and modern wheat and maize cultivation. The focused innovations were majorly tunnel farming, and modern maize and wheat cultivation.

In-depth observation and interviews highlighted that the modern techniques that were being focused and stressed upon by the project were not considered within the community's financial range. In both the locales, people were reluctant on adopting the modern wheat and maize farming since it required doubling the farming inputs, natural resources and time. It included multiple tilling through tractors or *hal*, use of fertilizers, laboratory seeds, and most importantly irrigation of land with careful precision. This of course not only increased the economic pressure but also increased the factor of "risk aversion". The techniques that were adopted by a few included thus individuals that had received assets, and abundance of assistance directly from the project. The close familial network, and hijacking of the authority by the community project representatives was the only reason for the little adoption that took place, which is supported by Richard and Layard (2002) that, 'Those in power are always smaller in number but much more organized than the masses". In Ghora Gali the participants mostly adopted the Roof Top Harvesting, and Dug Wells.

All these participants were given the required assets i.e. 'synthetic water storage *tankies*' and '*kangan* or concrete rings' for dug wells. The rest of the community had no means to adopt the technologies since they were beyond their financial grasp, and merely kept complaining about the biased behavior of the project staff in the distribution of assets. In *Arukas*, the major participants were again major landowners and dominant members of the community. The assets were pooled in the hands of a few people, like plastic bags and rings for 'Tunnel Farming'. The fish tank, belonged to the community project representative, who also acquired 'Tunnel', free seeds, fertilizers, and labor to plant his land. The paper thus projects that in order for the techniques to be effectively adopted by a majority, the project needs to be participatory, as Van Heck(2003) states that it is "Only through group approaches

the large numbers of marginalized rural people can be "reached" effectively" as the "individualistic approaches benefit mostly the better-off-people".

Ecological Constraints

Further the table reveals that ecological constraints also played an important role in the non-adoption of the technologies. In *Ghora Gali* 15 percent, and in *Arukas* 17 percent of the respondents were hesitant and reluctant to modernize their traditional techniques. It should be noted that the economic risk and ecological constraints are awfully inter-reliant. Since the locales had a hilly geographical spread, with sloppy land, water run-offs and rainfall as the only source of water for household and agricultural use the ecological determinism go the better of them. The risk levels rocketed the skies as represented in the bar chart data that the 'water for agricultural use' in *Ghora Gali* was 2 percent through tube wells, and 98 percent by rainfall, while in *Arukas* 8 percent had access to canal system, while 92 percent still relied over rainfall.

It was observed that in the village of *Ghora Gali* since the land was absolutely arid, and relied completely upon rainfall the risk aversion was soaring. People only participated with the project to receive "*tankies*" that instead of being used for roof top harvesting and kitchen gardening were used for household chores. Steward's ecological approach states, cited by Mc Gee & Warms (2004), that individual culture is an "adaptation to specific environmental circumstance". Moreover, it was observed that in the village of *Arukas,* individuals who were lowlander and demographically privileged were also dominating the ecological resources.

The locality included a single *"kass"* or stream for the formulation of a canal system, which obviously advantaged only the community members that were in a close proximity of the

water source. The areas that were far from the *"kass"* faced the same ecological constraints and thus did not adopt the modern farming techniques. This is in complete accordance with Steward's proposition that "cultures in similar environments would tend to follow the same development sequences and formulate similar responses to their environmental challenges." (McGee & Warms, 2004).

In the light of the citation it is thus understood why the community members insisted upon the use of traditional methods of cultivating wheat and maize i.e. use of *'Chatta'* method to sow seeds, ploughing through *"bails"* only once or twice, and use of *"pahari"*or local seed, minimizing input due to the risk of no rainfall, decreasing the possibility of loss. It is this inappropriate spacing of the techniques that leads to non-adoption of the modern technologies, as Van Willigen (1993), points these technologies as being 'socially uncontextualized', with 'expensive inputs' and 'complex agricultural innovation' which is thus rejected by the farmers as it was 'largely unsuitable technology'. Grigg (2005) further strengthens the argument of keeping the community's locality in mind when designing innovations by stating that, innovations that are "simple' are relatively more prone to be adopted than 'complex machinery'. Moreover, innovations analogous to the "existing farming system" are predisposed to be adopted.

