

Innovation in Unequal Societies: How can it contribute to improve equality?

José E. Cassiolato¹

Maria Clara Couto Soares²

Helena M. M. Lastres³

Paper presented at the international seminar Science, Technology, Innovation and Social Inclusion, UNESCO, Montevideo, May 2008.

1. Introduction

One of the most debated aspects of the recent changes occurring in the world is the acceleration of globalization of the economy and of knowledge. This process has been intensified by the expansion of new patterns of production, distribution and exchange based on the diffusion of ICT, allowing the interconnection of different and distant geographical parts of the world in real time and the communication and exchange of information in a way never experienced before. However, at the same time that we witness an amplification of the globalization process, a trend in the opposite direction is noticed. Together with the new possibilities offered by the increasing diffusion of ICT, new forms of social polarization and economic exclusion can be created. (Cassiolato, Lastres and Maciel 2003).

In fact globalization, it is recognized, has been accompanied by increases in economic inequality. Income inequality has increased in practically all industrial countries – Europe, USA, Canada and Japan – and most middle income developing countries such as China, India and South Africa in the last two decades. In the USA, for example, the income share of the top 1 percent of earners has more than doubled from 1979 to the late 1990s.

Although explaining such inequality increase turns out to be complex and beyond the objectives of this paper, most of the available explanation attributes it to either globalization or technological

¹ Ph.D. SPRU/University of Sussex, professor at Federal University of Rio de Janeiro and coordinator of RedeSist. E-mail:cassio@ie.ufrj.br.

² M.Sc. Economics Institute, Federal University of Rio de Janeiro (IE/UFRJ), Senior Researcher at RedeSist, IE/UFRJ. E-mail:clara@ie.ufrj.br.

³ Ph.D. SPRU/University of Sussex, Secretary for Local Production and Innovation Systems and Development, National Development Bank. E-mail:hlastres@bndes.gov.br.

change or to a combination of both (Storper 2000). It is argued that financial globalization, heralds the emergence and the consolidation – at least temporarily – of a new accumulation regime placed under the sway of finance and that this trend is having significant effects on the overall capacity of the system to produce innovation and on the type of innovation that is produced (Chesnais and Sauviat 2003). Far from allowing for knowledge diffusion to different economies and societies one observes an acceleration of a trend towards its concentration and privatization.

With the expansion of globalization new forms of polarization and exclusion have been set up. Inequalities in conditions of generation, access and use of new technologies, systems and content are bringing novel and more complex inequalities between individuals, social groups, organizations, countries and economic blocks, rich and poor. Rather allowing for a better, integrated world where knowledge flows freely, the new world order could be characterized as one where knowledge is assuming more and more a role of a power instrument (Cassiolato, Lastres and Maciel, 2003).

The benefits of science and technology to development are neither automatically nor equally distributed among or within countries. In fact, there has never been so much innovation with so little outcomes for social welfare. Scientific and technological development has created immense capabilities in the current world, which however coexist with growing poverty rates, with hunger and poor health conditions of a significant part of world population. This situation is even worst in highly unequal societies such as Brazil and other Latin American countries.

The effects of purely market-led science and technology efforts and associated innovations tend to aggravate this existing gap unless some alterations are imagined. For such purpose, the debate on the role of S&T, in general, and of innovation, in particular, in contemporaneous capitalism needs to be politicized.

This paper aims at analyzing how innovation process can contribute to improve equality in highly unequal societies, taking the example of Brazil. It also explores the assumption that improvements can be achieved when innovation policies are oriented to the resolution of social pressing problems and needs. The paper is organized as follows. Item 2 briefly discusses the issue of innovation and inequality. Item 3 concentrates on a discussion about the concepts of innovation, social innovation and a more appropriate notion of “socially oriented innovation process”. Item 4 analyzes how inequality impacts the national system of innovation focusing on the case of Brazil. Item 5 examines the case of a socially oriented innovation process in Brazil and highlights the importance

of interlinking social needs and innovation from a systemic innovation framework. Finally, in the item 6 some concluding remarks are presented.

2. Innovation & Inequality

In the modern era of learning and knowledge, the challenge for science and technology democratization in Latin America becomes even more pressing. If the relevance of science and technology for promoting economic development and competitiveness is broadly recognized today, it becomes imperative to advance in such debate in order to include their role for fighting inequality and promoting social inclusion. We must reconsider innovation and its insertion in development trajectories, blending innovative efforts with social concerns and interconnected development issues. Although innovation, taken apart, is not capable to overcome the scenery of huge inequity existing in Brazil and other Latin-American countries, it has much to contribute to tackle such challenge. For this a socially oriented innovation policy is needed

Extreme inequality affects knowledge and innovation capabilities, restricting development possibilities. In addition to social justice goals, the search for more equality is a necessary condition to foster development process. In spite of being needed, focalized and assistance-type social policies are not capable to assure lifelong improvement of equality. The challenge to reduce inequality in the knowledge economy cannot be divorced from innovation. A positive correlation is frequently observed between advances in science, technology & innovation and the deepening of inequality. As pointed out by some authors: “when the issue of inequality ... (is) ... investigated, we often find that diffusion of innovations widens the socioeconomic gap between the higher and the lower status segments of a system” (Rogers 1995, p. 125). Such course of action is particularly present in highly unequal underdeveloped countries where fostering innovation usually increases inequalities and “the trend toward higher inequality is probably stronger in a global knowledge-based and innovation-driven economy ... (with) ...people with greater capabilities, power, and social capital ... (being)... better situated to innovate, to take profit from innovations, and to learn by innovating” (Sutz and Arocena (2006, p.7).

Breaking this paradox is a huge challenge especially for underdeveloped countries. But it is not an unattainable objective as evidence shows that successful processes towards higher levels of equity have been accompanied by strong national efforts towards competence building and innovation .

3. Innovation, social innovation and socially oriented innovation processes in the National Innovation System framework

The recognition about the importance of innovation brought a huge popularity of the term. However, such popularity brought together confusion about its meaning. Different concepts are being used to define innovation. It is known that, from an etymological point of view, to innovate is to introduce something new. But the dictionary definition is not enough.

In social sciences the term is associated with the economist Joseph Schumpeter who early last century was the first scholar to put it in the centre of its analytical understanding of capitalist evolution. To explain innovation and its importance Schumpeter defined it as an act of will of individuals (entrepreneurs) and proposed a total separation between what he called invention, innovation and diffusion. When innovation started to be scrutinized in international circles more than 50 years ago, the understanding of innovation was the same. Take for example, the classic definition of the first OECD study on the subject back into 1971: innovation is “defined as the first application of science and technology in a new way, with commercial success” (OECD, 1971, p. 11). The emphasis was in an act – successful commercialization – split from invention and diffusion.

This definition became a standard representation of innovation and served also as the basis for the collection of statistics on the subject. However it did not survive the test brought by the results of the first studies on the subject, the SAPPHO project at Sussex University and the Yale Innovation Survey at Yale University. In fact, one of the several things that resulted from these studies was that such definition is essentially flawed. Without entering into much detail here we may argue that the literature on the subject (which became known as neo-Schumpeterian or evolutionary view on technology and innovation) found evidence that the traditional understanding of innovation was misleading as it supported the wrong view of innovations as representing well-defined, homogeneous events that entered the economy at a precise point of time.

It is worth noting that even though many decades have passed the “single act” perception of innovation still remain in most policy circles, patent offices and part of the academy which seems to

be more comfortable with this simplification: innovation is an act and its development occurs in subsequent phases of invention, innovation and diffusion.

What these empirical studies found was evidence supporting the notion that innovation is a very multifaceted process involving different actors and organizations that is specific, non-replicable. The recognition that innovation is a process has important consequences both in analytical and normative terms since it obviously moves the emphasis from the result (an “identifiable” product or process) to a whole complex process. Some of the authors that contributed more to such understanding, such as Chris Freeman also emphasized that the process that lies behind the production of any novelty is essentially a social process. Such a perception of innovation has also an important territorial dimension in the sense that the innovation process is essentially a localized process. It can not be totally replicated and the outcome of innovation processes in different parts of the world will be different and linked to specific learning processes that depend on history, culture, social conditions, accumulated capabilities and so on.

Obviously, being a social, localized process does not mean in any way that the innovation process is a socially oriented process. In fact, in modern capitalism, this social process is in the vast majority of the cases subordinated to a purely economic logic and to forms of economic organization that causes its outcome to be socially damaging. At the same time, it is necessary to recognize that in some few cases, the organized society has been able to produce innovations (social processes) that bring benefit to those who need most.

The term social innovation has been used to characterize such cases and this term has also been increasingly present in the literature. As with its predecessor (innovation) this expression has several overlapping meanings. Most of these meanings are also misleading as they explicitly or implicitly understand innovation as acts. For example when someone considers social innovations as innovations (acts) that have a social meaning he/she incurs in the same mistake of disregarding the process that lies behind the development of the good or service.

So, concepts such as the one proposed by Honey Bee Network (one of the most important international network on the subject), that social innovation refers to “new ideas that work in meeting social goals, or new ideas that work to meet pressing unmet needs and improve people’s lives or innovative activities that are motivated by the goal of meeting a social need that are predominantly developed and diffused through organizations whose primary purposes are social”

still commit the mistake of separating inventions (new ideas) from innovations and lack the emphasis on the processes themselves.