Conclusion

The indigenous knowledge system is uniquely defined by the specific locality it is born in, reliant upon independent invention, diffusion, and assimilation which are the major mechanisms of cultural change. The dependency theory along with the World-Systems theory illustrate how the traditional knowledge systems are being throttled to death, by completely disregarding them in the development process. Further, the paper concludes that determinism i.e. geographical, ecological

and economic; all impact the adoption of modern techniques tremendously. Thus, techniques must be developed with reference to the locality. Hence, technological interventions can only sustain if planned, designed and implemented incorporating emic approaches, representative of community participation.

BIBLIOGRAPHY

Barton, L. D. (1983). Applying Innovation Diffusion Theory to the Management of Change. *Applying Innovation Diffusion Theory to the Management of Change.* (1999). Innovation, Networks and Localities: An Introduction. In M. M. Suarez-Villa, & L. S.-V. Manfred M Fischer (Ed.), *Innovations, Networks and Localities* (pp. 1, 2). New York: Springer.

Deffuant, G., Hut, S. & Amblard. F. (2005). "An Individual-based Model of Innovation Diffusion Mixing Social Value and Individual Benefit", *American Journal of Sociology, 110,* 1041-1069.

Daghfous, N., Petrof, J. & Pons, F. (1999). "Values and Adoption of Innovation: A Cross-Cultural Study," *Journal of Consumer Marketing*, *16* (4), 314-331.

Grigg, D. 2005. An Introduction to Agricultural Geography. Ed. 2nd . Routledge London and New York. 178, 187.

Hassan, S., Mourad, M. & Tolba, A. (2010) 'Conceptualizing the influence of lead users and opinion leaders on accelerating the rate of innovation diffusion", Int. *J. Technology Marketing, 5*(3), 203-218.

Hadi, S. A., Chaudhry, A. G., Ahmed, A. & Farooq, H. (2014). Indigenous Response to Modern Agriculture: An Anthropological Study of Agriculture Productivity through Planned Change. *European Academic Research, II* (7), 9185-9209.

IFPRI (International Food Policy Research Institute) 2004: *Assuring food and nutrition security in Africa by 2020*. Prioritizing actions, strengthening actors and facilitating partnerships. Proceedings of an all-Africa Conference. Kampala, Uganda April 1- 3, 2004 IFPRI Pp 1-239.

Kalliny, M. & Hausman, A. (2007). "The Impact of Cultural and Religious Values on Consumer's Adoption of Innovation," *Academy of Marketing Studies*, *11*(1), 125-136.

McGee, J. R. & Warms, R. L. (2004). *An Anthropological Theory: An Introductory History*. 3rd Edition. Mc. Graw Hill. 237 pp.

Newman, K and Nollen, S. (1996), "Culture and Congruence: The Fit Between Management Practice and National Culture," *Journal of International Business Studies*, *27*(4), 753-779.

Richard, C. & Layard, R. (2002). Edited. *What the Future Holds*. Cambridge, Ma: MIT Press. 328.

Rogers, E. M. (2003). *Diffusion of innovations* (5th Ed.). New York: Free Press. 15, 232 Pp.

Rogers, E. M. (1983). *Diffusion of Innovations* (3 ed., Vol. 3). London: Macmillan Publishing.

Ronen, S. & Shenkar, O. (1985). "Clustering Countries on Attitudinal Dimensions: A Review and Synthesis," *Academy of Management Review*, *10*, 435-454.

Soh, C. & Sia, S. (2004). "An Institutional Perspective on Sources of ERP Package- Organization Misalignments," *Journal of Strategic Information Systems*, *13*(4), 375-397.

Syed, N. (2009). *Replicating Dreams: A Comprehensive Study of Grameen Bank and its replication,* Kashf Foundation, Pakistan. Oxford University Press. 68 pp.

Tolba, H. A, Mourad, M. (unknown). Individual and cultural factors affecting diffusion of innovation. *Journal of*

International Business and Cultural Studies. The American University in Cairo. 1-16 pp.

Van Willigen, J. (1993). Applied Anthropology. Greenwood Publishing Group, U.S. Pp.208

Van Heck, B. (2003). Participatory Development: Guidelines on Beneficiary Participation in Agricultural and Rural Development. FAO. Ed. 2. Pp 10.

Zhu, K. & Kraemer, K. (2005). "Post –adoption Variations and Usage and Value of e-Business by Organizations: Cross-Country Evidence from the retail Industry" *Information Systems, 16*(1), 61-84.