As such definitions are sufficiently broad to encompass the different features of technologies that specifically target social development one should not overlook the significance of the systemic character of innovation. Also worth pointing out is - both in analytical and normative terms - that what is important is not only the development of technologies which target social needs and the participation of social actors on such process. This is obviously vital. However it is only a part of larger processes which is completed with the effective use of these efforts by society. Both these processes of development and use of technologies are incorporated in the above definition of social innovation differently from a more limited view on “social technologies” that some authors fancy. The idea of a “socially oriented innovation” as those social processes that target the development of products and processes, technological and organizational that aim to meet a societal need is therefore more appropriate to address the subject.

The discussion about different notions of innovation is of paramount importance particularly because there are significant policy implications from it. For example, Schumpeter’s notion of innovation as an act and the dichotomist division of “invention” and “innovation” as subsequent phases have been intrinsically used for policy purposes in most developing countries. Such use has resulted in a “narrow” perspective of innovation that concentrates on frontier advances resulting from R&D efforts by large, hi-tech, firms producing manufacturing goods and from the R&D infrastructure. Policies, according to such notion should be geared towards fostering universities and other public R&D institutions to behave more and more like “firms”, privatizing the otherwise public knowledge and concentrates on economic returns, leaving aside social development.

On an opposite direction, a systemic notion of innovation calls for a “broad” perspective of innovation that extends beyond formal R&D activities, taking into account continuous improvements in product design and quality; modifications to production processes that not only reduce costs but also ensure social and environmental sustainability.(Cassiolato, Lastres and Maciel, 2003). An understanding of innovation as ‘the process by which ... (organizations) master and implement the design and production of goods and services that are new to them, irrespective of whether or not they are new to their competitors – domestic or foreign’ (Mytelka, 1999) helps to avoid an overemphasis on R&D in the innovation process, encouraging policy-makers to take a broader perspective on the opportunities for learning and innovation in SME and in the so-called traditional industries in the primary, secondary and tertiary sectors of the economy. Such approach,

as it includes the above-mentioned territorial dimension, gives also importance to traditional knowledge avoiding de-contextualized concepts.

Recognizing the territorial dimension of innovation systems enhanced their national character which led to the concept of national innovation systems. As it is known this concept was introduced by Christopher Freeman (1982, 1987) and Bengt-Ake Lundvall (1985, 1988). Since the beginning of the nineties it has been used as an analytical tool and as a framework for policy analysis in both developed and underdeveloped countries. As a result, research and policy activities explicitly focusing on systems of innovation can be found in most countries and a rapidly growing number of studies of specific national systems of innovation have been produced.

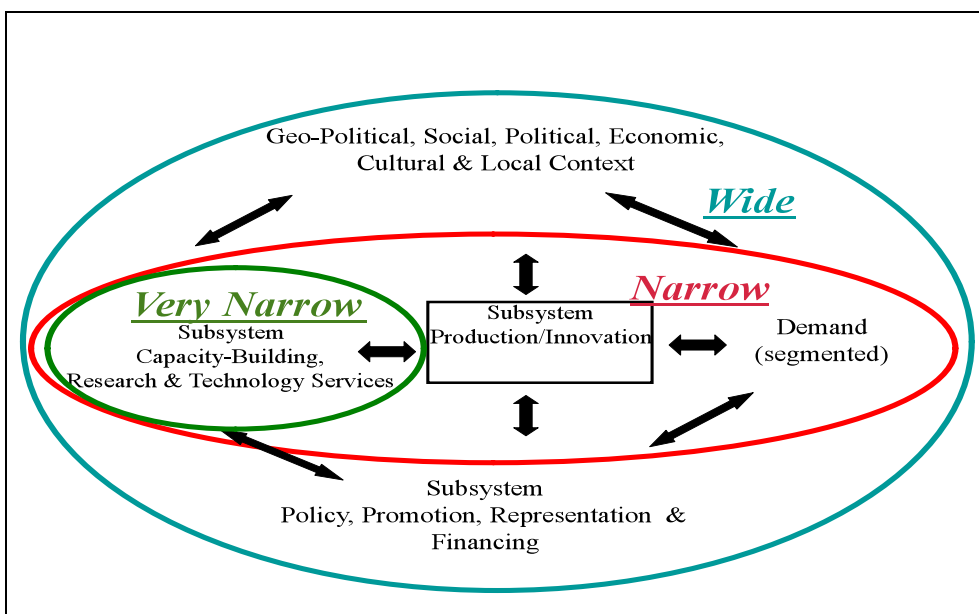
To adequately use this framework in the context of developing countries one has to be aware that there are two major versions of the concept: a narrow one and a broader one. In fact, some authors tend to focus on the innovation system in the narrow sense. In this vision, the NIS concept is a follow up to earlier analyses of national science systems and national technology policies. To authors that follow this approach, the key issue is to map indicators of national specialization and performance regarding innovation, research and development - R&D - efforts and science and technology - S&T - organizations. The policy issues raised are typically related almost exclusively to explicit S&T policy focusing on R&D. The analysis may include markets for knowledge – intellectual property rights and the venture capital aspects of financial markets, but it concentrates mostly on the “supply side” of innovation: firms and research organizations and policy institutions that directly influence the innovation process.

A broader perspective - including other institutions affecting the innovation system (such as macro-economic implicit policies for innovation, the financial system, cultural, historical processes that underlie it, etc.) and shaping competence building in the economy (such as education, training, industrial relations and labour market dynamics) - is necessary for understanding the whole dynamics of the process (Lundvall 2006). Figure 1 below is a schematic attempt to show these two approaches of NIS, the narrow and the broad.

What is important in this framework for the discussion of socially oriented innovation as part of development processes is, firstly, that the broader and systemic understanding of the innovation process is instrumental to avoid an overemphasis on R&D, encouraging policy-makers to take a far-reaching perspective on the opportunities for learning. Emphasis is put on interactions and on the role of historical processes - which account for differences in socio-economic capabilities and for

different development trajectories and institutional evolution - creating systems of innovation with very specific local features and dynamics. In terms of socially oriented innovations the broad approach does not have a “supply” bias as it includes elements of the “demand”, meaning the specificities of societies which have tremendous social needs. Also such societies have some characteristics (as exemplified by high differences in levels of income) and needs of social demand (water, sanitation, health, education, basic infrastructure, etc.) that affect and are affected by processes of innovation.

Figure 1 - The broad, narrow and very narrow versions of the national system of innovation approach



Source: Cassiolato and Lastres (2007)

4. How Inequality Impacts the National System of Innovation - the case of Brazil

As Furtado (1986) warned, dealing with underdeveloped countries requires special methodological care. Thus, the discussion on the issue of national innovation system (NIS) in Brazil must regard to the specificities of our underdevelopment. One of the fundamental dimensions for understanding the particularities of and hindrances to our NIS refers to the highly concentrated Brazilian pattern of income distribution. A deep and complex social heterogeneity is one of the outcomes of such

pattern. This heterogeneity affects every organization and competition of every sector of activity including the ways firms accumulate capabilities and ultimately their innovation strategies and outcomes.

According to data provided by *Instituto de Pesquisa Econômica Aplicada* (IPEA), in 2000 Brazil presented a rate of income inequality of 0,64. Although some improvement has been reached in the last years, with Gini coefficient declining to 0,57 in 2007, Brazil still stands among the most unequal countries in the world (UNDP, 2007). Such inequality is expressed under multiple forms besides income, including regions asymmetry, and gender and race discriminations, among others.

So, whereas, in 2006 in Southern Brazil, 58.6% of students aged 18 to 24 attended higher education, only 21% of students of the country's North East had access to university. In this same year, the average rate of functional illiteracy among people aged over 15 in Brazil was of 22.2%; however, when people within the same range of age but living in rural areas of Brazilian North East are considered, this percentage raises to 55.2% (IBGE, PNAD 2006). The same unequal pattern is observed in the access to health services, potable water, basic sanitation and energy services. A few examples: while the southern state of Rio de Janeiro, in 2000, had 2,24 physicians per 1000 inhabitants, the state of Maranhão, in poor Northeast, had only 0.31. In the same year, while only 53% of households in Maranhão counted on garbage collection, 78% on energy services and 32.83% on treated water, in São Paulo, the richest state in Brazil, these percentages reached respectively 98.78%, 99.66% and 97.81% (IPEA DATA, 2008).

This pattern of inequality has strong repercussions on the demand structure of Brazilian economy. Thus, whereas in the period 2002-2003 the average monthly expenditure (monetary and non-monetary) of the 40% poorest families was 180 Brazilian reais (US\$ 90) *per capita*, this average for the 10% richest families reached over 1,800 Brazilian reais (US\$ 900). In 2000, whereas in the country's northeastern region only 20.85% of households had telephone, 15.32% had a car and 4.31% had a computer, in the South East these figures were significantly higher 47.71%, 41.57% and 14.93% respectively (IPEA DATA, 2008).

The heterogeneous pattern of demand tends to be reflected into a productive structure far less homogeneous than that of countries that present a less unequal income distribution. One aspect of such heterogeneity of the Brazilian productive structure is observed, for instance, in the coexistence of different productive systems, of quite distinct technological bases, within the same industrial sector and even within the same industrial plant. Each of these productive systems is directed to

distinct markets in terms of income. Therefore, within the same industrial plant it is found a technologically modern production line, producing goods targeting the demand of higher-income consumers, together with another production line, of lower technological complexity, aimed at serving the demand of low-income people. To each distinct production line, different patterns of technological capabilities, information and knowledge requirements and, especially, distinct forms of social, economic and technical organization with are associated to distinct innovation systems. This heterogeneity has direct repercussions on the differentiation and characterization of the production structure intra and inter sectors.

One of the main problems posed to innovativeness (and to the study of innovation) in Brazil results from this broad heterogeneity of Brazilian productive structure that occurs as much spatially as sectorially. Thus, we detect the coexistence of complex and articulated innovation systems with less innovative production systems, what poses additional challenges to both the understanding of the functioning dynamics of these systems and the formulation of policies suited to our reality (Cassiolato, Lastres and Laplane, 2007).

Furtado (1986) reminded that “the main factor accounting for rising productivity in the industrialized peripheral economies seems to be the diversification of consumption patterns by high-income minorities, a process that not necessarily has repercussions on the living conditions of the major part of the population”. He emphasizes that “Brazilian development is essentially a social problem” (2003) where size limitations of domestic market affect the possibilities for technical progress. Furthermore, he recalled the lesson of Eastern Asian countries for overcoming the barriers to development by means of combining “social homogeneity” and the “creation of an efficient productive system endowed with technological autonomy” (1992).

Assuming that the emphasis must be put on innovation policies of a broader and systemic character, a hypothesis to be explored is that the interactive building of innovation systems targeting social development could contribute to reduce the polarization “modernization – marginalization”, which characterizes Brazil, and signaling a less unequal pattern of technological development that could be more consistent with a national long term development project. Innovation policies should place the support of *socially oriented innovation* in the centre of its strategy, assuring adequate funding, deepening local innovative and diffusion efforts, protecting and inducting the creation of new competences and technological capabilities, articulating different actors, inducing socially-oriented research, enabling problem-solving capabilities, strengthening learning capabilities, etc. National policies should be articulated to local policies as the local dimension is essential to assure the

contribution of local actors to find solutions to problems that directly affect them. In the next item some examples of this type of action in Brazil will be shown.

5 – Socially oriented innovations: some examples from Brazil

In Brazil, as well as in other underdeveloped countries, there are several examples that show the potential of stimulating the underutilized capacities to foster developmental purposes. Examples vary from high tech solutions developed to cope with public health issues to low tech and local level alternatives directed to overcome potable water restraints in the semi-arid region (1 million cisterns program). This kind of efforts besides being concrete solutions to local people needs, also contribute to the generation of endogenous knowledge and reinforce local learning capacities.

Departing from the overall idea of systemic and socially determined innovation, RedeSist – a research network comprising 26 Brazilian universities in Brazil and in Mercosur - developed an analytical approach combining the contributions of Latin American Structuralist school with the neo-schumpeterian view of innovation systems.⁴ Departing from these references RedeSist proposed the concept of Local Productive and innovation Systems (LIPS) that focuses on specific sets of actors and economic activities. This focus privileges the investigation of: relations - including technological and innovation related - between actors (including firms); knowledge flows (including tacit); bases of learning processes to increase capabilities (productive, innovative, organizational); and the importance of geographical proximity and historical, institutional, social and cultural identities as sources of diversity and sustained competitive advantages.

As proposed by RedeSist⁵, Local Productive and innovation Systems (LIPS) is a framework capable of encompassing sets of social, economic and political actors that are fundamental for the generation, regulation and mobilization of productive and innovative capabilities. LIPS include firms – producing final goods and services, suppliers of services and goods (raw materials and equipment and other inputs), distributors, consumers, etc. and all other actors and organizations directed to training of human resources, information, research, development, engineering, promotion and financing, cooperatives, associations, etc.

⁴ For details see CASSIOLATO *et al.*, 2005.

⁵ See www.sinal.redesist.ie.ufrj.br.

Such analytical framework has been used by RedeSist for 10 years to analyse and study local productive arrangements in Brazil and other Mercosur countries. Among the approximately one hundred cases studied several involve successful development of socially oriented innovation processes. One of such case is an interesting experience of innovation and social inclusion that is occurring in the NorthEast State of Ceará: the local productive arrangement of Pingo D'água.⁶ It is an emblematic example of innovation processes stimulated by and oriented to social demands.⁷

This LPA is located in the city of Quixeramobim (Ceará), 200 kms from the sea being part of the well known semi-arid area of Brazilian NorthEast. It was structured from the self organization of a group of small farmers of the area that searched for alternatives to overcome the precarious life conditions brought by draught and poverty, so common in the Brazilian “sertão”. Thanks to efforts and articulations by these small producers an agreement was set up with the local prefecture and Brazilian and French researchers that were in the region and that held some hydro technological knowledge. This agreement resulted in the development and effective use of a technology to perforate tubular wells suitable to alluvium areas and to the needs of small family agriculture.

Till the 1980s policies of federal and state governments to tackle the drought in the region were restricted to stock rain water in dams and weirs. Besides the relatively high cost and restricted scope, such policies were characterized also by a lack of a productive option that could transform stocked water into irrigated agricultural production.

The setting up of large size irrigation projects which started in the 1990s by the State government has been evolving in a pattern where the dominant technological regime is dictated by the logic of the big agribusiness. Then, the policy focus has been directed towards large agricultural projects that target the international market, leaving aside productive alternatives for the family agriculture.

It is important to point out that the scientific and technological knowledge related to the technological regime of agribusiness oriented agricultural irrigation – that encompass the construction of dams, water transposition, management of hydro resources and expensive irrigation methods – is controlled by large, most multinational, firms and, partially in public R&D institutions. In the case of Pingo D'água, the hydro source is close to the producer, perforation equipment is manual – with easiness of use -, low cost and could be built in small local metallurgy

⁶ Pingo D'água could be literally translated into English as Drop of Water.

⁷ The experience described below is based on the study made by RedeSist; Estudo do Arranjo Produtivo Local Pingo D'água, Quixeramobim, Ceará. See Amaral Filho and Teixeira (2004) for a detailed analysis.

firms. Then, a marked difference between the Pingo D'água local productive arrangement and the agribusiness irrigated agriculture is in the technological pattern of the structures and equipment needed to capture water and of irrigation methods.

Such differences allowed the family farmers of the area to convert their traditional agricultural production geared to subsistence to a more modern irrigation agriculture targeted to both local and regional markets. A radical change of the productive system was promoted. Besides making viable the increase and diversification of agricultural production in the semi-arid area, this innovative process allowed for the increase in employment and income in segments of the population traditionally excluded and resulted in a high positive impact in the local economy.

However, it is necessary to emphasize that the technology developed was a necessary condition for the successful experience but not a sufficient one. For the technological success to become an innovation success, several other factors of a systemic character, in a particularly favorable framework of partnerships and institutional support, were essential for the success obtained by the Pingo D'água LPA.

First, previous social organization of productive actors was adamant to start up the innovation process. This was a direct fruit of specific features of that territory and also resulted from previous social movements. Although local actors (farmers) had a relatively low level of education, these pre-existing “human capabilities” were on the base of articulation and coordination process of the LPA and favored cooperation relations and learning.

Second, the role of local powers, such as the Prefecture of Quixeramobim was also fundamental. It was essential for structuring, increasing, articulating and coordinating the LPA. Through its political-institutional work it was possible to channel important support and partnership for the LPA, as those of universities⁸, state government, Banco do Nordeste, promoting agencies (such as Sebrae), among others. Perhaps the most important policy action was the guarantee by the prefecture for purchasing a substantial part of the in production of family farmers (through the “Programa Merenda Escolar”, a program that provides lunch for children at schools) and the availability of permanent technical support.

⁸ Instituições de pesquisa participantes do convênio: A Universidade Federal do Ceará, a Université François Rebelais, a École Nationale D'Ingenieurs dès Techniques de l'Horticulture e du Paysage.

Third, besides the already mentioned participation of universities, there were several institutions specialized in technical assistance and training, such as SEAGRI, EMATER-CE and SEBRAE that became part of the LPA. Interviews with farmers (Amaral Filho and Teixeira 2006), found that one of the main advantages of the localization of the LPA was the availability of specialized technical services and farmers pointed out that technicians of these institutions were their main partners. It is worth pointing out that this radical change of the productive process of these farmers would not be possible without the support received for training and capacity-building, crucial elements for the expansion of the LIPS and its sustainability.

Forth, an important achievement regards the innovative dynamics of the LPA. Although based on poor, uneducated farmers localized in an area chastened by the drought and without any previous experience with irrigation, the research results showed a situation of intense innovativeness. This refers not only through a radical change in the productive pattern, but also through an intense diversification of products and markets, positive changes in the organizational, marketing and distribution structures and regarding .

Finally, an important feature of the overall experience was the role played by local knowledge. Although local farmers lacked formal education they were keepers of local knowledge that passes from generation to generation. In the whole process of technological generation and innovation this type was crucial as recognized by statements of Brazilian and foreign scientists that participated in the process. In fact one of the key factors for success was the interaction of local knowledge with “advanced” scientific knowledge. Such interaction was crucial for the development of the first generation of technologies and for subsequent and constant adaptations and modifications in the locally produced equipment and process. Obviously all of this is attributed in large scale to permanent programs for training and technical assistance but is also a result of an intense use of local knowledge.

Besides having received several prizes, the Pingo D’água IPS served as a model to the setting up of new rural programs of the state government (Poços do Sertão e Caminhos de Israel) that attempt to target all family agriculture in Ceará. Besides contributing to the formulation of inclusive public policies, the farmers of Pingo D’água participate in the capacity-building programs disseminating the learning and knowledge acquired to other cities and towns of the region.

Government policies oriented to address demands claimed by excluded sectors are another way to promote the interlinking between social needs and innovation. Social movements, cooperatives,

family farmers, and other organized social sectors are important chains for identifying, demanding and helping to build solutions for societal pressing problems and needs.

During the last decades in Brazil we have seen the emergence of diverse interest groups articulated around concerns on the social dimension of STI in Brazil. These groups include movements such as Redes de Economia Solidária (Solidarity Economic Networks), Rede de Tecnologia Social (Social Technology Network), Incubadoras Tecnológicas de Cooperativas Populares (Technological Incubators of Popular Cooperatives), among others. They share a common view that scientific and technological progress has not been able to attend the basic needs of a large part of Brazilian population, besides engendering social and environmental impacts. Recognizing that relationships between STI and society are complex and unequal, especially in a heterogeneous country such as Brazil, they claim that the benefits from scientific and technological advances must be more equally distributed. Additionally, they argue on behalf of the recognition and valorization of traditional knowledge and the orientation of STI policies for social inclusion and sustainable development.

Gathering an ample scope of problem-solving experiences involving technological and innovative efforts they are important chains of social demands for public intervention on STI. However, we should avoid interpreting *socially oriented innovation* as the mere act of developing or making available “appropriate” technologies. Palliative interventions designed to and focused on extreme poverty situations that lack a broader systemic approach usually fails to be sustainable in the medium and long term. If the ultimate goal is social inclusion, the approach cannot be restricted to focalized solutions for alleviating poverty or other specific deficits. Improvements due to innovation should also generate a broader dynamic process of societal change, including the generation of local learning processes and capabilities for problem resolution. The creation of specific instances inside public administration oriented for dealing with social gaps and demands for technologies also have limited effectiveness if a systemic view is not adopted to articulate these demands with other STI and development policies.⁹

Precisely because *socially oriented innovation* should be integrated in the broader scope of development trajectories, policies aiming to mobilize the processes of knowledge generation and use are embedded in complexity and cannot be considered de-linked from social, political and economic powers. This is particularly truth when one take into account the central importance acquired by knowledge and innovation in the current accumulation pattern.

⁹ For instance, the creation in Brazil of the SECIS - Science and Technology Secretariat for Social Inclusion - at the Ministry of science and Technology, despite representing a step forward towards the claims for democratization of science and technology has limited scope and capacity to influence other public policies.

6 - Concluding Remarks: Integrating Innovation Policies with Social Policies

The innovation system approach is particularly useful to design effective innovation policies, particularly those analysed in this paper. First, because its more advanced, broader and inclusive understanding of the innovation process includes in the policy agenda actors, activities and regions that are often set aside. The case of Pingo D'água presented in this paper is an emblematic example of such understanding. This approach also highlights the importance of actors, institutions, and their mutual relations. In this way, it helps to identify the wide range of people and organizations involved in innovation, their demands and aims, the capabilities they have, the weakness they present, and the type of conflicting and cooperative relationships they maintain in society as a whole. This coverage is a fundamental step for the subsequent mapping of existing and missing linkages between these actors and organizations and a useful guideline for policy design.

Integrating innovation policies with social policies is one key strategy to pursue this goal (Sutz and Arocena (2006). As the authors point out, social policies besides addressing social needs should help to enhance capacities to do new things, to integrate new technologies into everyday life, and to solve problems by making the most extensive use of knowledge. On the other hand, innovation efforts should be oriented not only to increase competitiveness and other economic goals, but attend the needs of the poor and expand their own capabilities. They call equality emerging from these processes “proactive equality” because by fostering equality and innovative capabilities at the same time opens room to virtuous circles for lasting and even increasing equality.

In underdeveloped countries social needs are usually pressing. Brazil, for instance, despite being a middle income country has an expressive part of its population with precarious or no access to water, sanitation, health and other social services due to the high levels of inequality. Integrating excluded and precariously-included population in adequate consumption conditions, together with the search for improvement in the generation of social services infrastructure could represent a huge challenge for innovation policies. Social policies demands in this context could be an extremely valuable instrument to induce socially oriented innovation.

Contrary to the mainstream belief that market mechanisms would be capable to trickle-down the economic benefits from the advancements of science, technology and innovation (STI), we argue that deliberate policy efforts are essential to allow social-equality positive correlated innovation.

Both government and private policies are needed to move forward the linking between innovation and social policies demands. State purchasing power and other public policy instruments should be used to stimulate social demand for innovation, assure the generation and diffusion of the solutions and promote the accumulation of knowledge and productive capabilities in a wide range of productive sectors supportive to fulfilling social needs. Academic research incentives and university reward system could also be valuable instruments to foster problem-solving inventiveness. Additionally, national innovation efforts oriented by social policy demands might be an important instrument to stimulate research in areas without market interest but critical for social well being, such as tropical diseases and other under-researched issues. Similarly, new low cost solutions could be fostered in order to broaden coverage and access by the poor population, together reducing the gaps and enhancing innovation capabilities. Hence the importance of emphasizing the mobilization of the health, education, housing and other socially oriented local and productive innovation systems in less developed countries

As Hirschman pointed out, underdevelopment is a result not only of weak capabilities but, even more, of the sub-utilization of existing capabilities. Social policy demands for innovation could be an instrument to overcome the lack of sustained, inward oriented, knowledge demand coming from production that characterizes underdeveloped countries, opening opportunities to put available capabilities to work for development purposes. In this sense, *socially oriented innovations* could foster the social utility of scientific and technological knowledge locally available that are currently underutilized.

Therefore, promoting the interlinking between social and innovation policies requires the re-evaluation of development goals. Strategic changes are needed to put STI on behalf of social needs. Beyond the usual target of increasing international competitiveness and promoting economic growth, innovation policies should put focus on the resolution of social pressing problems and interconnected development issues, opening room for the development of productive specialization in important areas, the building of new product lines and business opportunities, fostering local level innovative dynamics, etc besides contributing to improving life conditions and the capabilities of the poor.

For this aim, priorities need to be reshaped and political will must be constructed to allow the necessary changes. Therefore, deepening democratization process and dealing with potential conflicts is another challenge to be faced to foster the intertwined process of increasing innovation and equality.

BIBLIOGRAPHY

CASSIOLATO, José E.; LASTRES, H.; LAPLANE, M. (2007) *Propostas para uma Política de Inovação*. Rio de Janeiro, pp.10., mimeo.

FREEMAN, Chris (1982), *The Economics of Industrial Innovation*, London: Frances Pinter.

FREEMAN, Chris (1987), *Technology Policy and Economic Performance*, London: Pinter.

FURTADO, Celso (1986) *Teoria e política do desenvolvimento econômico*. São Paulo: Nova Cultural (2^a edição).

FURTADO, Celso (2003a) *O Brasil do século XX: uma entrevista*. In: IBGE. Estatísticas do século XX. Rio de Janeiro: IBGE, pp. 11-24.

FURTADO, Celso (1992) *Brasil: a construção interrompida*. São Paulo: Paz e Terra.

LUNDVALL, B.-Å. (1985), *Product Innovation and User–Producer Interaction*, Aalborg: Aalborg University Press.

LUNDVALL, B.-Å. (1988), *Innovation as an interactive process: from user–producer interaction to the National Innovation Systems*, in G. DOSI, C. FREEMAN, R.R. NELSON, G. SILVERBERG and L. SOETE (eds), *Technical Change and Economic Theory*, London: Pinter Publishers.

LUNDVALL, B.-Å. (ed.) (1992), *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*, London: Pinter Publishers.

MYTELKA, L.K. (1999), *Competition, innovation and competitiveness: a framework for analysis*, in L.K. MYTELKA (ed.), *Competition, Innovation and Competitiveness in Developing Countries*, Paris: OECD, pp. 15–27.

STORPER, M. (2000) *Lived effects of the contemporary economy: globalization, inequality and consumer society*. *Public Culture*, vol. 12, 2, pp. 375-409.

SUTZ, Judith; AROCENA, Rodrigo (2006), *Integrating Innovation Policies with Social Policies: A Strategy to Embed Science and Technology into Development Process*; IDRC Strategic Commissioned Paper, April.